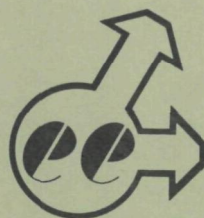


72 - CI - 5B
BORDEN CHEMICAL, INC.
GRANULAR TRIPLE SUPERPHOSPHATE STORAGE
PINEY POINT
JANUARY 24, 1972



environmental engineering, inc.

2324 S. W. 34th STREET / GAINESVILLE, FLORIDA 32601 / PHONE 904 / 372-3318

72 - CI - 5B
BORDEN CHEMICAL, INC.
GRANULAR TRIPLE SUPERPHOSPHATE STORAGE
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Test Conducted by:
Environmental Engineering, Inc.
Contract # CPA 70 - 82

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INTRODUCTION

Under the direction of the Environmental Protection Agency, Environmental Engineering, Inc. conducted emission tests at the Borden Chemical, Inc. phosphate works in Piney Point, Florida. On January 24, 1972, three test runs of approximately eighty minutes each were conducted on Borden's granular triple superphosphate storage building. The purpose of the tests was to obtain emission data for the use of both the Industrial Studies Branch and the Performance Standards Branch of the EPA.

Measurements for total fluorides were made at the inlet and outlet ducts of the storage off-gas scrubber. Grab samples of the scrubbing liquid were taken during the test runs and analyzed for fluoride content. A schematic flow diagram of the process operation and the sampling locations is given in Figure 1. Complete test results are given in Appendix A.

SUMMARY OF RESULTS

The amount of granular triple superphosphate located in storage during the test runs was approximately 1400 tons P_2O_5 . Loading of the product into rail cars was taking place during the test runs.

No major problems were encountered during the sampling; the only irregularity occurred at the scrubber outlet. At the first three traverse points of the duct the gas flow was negative. For this reason, although the true duct area was 26.3 FT^2 , the effective stack area was calculated to be only 23 FT^2 . The value for the effective stack area was used in all calculations.

A complete summary of the stack conditions and fluoride concentrations for each test point is given in Tables 1 and 2.

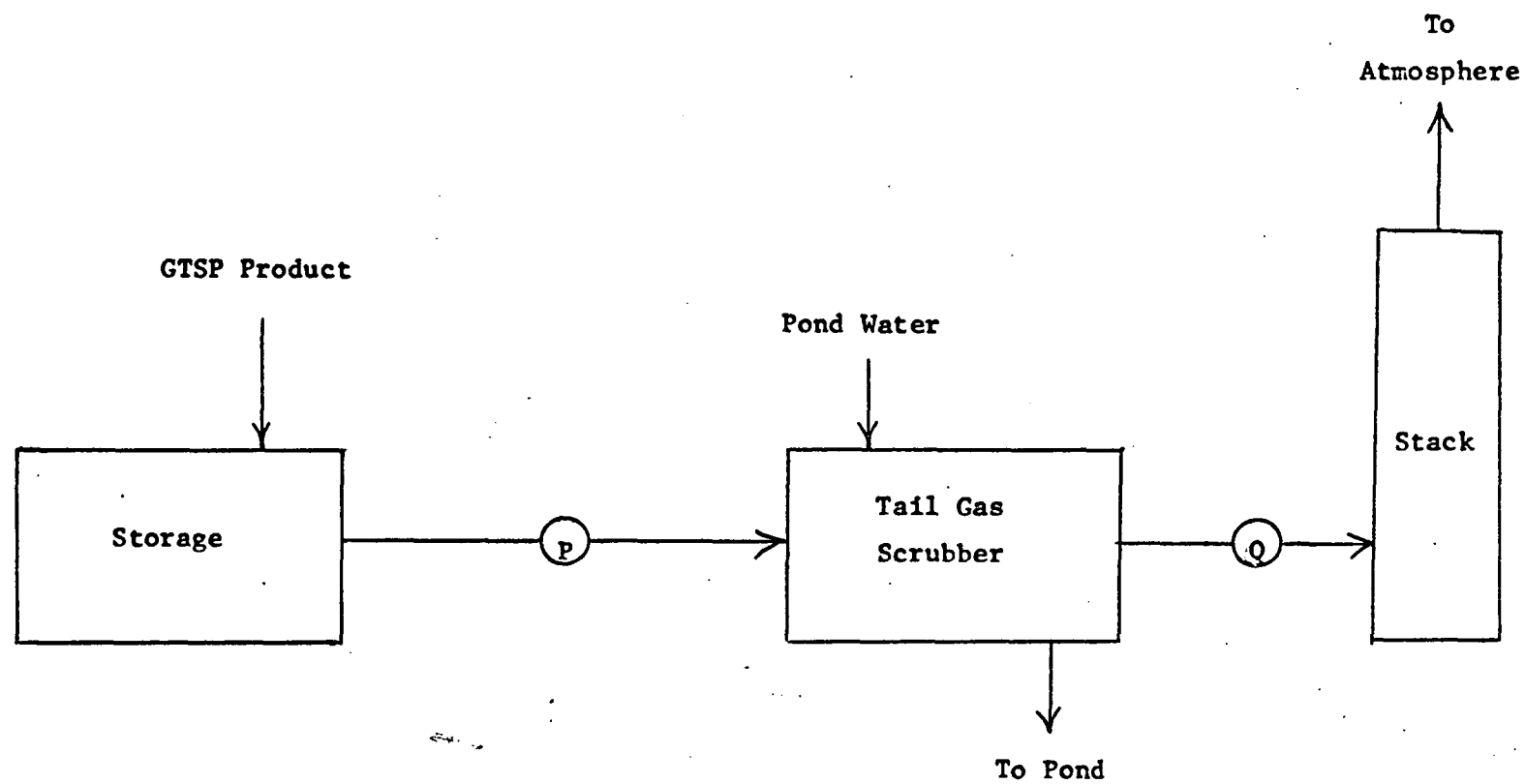


FIGURE 1
GTSP STORAGE
BORDEN CHEMICAL, INC.

TABLE 1
SUMMARY OF RESULTS
FLUORIDES

- Scrubber Outlet -

Run No.	1	2	3
Date	1-24-72	1-24-72	1-24-72
Barometric pressure, inches Hg	30	30	30
Stack pressure, inches Hg	30	30	30
Stack gas moisture, % volume	2.3	2.3	2.2
Average stack gas temperature, °F.	75	75	75
Stack gas flow rate @ S.T.P., SCFM	64844	64401	65744
Vol. dry gas @ S.T.P. *, SCF	81.9	79.439	82.663
Fluoride, water soluble, mg	5.6	4.1	4.6
Fluoride, total, mg	5.61	4.133	4.687
Fluoride, water soluble, gr/SCF	0.0011	0.0008	0.0009
Fluoride, total, gr/SCF	0.0011	0.0008	0.0009
Fluoride, water soluble, gr/CF stk. cond.	0.001	0.0008	0.0008
Fluoride, total, gr/CF stk. cond.	0.001	0.0008	0.0008
Fluoride, water soluble, lb/hour	0.61	0.44	0.51
Fluoride, total, lb/hour	0.61	0.44	0.51
Product in Storage, Tons P ₂ O ₅	1430	1430	1430
Fluoride, water soluble, (lb/hr)/ton P ₂ O ₅ stored	0.0004	0.0003	0.0003
Fluoride, total (lb/hr)/ton P ₂ O ₅ stored.	0.0004	0.0003	0.0003
Scrubber efficiency, %	71.6	54.2	71.5

* Dry, 70°F., 29.92 inches Hg.

TABLE 2
SUMMARY OF RESULTS
FLUORIDES

SCRUBBER INLET

Run No.	1	2	3
Date	1-24-72	1-24-72	1-24-72
Barometric pressure, inches Hg	30	30	30
Stack pressure, inches Hg	29.75	29.75	29.75
Stack gas moisture, % volume	0.5	0.4	0.9
Average stack gas temperature, °F.	85	85	84
Stack gas flow rate @ S.T.P., SCFM	83457	79621	74427
Vol. dry gas @ S.T.P.* , SCF	84.432	91.941	84.934
Fluoride, water soluble, mg	16.3	8.3	15.3
Fluoride, total, mg	16.59	8.44	15.372
Fluoride, water soluble, gr/SCF	0.003	0.0014	0.0028
Fluoride, total, gr/SCF	0.003	0.0014	0.0028
Fluoride, water soluble, gr/CF stk. cond.	0.0029	0.0013	0.0027
Fluoride, total, gr/CF stk. cond.	0.0029	0.0014	0.0027
Fluoride, water soluble, lb/hour	2.15	0.96	1.79
Fluoride, total, lb/hour	2.15	0.96	1.79
Product in Storage, Tons P_2O_5	1430	1430	1430
Fluoride, water soluble, (lb/hr)/ton P_2O_5 stored	0.0015	0.0007	0.0012
Fluoride, total, (lb/hr)/ton P_2O_5 stored	0.0015	0.0007	0.0012
Scrubber efficiency, %	-	-	-

* Dry, 70°F., 29.92 inches Hg.

PROCESS DESCRIPTION

Bulk granular triple superphosphate is stored in a large building. Emissions generated by the curing, and the handling of the product while loading on rail cars are vented to a packed scrubber.

PROCESS OPERATION

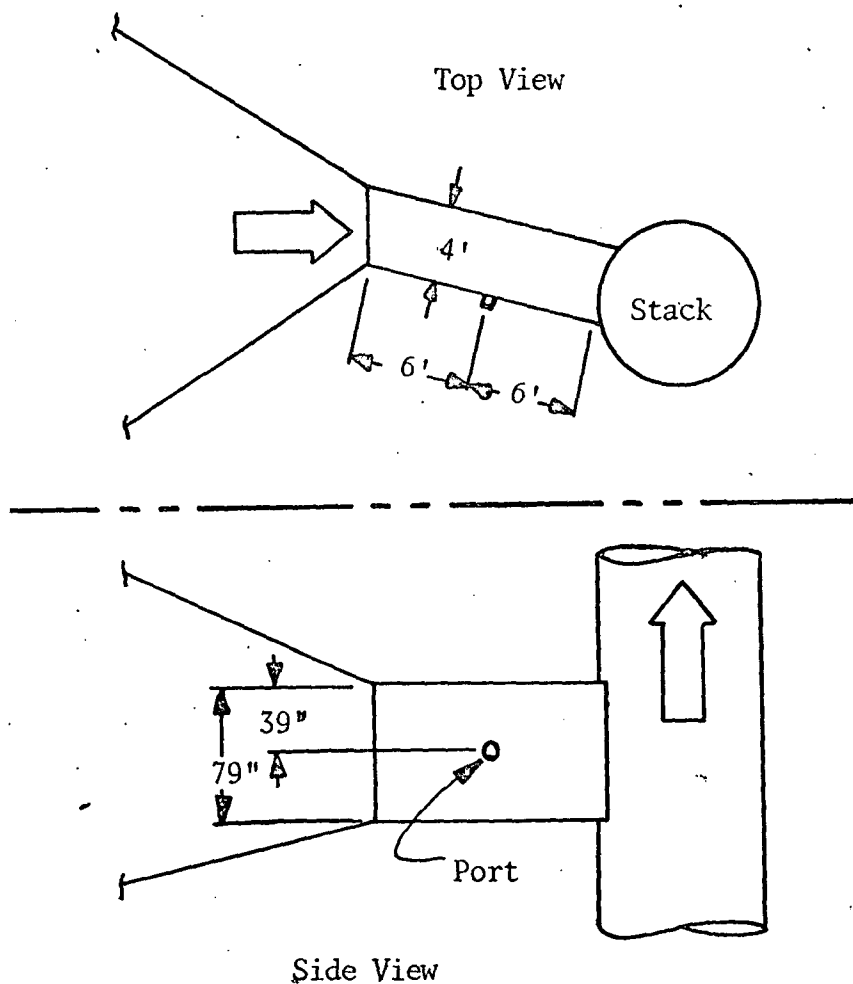
Operating conditions were normal during all three test runs.

LOCATION OF SAMPLING POINTS

The sampling sites and number of traverse points were selected as per "Method I - Sample and Velocity Traverses for Stationary Sources, Part 60, Subchapter C, Chapter 1, Title 40," Federal Register, No. 247-Pt. II-1.

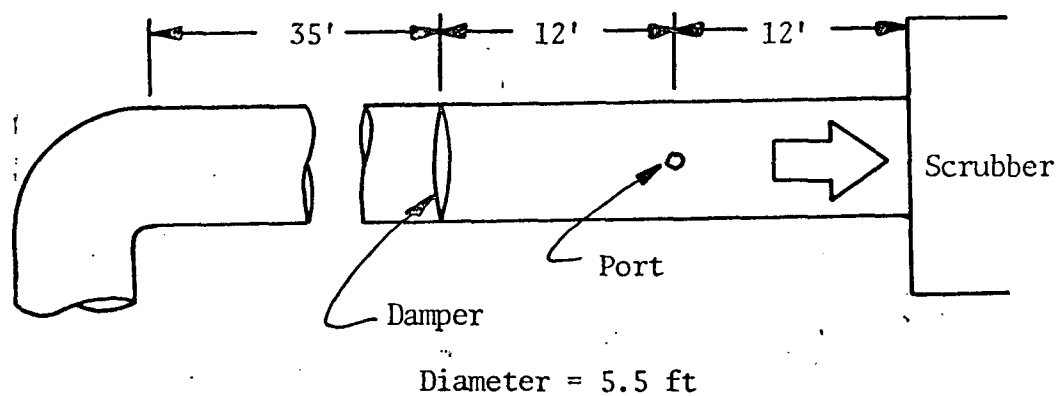
The above method suggests using two perpendicular diameters of traverse points per sampling station, however, on-site conditions necessitated the use of only one traverse diameter. The suggested number of traverse points per diameter was used where possible without sampling within one inch of the inner wall.

Figures 2 through 3 are schematic diagrams of the stack configurations near the sampling location, and the sampling points traversed during the emission tests.



<u>Traverse Point</u>	<u>Distance from Inner Wall (in.)</u>
1	1
2	3
3	5
4	7
5	9
6	11
7	13
8	15
9	17
10	19
11	21
12	23
13	25
14	27
15	29
16	31
17	33
18	35
19	37
20	39
21	41
22	43
23	45
24	47

FIGURE 2
LOCATION OF PORT, STATION Q, BORDEN CHEMICALS
SCRUBBER OUTLET



<u>Traverse Point</u>	<u>Distance from Inner Wall (in.)</u>
1	2 3/16
2	6 15/16
3	12 13/16
4	21 3/8
5	44 5/8
6	53 1/4
7	59 1/8
8	63 15/16

FIGURE 3
 LOCATION OF PORT, STATION P, BORDEN CHEMICALS
 SCRUBBER INLET

SAMPLING AND ANALYTICAL PROCEDURES

A. Preliminary Moisture Determination

The preliminary moisture contents were determined from wet and dry bulb thermometry. See Appendix B for the data used in determining the preliminary moisture content of the stack gases.

The final moisture content was determined as per Method 5 of the Federal Register (Volume 36, Number 297, Paragraph II, December 23, 1971) by totalling the condensate collected in the three impingers and the silica gel.

B. Preliminary Velocity Determination

Method 2 of the above mentioned Federal Register was used as a guide in determining the preliminary stack gas velocity for each source tested. The major difference was that only the maximum and minimum velocity heads across each stack area were determined so that a proper nozzle size could be selected. During each of the three fluoride emission tests, velocity head readings were taken at points selected by using Method 1 of the Federal Register.

Stack pressure and temperature measurements were also made during the preliminary velocity determinations.

C. Sampling for Fluoride Emissions

The sampling procedure used for determining fluoride emissions was similar to Method 5 of the Federal Register. The major difference between the two methods was the configuration of the sampling train. The sampling train described in the Federal Register has a heated box containing the filter holder directly following the glass probe. The s

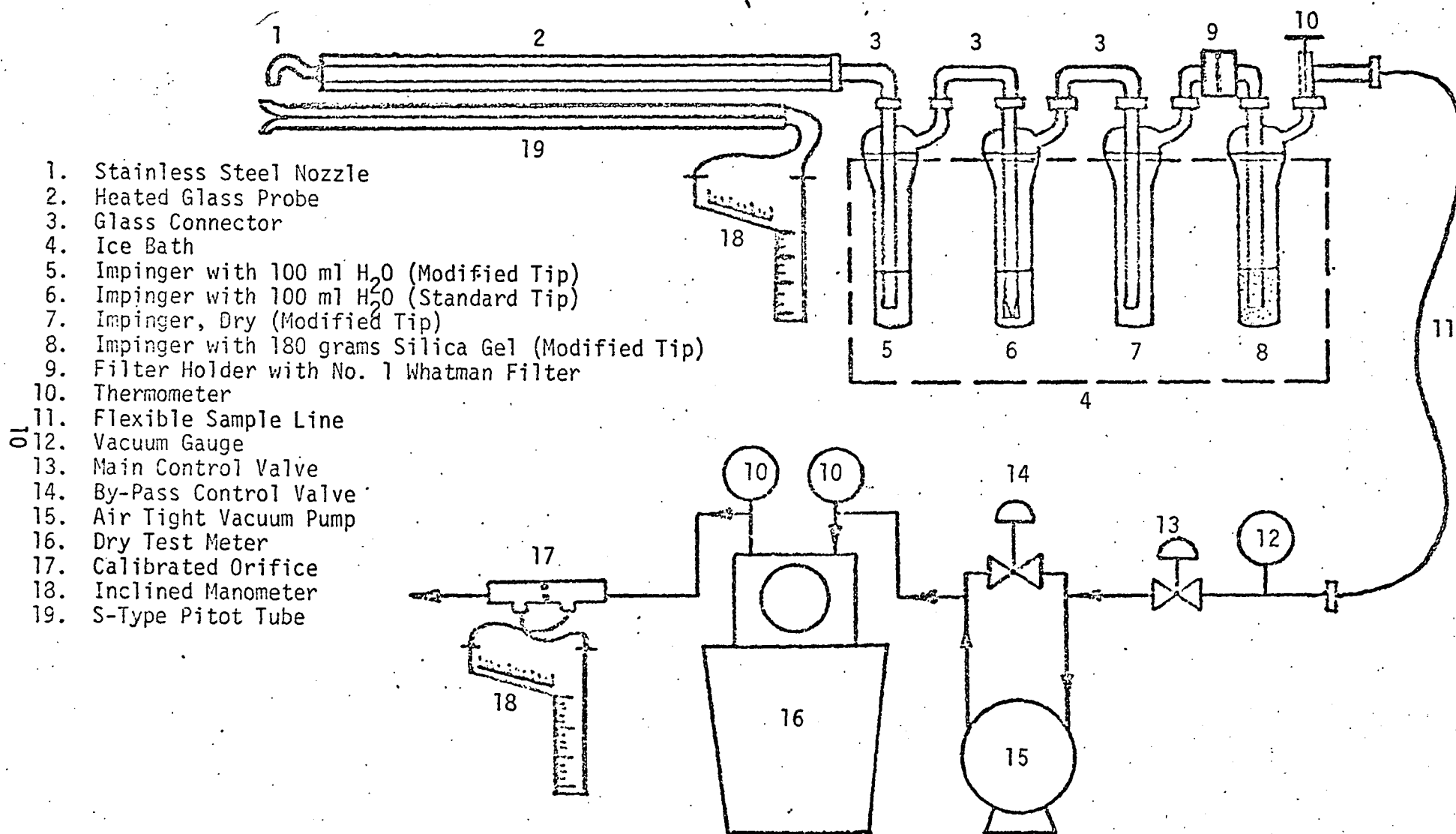


Figure 4
 FLUORIDE SAMPLING TRAIN

sampling train used in these tests contained no heated box and the filter holder was placed between the third and fourth impingers (between dry impinger and silica gel impinger) to prevent sample carryover. Figure 4 is a schematic diagram of the sampling train used.

After the selection of the sampling site and the minimum number of sampling points per Method 2 of the above mentioned Federal Register, three separate test runs were performed. For each run, the required stack and sampling parameters were recorded on field data sheets. They are included in Appendix B. Readings were taken at each traverse point at least every five minutes, and when significant changes in stack parameters necessitated additional adjustments to maintain an isokinetic flow rate. Nomographs were used to aid in the rapid adjustment of the sampling rate. The traverse points were selected to maintain at least one inch from the inner stack wall.

After each run, the liquid volume in the first three impingers was measured volumetrically and the silica gel was reweighed. The impinger liquid, the filter, plus the water washings of the probe and other sampling train components up to the silica gel were placed into a single polyethylene container.

D. Liquid and Product Grab Samples

Periodically, during each test run, grab samples of the raw materials, finished product, and scrubber liquid were taken, and the temperature and pH were determined at the site.

E. Laboratory Analysis

Water soluble fluorides were done by a sulfuric acid distil-

lation followed by the SPADNS-ZIRCONIUM LAKE METHOD. Water insoluble fluorides were first fused with NaOH followed by a sulfuric acid distillation then by the SPADNS-ZIRCONIUM LAKE METHOD.

For more details of exact method used see Appendix C.

APPENDIX

APPENDIX A

Emission Calculations & Results

E.E.I. SOURCE SAMPLING NOMENCLATURE SHEET

PB - Barometric pressure, inches Hg
 PS - Stack pressure, inches Hg
 As - Stack area, sq. ft.
 AS' - Effective area of positive stack gas flow, sq. ft.
 NPTS - Number of traverse points where the pitot velocity head was greater than zero
 TS - Stack temperature, °R
 TM - Meter temperature, °R
 H - Average square root of velocity head, $\sqrt{\text{inches H}_2\text{O}}$
 ΔH - Average meter orifice pressure differential, inches H₂O
 AN - Sampling nozzle area, square feet
 CP - S-type pitot tube correction factor
 VM - Recorded meter volume sample, cubic feet (meter conditions)
 VC - Condensate and silica gel increase in impringers, milliliters
 Po - Pressure at the dry test meter orifice, $\left[\text{PB} + \frac{\Delta H}{13.6} \right]$ inches Hg
 STP - Standard conditions, dry, 70°F, 29.92 inches Hg

- - - - -

VWV - Conversion of condensate in milliliters to water vapor in cubic feet (STP)
 VSTPD - Volume sampled, cubic feet (STP)
 VT - Total water vapor volume and dry gas volume sampled, cubic feet (STP)
 W - Moisture fraction of stack gas
 FDA - Dry gas fraction
 MD - Molecular weight of stack gas, lbs/lb-mole (dry conditions)
 MS - Molecular weight of stack gas, lbs/lb-mole (stack conditions)
 GS - Specific gravity of stack gas, referred to air
 EA - Excess air, %
 $\sqrt{H \times TS}$ - Average square root of velocity head times stack temperature
 U - Stack gas velocity, feet per minute
 QS - Stack gas flow rate, cubic feet per minute (stack conditions)
 QD - Stack gas flow rate, cubic feet per minute (dry conditions)
 QSTPD - Stack gas flow rate, cubic feet per minute (STP)
 PISO - Percent isokinetic volume sampled (method described in Federal Register)
 Time - Total sample time, minutes

EQUATIONS FOR CALCULATING FLUORIDE EMISSIONS

$$VWV = (0.0474) \times (VC)$$

$$VSTPD = (17.71 \times (VM) \times (PB + \frac{H}{13.6}) \div TM$$

$$VT = (VWV) + (VSTPD)$$

$$W = (VWV) \div (VT)$$

$$FDA = (1.0) - (W)$$

FMOIST = Assumed moisture fraction

$$MD = (0.44 \times \% CO_2) + (0.32 \times \% O_2) + (0.28 \times \% N_2) + (0.28 \times \% CO)$$

$$MS = (MD \times FDA) + (18 \times W)$$

$$GS = (MS) \div (28.99)$$

$$EA = \left[(100) \times (\% O_2 - \frac{\% CO}{2}) \right] \div \left[(0.266 \times \% N_2) - (\% O_2 - \frac{\% CO}{2}) \right]$$

$$\underline{U} = (174) \times (CP) \times (\underline{H}) \times \sqrt{(TS \times 29.92) \div (GS \times PS)}$$

$$QS = (\underline{U}) \times (AS)$$

$$QD = (QS) \times (FDA)$$

$$QSTPD = (530) \times (QD) \div (TS) \times (PS) \div (29.92)$$

$$PISO = \left[(0.00267 \times VC \times TS) + (P_o \times TS \times VM \div TM) \right] \div \left[(Time \times \underline{U} \times PS \times AN) \right]$$

Fluoride Emissions:

MG = Milligrams of fluoride from lab analysis

$$\text{Grains/SCF} = (0.01543) \times (MG) \div VSTPD$$

$$\text{Grains/CF, Stack Cond.} = (17.71) \times (PS) \times (FDA) \times (\text{Grains/SCF}) \div (TS)$$

$$\text{Lbs/hour} = (\text{Grains/SCF}) \times (0.00857) \times (QSTPD)$$

P₂O₅ Fed = Tons/hour, determined from plant data

$$\text{Lbs/ton } P_2O_5 \text{ Fed} = (\text{lbs/hour}) \div (\text{Tons/hour } P_2O_5 \text{ Fed})$$

FLUORIDE EMISSIONS

SOURCE TEST DATA

TEST NO - NO OF RUNS - 3
 PLANT - BORDEN CHEMICAL PINEY POINT, FLA.
 SOURCE - W.H. SCRUBBER INLET
 TYPE OF PLANT - FERTILIZER STORAGE
 CONTROL EQUIPMENT -
 POLLUTANTS SAMPLED - FLUORIDES

1) RUN NUMBER	1	2	3
2) DATE	1/24/72	1/24/72	1/24/72
3) TIME BEGAN	12:15	13:55	15:55
4) TIME END	13:35	15:15	17:10
5) BAROMETRIC PRESSURE, IN HG	30	30	30
6) METER ORIFICE PRESSURE DROP, IN HG	4.42	4.48	4.11
7) VOL DRY GAS, METER COND, CUBIC FEET	88.173	98.86	91.24
8) AVERAGE GAS METER TEMPERATURE, DEG F	101	117.7	116.6
9) VOL DRY GAS, S.T.P., CUBIC FEET	84.432	91.941	84.934
10) TOTAL H2O COLLECTED, ML	8.3	8	16.2
11) VOL H2O VAPOR COLLECTED, S.T.P., CU FT	0.39	0.38	0.77
12) STACK GAS MOISTURE, PERCENT VOLUME	0.5	0.4	0.9
13) ASSUMED STACK GAS MOISTURE, PCT VOL	1	1	1
14) PERCENT CO2	---	---	---
15) PERCENT O2	---	---	---
16) PERCENT CO	---	---	---
17) PERCENT N2	---	---	---
18) PERCENT EXCESS AIR	0	0	0
19) MOLECULAR WEIGHT OF STACK GAS, DRY	28.85	28.85	28.85
20) MOLECULAR WEIGHT OF STACK GAS, STK COND	28.8	28.81	28.75
21) STACK GAS SPECIFIC GRAVITY	0.99	0.99	0.99
22) AVG SQUARE ROOT (VEL HEAD), IN H2O	1.076	1.026	0.962
23) AVERAGE STACK GAS TEMPERATURE, DEG F	85	85	84
24) AVG SQUARE ROOT (STK TEMP*VEL HEAD)	25.117	23.95	22.436
25) PITOT CORRECTION FACTOR	0.83	0.83	0.83
26) STACK PRESSURE, IN HG, ABSOLUTE	29.75	29.75	29.75
27) STACK GAS VEL, STACK COND, F.P.M.	3649.8	3479.9	3262.8
28) STACK AREA, SQ FEET	23.76	23.76	23.76
29) EFFECTIVE STACK AREA, SQUARE FEET	23.76	23.76	23.76
30) STACK GAS FLOW RATE, S.T.P., SCFMD	83457	79621	74427
31) NET TIME OF TEST, MINUTES	80	80	80
32) SAMPLING NOZZLE DIAMETER, INCHES	0.25	0.25	0.25
33) PERCENT ISOKINETIC	88.1	100.6	94.4
34) FLUORIDE - WATER SOLUBLE, MG	16.3	8.3	15.3
35) FLUORIDE - TOTAL, MG	16.59	8.44	15.372
36) FLUORIDE - WATER SOLUBLE, GR/SCF	0.003	0.0014	0.0028
37) FLUORIDE - TOTAL, GR/SCF	0.003	0.0014	0.0028
38) FLUORIDE - WATER SOL., GR/CF, STK CHD.	0.0029	0.0013	0.0027
39) FLUORIDE - TOTAL, GR/CF, STK CHD.	0.0029	0.0014	0.0027
40) FLUORIDE - WATER SOLUBLE, LB/HOUR	2.1457	0.9553	1.786
41) FLUORIDE - TOTAL, LB/HOUR	2.1457	0.9553	1.786
42) P205 stored- Tons	1430	1430	1430
43) FLUORIDE - WATER SOL., lb/hr/ton P205 stored	0.0015	0.0007	0.0012
44) FLUORIDE - TOTAL, lb/hr/ton P205 stored	0.0015	0.0007	0.0012

S.T.P. ← DRY, 70 DEGREES F, 29.92 INCHES MERCURY

SOURCE TEST DATA

TEST NO - NO OF RUNS - 3
 PLANT - BORDEN CHEMICAL PINEY POINT, FLA.
 SOURCE - Scrubber Outlet
 TYPE OF PLANT - FERTILIZER STORAGE
 CONTROL EQUIPMENT -
 POLLUTANTS SAMPLED - FLUORIDES

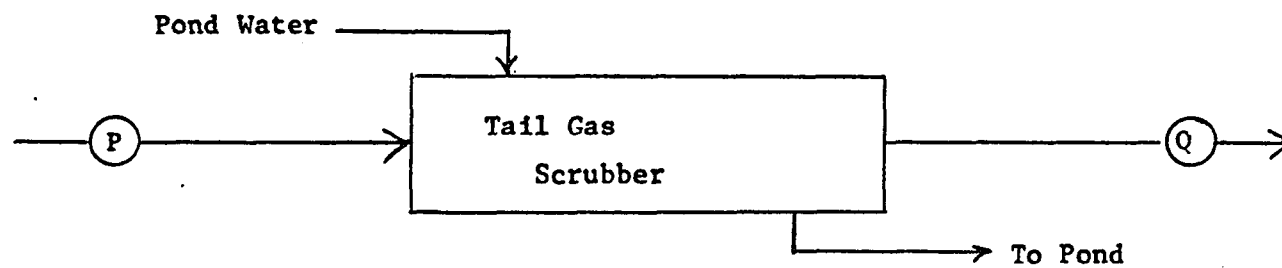
1) RUN NUMBER	1	2	3
2) DATE	1/24/72	1/24/72	1/24/72
3) TIME BEGAN	12:20	14:00	15:48
4) TIME END	13:44	15:24	17:12
5) BAROMETRIC PRESSURE, IN HG	30	30	30
6) METER ORIFICE PRESSURE DROP, IN HG	3.18	3.16	3.38
7) VOL DRY GAS, METER COND, CUBIC FEET	87.1	86.3	82.647
8) AVERAGE GAS METER TEMPERATURE, DEG F	109.6	121.8	121.1
9) VOL DRY GAS, S.T.P., CUBIC FEET	81.9	79.439	82.663
10) TOTAL H2O COLLECTED, ML	41.4	40.3	39
11) VOL H2O VAPOR COLLECTED, S.T.P., CU FT	1.96	1.91	1.85
12) STACK GAS MOISTURE, PERCENT VOLUME	2.3	2.3	2.2
13) ASSUMED STACK GAS MOISTURE, PCT VOL	2.4	2.4	2.4
14) PERCENT CO2	---	---	---
15) PERCENT O2	---	---	---
16) PERCENT CO	---	---	---
17) PERCENT N2	---	---	---
18) PERCENT EXCESS AIR	0	0	0
19) MOLECULAR WEIGHT OF STACK GAS, DRY	28.85	28.85	28.85
20) MOLECULAR WEIGHT OF STACK GAS, STK COND	28.6	28.6	28.61
21) STACK GAS SPECIFIC GRAVITY	0.99	0.99	0.99
22) AVG SQUARE ROOT (VEL HEAD), IN H2O	0.865	0.859	0.876
23) AVERAGE STACK GAS TEMPERATURE, DEG F	74.7	75	74.9
24) AVG SQUARE ROOT (STK TEMP*VEL HEAD)	20.001	19.878	20.26
25) PITOT CORRECTION FACTOR	0.83	0.83	0.83
26) STACK PRESSURE, IN HG, ABSOLUTE	30	30	30
27) STACK GAS VEL, STACK COND, F.P.M.	2904.5	2886.7	2941.3
28) STACK AREA, SQ FEET	26.33	26.33	26.33
29) EFFECTIVE STACK AREA, SQUARE FEET	23	23	23
30) STACK GAS FLOW RATE, S.T.P., SCFMD	64844	64401	65744
31) NET TIME OF TEST, MINUTES	84	84	84
32) SAMPLING NOZZLE DIAMETER, INCHES	0.25	0.25	0.25
33) PERCENT ISOKINETIC	101.4	99.1	101
34) FLUORIDE - WATER SOLUBLE, MG	5.6	4.1	4.6
35) FLUORIDE - TOTAL, MG	5.61	4.133	4.687
36) FLUORIDE - WATER SOLUBLE, GR/SCF	0.0011	0.0008	0.0009
37) FLUORIDE - TOTAL, GR/SCF	0.0011	0.0008	0.0009
38) FLUORIDE - WATER SOL., GR/CF, STK CHD.	0.001	0.0008	0.0008
39) FLUORIDE - TOTAL, GR/CF, STK CHD.	0.001	0.0008	0.0008
40) FLUORIDE - WATER SOLUBLE, LB/HOUR	0.6115	0.4415	0.507
41) FLUORIDE - TOTAL, LB/HOUR	0.6115	0.4415	0.507
42) P205 Stored-Tons	1430	1430	1430
43) FLUORIDE - WATER SOL., lb/hr/ton P205 stored	0.0004	0.0003	0.0003
44) FLUORIDE - TOTAL, lb/hr/ton P205 stored	0.0004	0.0003	0.0003

S.T.P. ↔ DRY, 70 DEGREES F, 29.92 INCHES MERCURY

SCRUBBER EFFICIENCY

BORDEN CHEMICAL, INC.

GTSP STORAGE



RUN #1	Flow: 83457 (DSCFM) Fluoride: 2.15 #/hr	Efficiency: 71.6%	Flow: 64844 (DSCFM) Fluoride: 0.61 (#/hr)
RUN #2	79621 0.96	54.2%	64401 0.44
RUN #3	74427 1.79	71.5%	65744 0.51

APPENDIX B
FIELD DATA

PRELIMINARY MOISTURE DETERMINATION

PRELIMINARY MOISTURE CHECK

PLANT Borden Chemicals

STACK Scrubber Inlet

DATE January 24, 1972

SAMPLE TIME _____

METHOD 1

Dry Bulb Temp. 115°F, Wet Bulb Temp. 91°F, Dew Point Temp. 33°F.

Vapor Pressure of H_2O @ DP 0.1878 "Hg. Stack Pressure 29.75 "Hg.

Moisture Fraction 0.0068, Dry Air Fraction 0.9932 "Hg.

METHOD 2

Final Dry Test Meter Reading _____ Ft^3

Initial Dry Test Meter Reading _____ Ft^3

Dry Test Meter Volume Sampled _____ Ft^3

Average Meter Temp _____ °F

Average Orifice ΔH _____ " H_2O

Barometric Pressure @ Orifice Meter _____ "Hg

Dry Gas Volume Sampled @ STP _____ Ft^3

Volume of Condensate _____ ml

Water Vapor Volume @ STP _____ Ft^3

Moisture Fraction _____,

Dry Air Fraction _____.

PRELIMINARY MOISTURE CHECK

PLANT Borden Chemicals

STACK Storage Outlet

DATE January 24, 1972

SAMPLE TIME _____

METHOD 1

Dry Bulb Temp. 74°F, Wet Bulb Temp. 74°F, Dew Point Temp. 74°F.

Vapor Pressure of H_2O @ DP 0.8462 "Hg. Stack Pressure 30 "Hg.

Moisture Fraction 0.0282, Dry Air Fraction 0.9718 "Hg.

METHOD 2

Final Dry Test Meter Reading _____ Ft^3

Initial Dry Test Meter Reading _____ Ft^3

Dry Test Meter Volume Sampled _____ Ft^3

Average Meter Temp _____ °F

Average Orifice ΔH _____ " H_2O

Barometric Pressure @ Orifice Meter _____ "Hg

Dry Gas Volume Sampled @ STP _____ Ft^3

Volume of Condensate _____ ml

Water Vapor Volume @ STP _____ Ft^3

Moisture Fraction _____,

Dry Air Fraction _____.

FLUORIDE EMISSIONS

SOURCE SAMPLING FIELD DATA SHEET

15' at 1-3.5" H₂

Plant Borden

Sampling Location WH - Scrubber Inlet

Date 11/24/72 Run No. 1

Time Start 12:15 Time End 13:35

Sampling Time/Point 10.0' (80 total)

DB 85 °F, WB °F, VF @ DP "Hg

Moisture 1 %, FDA , Gas Density Factor

Barometric Press 30 "Hg, Stack Press 29.75

Weather Fair

Temp. °F, W/D , W/S

Sample Box No. Meter Box No.

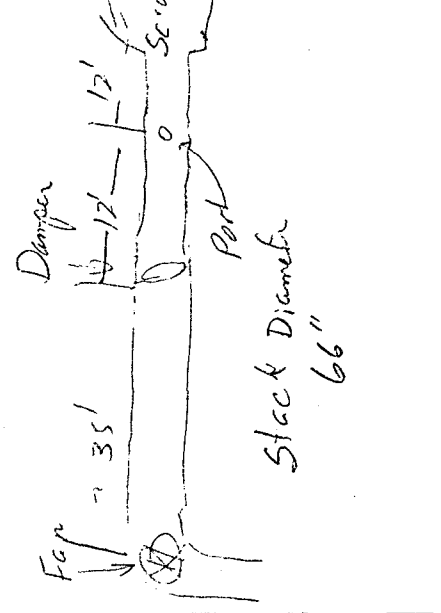
Meter ΔH 1.60 Pitot Corr. Factor 0.83

Nozzle Dia. 0.25 in., Probe Length 8 ft

Probe Heater Setting

Stack Dimensions: Inside Diameter 66 in
Inside Area ft²
Height ft

Sketch of Stack



Mat'l Processing Rate

Final Gas Meter Reading 667.5 ft³

Initial Gas Meter Reading 579.327 ft³

Total Condensate in Impingers 5 ml

Moisture in Silica Gel 3.3 gm

Silica Gel Container No. 603 Filter No. 7204/8

Orsat:	CO ₂				
	O ₂				
	CO				
	N ₂				
Excess Air					

Test Conducted By: John Cutts

Tom Tucker

Remarks: Stack velocity unstable due to damper in line. Unable to main train iso kinetic on sides.

Port and Traverse Point No.	Distance from End of Port (in)	Clock Time	Gas Meter Reading (ft ³)	Stack Velocity Head ("H ₂ O)	Meter Orifice Press. Diff. ("H ₂ O)		Stack Gas Temp. (°F)	Gas Sample Temp. @ Dry Gas Meter (°F)		Sample Box Temp. (°F)	Last Impinger Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual		In	Out			
1	2 7/16	12:15	581.190									
		12:20	588.6	2.5	10.0	7.0	85	84	74		62	15.0
		12:25	596.3	2.5	10.0	7.0	85	90	77		61	15.0
2	6 15/16	12:30	603.8	1.8	7.0	7.0	85	100	78		60	15.0
		12:35	612.6	1.8	7.0	7.0	85	106	80		60	15.0
3	12 13/16	12:40		0.85	3.4	3.4	85	108	84		63	7.0
		12:45	523.9	0.90	3.6	3.6	85	110	87		64	

* Note - Maximum that train can pull

[illegible]

Gainesville, Florida

SOURCE SAMPLING FIELD DATA SHEET

Plant Borden

Sampling Location W House Scrub inlet

Date 1/24/72 Run No. 2

Time Start 1355 Time End 15:15

Sampling Time/Point 10 minutes (80 total)

DB _____ °F, WB _____ °F, VF @ DP _____ "Hg

Moisture / %, FDA, Gas Density Factor

Barometric Press **30** "Hg, Stack Press ^{29.75}~~29.75~~ "Hg

Weather *Clear - Warm*

Temp. °F, W/D , W/S

Sample Box No. Meter Box No.

Meter ΔH 1.60 Pitot Corr. Factor 0.83

Nozzle Dia. 0.25 in., Probe Length 8 ft

Probe Heater Setting

Stack Dimensions: Inside Diameter **66** in

Inside Area . ft²

Height _____ ft

Mat'l Processing Rate

Final Gas Meter Reading 776.410 ft³

Initial Gas Meter Reading 6 77.550 ft³

Total Condensate in Impingers 5 ml

Moisture in Silica Gel 3.0 gm

Silica Gel Container No. 605 Filter No. _____

Orsat: CO_2 _____

02 _____

CO

N₂

Excess

Air _____

Test Conducted by: _____

Remarks:

[illegible]

[illegible]

SOURCE SAMPLING FIELD DATA SHEET

Height _____ ft

Remarks: LOADING CARS 4⁵⁰ PM

[illegible]

[illegible]

SOURCE SAMPLING FIELD DATA SHEET

Plant BORDEN CHEMICAL - PINEY POINT, FLA.

Q Sampling Location STORAGE TANK OUTLET

Date 1-24-72 Run No. 1

Time Start 12:20 Time End 13:44

Sampling Time/Point 21 points @ 4 min = 84 min

DB 69 °F, WB 69 °F, VF @ DP 69 "Hg

Moisture 2.4 %, FDA 97.6, Gas Density Factor —

Barometric Press 30 "Hg, Stack Press 30 "Hg

Weather CLEAR

Temp. 70's °F, W/D —, W/S —

Sample Box No. 1 Meter Box No. 1

Meter ΔH@ 1.72 Pitot Corr. Factor 0.83

Nozzle Dia. 1/4 in., Probe Length 6 ft

Probe Heater Setting 20 %

Stack Dimensions: Inside Diameter 48" x 79"

Inside Area — ft²

Height — ft

Eff. Area. = 23 ft²
RECTANGULAR STACK 48" X 79"

Mat'l Processing Rate —

Final Gas Meter Reading 159.237 ft³

Initial Gas Meter Reading 72.137 ft³

Total Condensate in Impingers 36 mL

Moisture in Silica Gel 220.3 - 214.9 = 5.4 gm

Silica Gel Container No 604 Filter No. 72041

Orsat: CO₂ —

O₂ —

CO —

N₂ —

Excess Air —

Test Conducted by: R. BLACK

K. DURHAM

S. WILKINS

Remarks: LOADING ROXCEPS

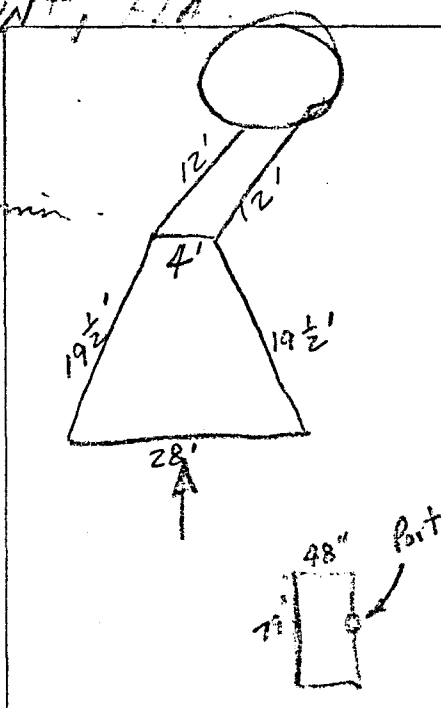
Port and Traverse Point No.	Distance from End of Port (in.)	Clock Time	Gas Meter Reading (ft ³)	Stack Velocity Head ("H ₂ O)	Meter Orifice Press. Diff. ("H ₂ O)		Stack Gas Temp. (°F)	Gas Sample Temp. @ Dry Gas Meter (°F)		Sample Box Temp. (°F)	Last Impinger Test (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual		In	Out			
Part # 1												
Point # 1	1"	—	—	—	—	—	—	—	—	—	—	—
2	3	—	—	—	NEGATIVE VELOCITIES			—	—	—	—	—
3	5	—	—	—				—	—	—	—	—
4	7	12:24	75.4	0.10	.42	.42	75	83	83	—	77	1.0
5	9	12:28	77.4	0.26	1.05	1.05	75	84	83	—	75	2.0
6	11	12:32	81.2	0.76	3.20	3.20	75	92	83	—	75	5.0
7	13	12:36	85.5	0.84	3.45	3.45	75	102	85	—	75	5.5

[illegible]

UROI TAL BINE NG,
Gainesville, Florida

SOURCE SAMPLING FIELD DATA SHEET

Plant BORDEN CHEM. PINEY POINT, FLA.
Q Sampling Location STORAGE TANK OUTLET
Date 1-24-72 Run No. 2
Time Start 14:00 Time End 15:24
Sampling Time/Point 21 points @ 1 min = 84 min
DB 69 °F, WB 69 °F, VF @ DP 69 "Hg
Moisture 2.4%, FDA 97.6, Gas Density Factor —
Barometric Press 30 "Hg, Stack Press 30 "Hg
Weather CLIM
Temp. 70.5 °F, W/D —, W/S —
Sample Box No. 1 Meter Box No. 1
Meter ΔH 1.72 Pitot Corr. Factor 0.83
Nozzle Dia. 1/4 in., Probe Length 6 ft
Probe Heater Setting 20%
Stack Dimensions: Inside Diameter — in
Inside Area — ft²
Height — ft



Mat'l Processing Rate —
Final Gas Meter Reading 245.537 ft³
Initial Gas Meter Reading 159.237 ft³
Total Condensate in Impingers 2833 ml
Moisture in Silica Gel 7.3 gm
Silica Gel Container No. 600 Filter No. 7201

Orsat: CO₂ —
O₂ —
CO —
N₂ —
Excess Air —

Test Conducted by: R. BLACK
R. DURGAN
L. WURTS

Remarks: —

Eff Area = 23 ft²
RECTANGULAR STACK 48" X 79"

Port and Traverse Point No.	Distance from End of Port (in.)	Clock Time	Gas Meter Reading (ft ³)	Stack Velocity Head ("H ₂ O)	Meter Orifice Press. Diff. ("H ₂ O)		Stack Gas Temp. (°F)	Gas Sample Temp. @ Dry Gas Meter (°F)		Sample Box Temp. (°F)	Last Impinger Test (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual		In	Out			
Port # 1												
Point # 1	1"	—	—	—	—	—	—	—	—	—	—	—
2	3	—	—	—	NEGATIVE		VELOCITIES		—	—	—	—
3	5	—	—	—	—	—	—	—	—	—	—	—
4	7	14:04	160.5	0.05	.21	.21	75	112	109	—	85	1.0
5	9	14:08	163.1	0.30	1.25	1.25	75	113	110	—	85	1.0
6	11	14:12	—	0.60	2.45	2.45	75	120	107	—	85	4.3
7	13	14:16	170.3	0.86	3.60	3.60	75	121	107	—	87	5.3

[illegible]

SOURCE SAMPLING FIELD DATA SHEET

Plant Borden Chem Process Point

Sampling Location Chlorine Gas

Date 1/24/72 Run No. 3

Time Start 1548 Time End 1712

Sampling Time/Point 4 min Y21 = 84 min

DB 69 °F, WB 69 °F, VF @ DP 69 "Hg

Moisture 2.4 %, FDA 97.6, Gas Density Factor

Barometric Press 30 "Hg, Stack Press 30 "Hg

Weather Cloudy

Temp. 69 °F, W/D, W/S

Sample Box No. 1 Meter Box No. 1

Meter ΔH 1.72 Pitot Corr. Factor 0.85

Nozzle Dia. 1/4 in., Probe Length 6 ft

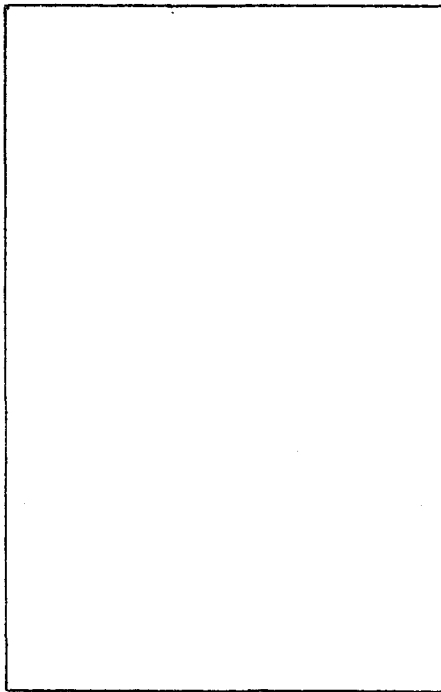
Probe Heater Setting 205

Stack Dimensions: Inside Diameter 18 in

Inside Area 254.47 ft²

Height 100 ft

Eff. Area = 23 ft² "x 79"



Mat'l Processing Rate

Final Gas Meter Reading 335.184 ft³

Initial Gas Meter Reading 295.537 ft³

Total Condensate in Impingers 37 ml } 3

Moisture in Silica Gel 2 gm }

Silica Gel Container No. 510 Filter No. 22041

Orsat: CO₂

O₂

CO

N₂

Excess

Air

Test Conducted by: J. Chadbourne

J. Smith

Remarks: Smooth

Port and Traverse Point No.	Distance from End of Port (in.)	Clock Time	Gas Meter Reading (ft ³)	Stack Velocity Head ("H ₂ O)	Meter Orifice Press. Diff. ("H ₂ O)		Stack Gas Temp. (°F)	Gas Sample Temp. @ Dry Gas Meter (°F)		Sample Box Temp. (°F)	Last Impinger Test (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual		In	Out			
<u>Port 1</u>		<u>PM</u>										
<u>1</u>	<u>1"</u>	<u>—</u>		<u>105"</u>								
<u>2</u>	<u>3</u>	<u>—</u>	<u>NCS</u>	<u>105"</u>								
<u>3</u>	<u>5</u>	<u>—</u>	<u>295.537</u>	<u>NCS</u>								
<u>4</u>	<u>7</u>	<u>3:52</u>	<u>296.8</u>	<u>0.05</u>	<u>.22</u>	<u>.22</u>	<u>74</u>	<u>102</u>	<u>102</u>		<u>90</u>	<u>41</u>
<u>5</u>	<u>9</u>	<u>3:56</u>	<u>299.5</u>	<u>.35</u>	<u>1.5</u>	<u>1.5</u>	<u>71</u>	<u>110</u>	<u>103</u>		<u>90</u>	<u>3</u>
<u>6</u>	<u>11</u>	<u>4:00</u>	<u>253.9</u>	<u>.85</u>	<u>2.6</u>	<u>2.6</u>	<u>75</u>	<u>108</u>	<u>104</u>		<u>90</u>	<u>6</u>
<u>7</u>	<u>13</u>	<u>4:04</u>	<u>255.1</u>	<u>.90</u>	<u>3.9</u>	<u>3.9</u>	<u>75</u>	<u>112</u>	<u>106</u>		<u>90</u>	<u>6.5</u>

12/10/1914

Final

GRAB SAMPLE COLLECTION

GRAB SAMPLE DATA SHEET

Plant Borden Chem Storage House

1/24/72

EPA Sample No.	509PG	509PG		*509PG
Run No.	1	1		1
Date	1/24/72	1/24/72		1/24/72
Time	1:20 p	2:40		2:49
Sampling Point	OUTlet	OUTlet		OUTlet
Temperature, °F	75	75		75
pH	2.10	2.10		2.05
Fluorides				
P ₂ O ₅				
Trace Metals				

Remarks * Combined Sample

Only two grab samples were taken
(GTSP)

GRAB SAMPLE DATA SHEET

Plant Borden Chem Storage House

1/24/72

EPA Sample No.	508PG	508PG	*	508PG
Run No.	1	1		1
Date	1/24/72	1/24/72		1/24/72
Time	1:20 _p	2:40 _p		2:49
Sampling Point	inlet	inlet		inlet
Temperature, °F	74	74		75
pH	2.10	2.15		2.01
Fluorides				
P ₂ O ₅				
Trace Metals				

Remarks * Combined Sample

Only two grab samples were taken
(GTSP)

GRAB SAMPLE DATA SHEET

Plant Borden Chem Storage House

1/24/72

EPA Sample No.	515PG	515PG	515PG	* 515PG
Run No.	2	2	2	2
Date	1/24/72	1/24/72	1/24/72	1/24/72
Time	2:22	2:50	3:05	3:15
Sampling Point	outlet	outlet	outlet	outlet
Temperature, °F	75	75	75	75
pH	2.28	2.30	2.25	2.20
Fluorides				
P ₂ O ₅				
Trace Metals				

Remarks * Combined sample

(GTSP)

GRAB SAMPLE DATA SHEET

Plant Borden Chem Storage House
1/24/72

EPA Sample No.	514PG	514 PG	514PG	* 514PG
Run No.	2	2	2	2
Date	1/24/72	1/24/72	1/24/72	1/24/72
Time	2:22	2:50	3:05	3:15
Sampling Point	inlet	inlet	inlet	inlet
Temperature, °F	75	74	74	75
pH	2.25	2.28	2.18	2.20
Fluorides				
P ₂ O ₅				
Trace Metals				

Remarks * Combined Sample

(GTSP)

GRAB SAMPLE DATA SHEET

Plant Borden Chem Storage House

1/24/72

EPA Sample No.	519 PG	519 PG	519 PG	* 519 PG
Run No.	3	3	3	3
Date	1/24/72	1/24/72	1/24/72	1/24/72
Time	4:05	—	4:55	5:00
Sampling Point	outlet	outlet	outlet	outlet
Temperature, °F	75	76	75	74
pH	2.20	2.22	2.20	2.20
Fluorides				
P ₂ O ₅				
Trace Metals				

Remarks * Combined sample

(GTSP)

GRAB SAMPLE DATA SHEET

Plant Borden Chem Storage House

1/24/72

EPA Sample No.	518 PG	518 PG	518 PG	* 518 PG
Run No.	3	3	3	3
Date	1/24/72	1/24/72	1/24/72	1/24/72
Time	4:05	—	4:55	5:00
Sampling Point	inlet	inlet	inlet	inlet
Temperature, °F	75	75	75	75
pH	2.20	2.20	2.19	2.20
Fluorides				
P ₂ O ₅				
Trace Metals				

Remarks * Combined Sample

(GTSP)

APPENDIX C
Standard Analytical Procedures

ENVIRONMENTAL PROTECTION AGENCY
Research Triangle Park, North Carolina 27711

Reply to
Attn of:

Date: 12-21-72

Subject: Summary of Fluoride Analysis

To: R. Neulicht, EMB, IRL

This memorandum is in response to your request for a brief summary of our SPADNS-Zirconium Lake procedure for determination of fluoride in stack emission samples.

Samples received in our laboratory are filtered through fluoride free paper filters to yield water soluble and water insoluble portions. The water insoluble particulate collected on the filter is rinsed thoroughly to be sure that all water soluble fluoride is rinsed through. The water soluble fraction is distilled from sulfuric acid to a maximum temperature of 180°C. If chloride is suspected in the sample Ag_2SO_4 is added to the still. SPADNS solution is added to an aliquot of the distillate and the absorbance is read at 570 nm. The concentration of the sample is determined from a calibration curve prepared from standard fluoride solutions. It is very important that the temperature of the samples be the same as that of the standards when absorbances are recorded.

The water insoluble fraction of the sample is evaporated to dryness in the presence of a slurry of CAO, and then fused with NaOH. The fusate is dissolved with distilled water, neutralized with dilute H_2SO_4 , distilled and analyzed as described for the soluble portion.

Paper filters containing particulate are cut into small pieces, suspended in a slurry of CAO, evaporated to dryness and ashed prior to the alkali fusion and distillation.

If you have any questions about this procedure, let me know.

Howard Crist

Howard L. Crist
Chief, Source Sample Analysis Section
SSFAB, QAEML

cc: R. E. Lee

APPENDIX E
Project Participants

PROJECT PARTICIPANTS

<u>Name</u>	<u>Title</u>
John Dollar	Project Manager
George Allen	Environmental Specialist
Ray Black	Environmental Specialist
John Cutts	Environmental Specialist
Bob Durgan	Environmental Specialist
Dennis Falgout	Environmental Specialist
Albert Henderson	Environmental Specialist
Tom Tucker	Environmental Specialist
Larry Wurts	Environmental Specialist
Jerome Rom	EPA
John Reynolds	EPA
Roy Neulicht	EPA