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CHAPTER 1

INTRODUCTION

Engineering-Science (ES) was contracted by the Green Bay Metropolitan Sewerage District (GBMSD) to perform emissions testing on Incinerator No. 2 located at the GBMSD sewage treatment facility in Green Bay, Wisconsin. The purpose of the testing was to measure the emission rates to the atmosphere of particulate matter, sulfur dioxide (SO_2) and various heavy metals during the incinceration of sewage sludge produced at the facility and of solid wastes produced by American Can Company.

Testing of Incinerator No. 2 was performed during the period September 21 through 25, 1981. The ES test crew was composed of Messrs. Jonathan Greenberg, Michael Gallagher and Jeffrey Coffin. During the testing GSMSD personnel maintained records of the incinerator operating rates and conditions. The testing was observed by Mr. Tom Ponty of the Wisconsin Department of National Resources (DNR). Prior to initiating the test program, ES reviewed the procedures for sampling the emissions with the DNR.

A total of nine emissions tests were conducted, three on each of three different days. Each set of three tests was conducted for a different incinerator feed composition. The emission samples were collected using an EPA Reference Method 8 type sampling train with the exception that a heated particulate filter was installed prior to the first impinger to allow collection and measurement of particulate matter. The results of the testing program are presented in this report along with a description of the incineration process, sampling locations, sampling procedures, and analytical methods. The appendices to this report contain copies of the field data sheets, example calculations, equipment calibration data, laboratory data, and incinerator process data.

CHAPTER 2

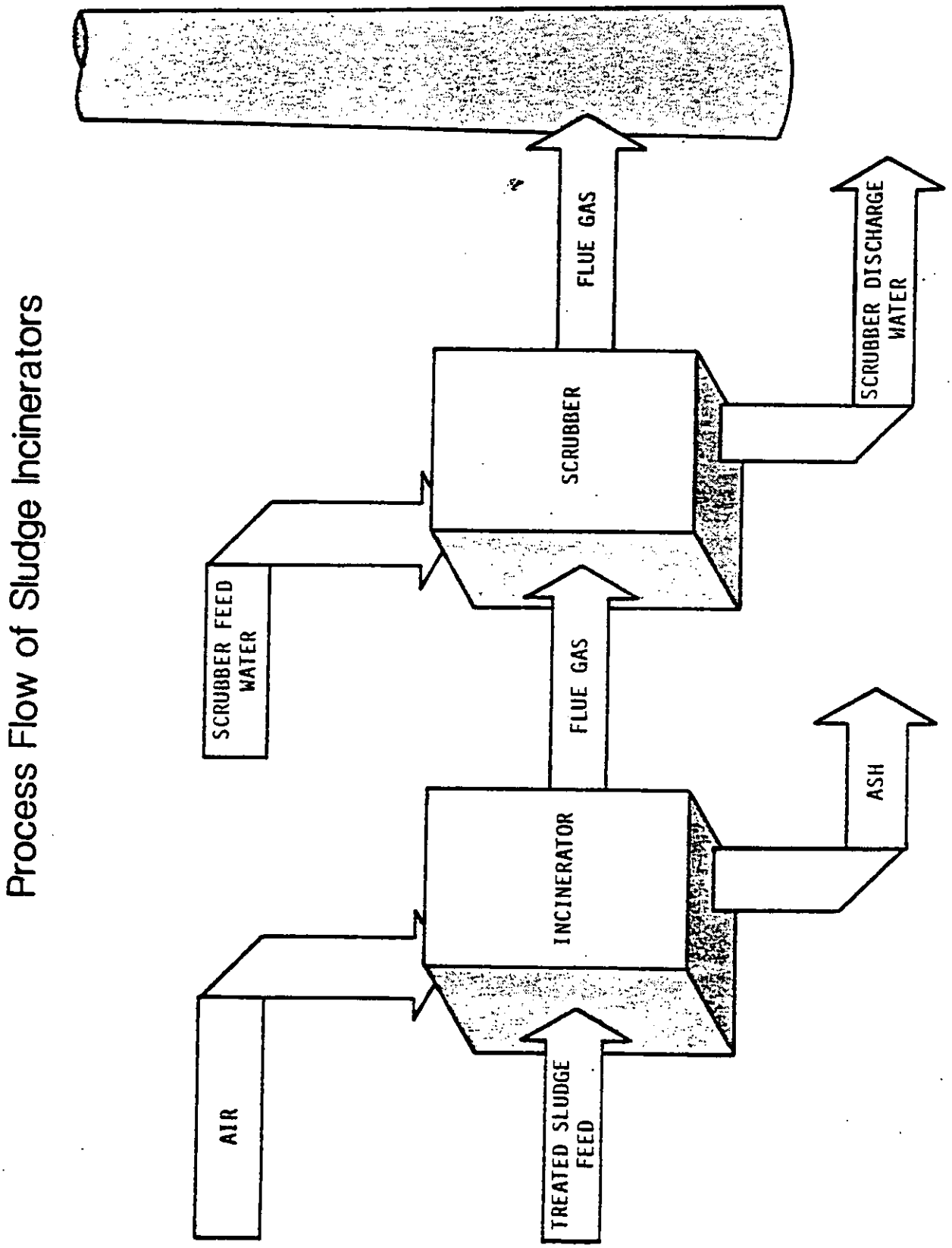
PROCESS DESCRIPTION

The Green Bay Metropolitan Sewerage District operates tandem seven hearth incinerators that have been on line since 1975. During normal operations, only one of the two incinerators is operated at a time. Emissions from each incinerator are controlled by a wet scrubbler. Figure 2.1 is a diagram showing the incineration process.

Basic to the incineration of sludge in an efficient and cost effective manner is its preparation for combustion. Incoming raw sludge is thickened and then subjected to a pressure and heat conditioning process which breaks down the sludge solids producing smaller particles that are more easily dewatered. The sludge is then fed onto drum-type vacuum filters where a sludge cake is produced. This cake is then moved by conveyor belt and deposited into the top of the incinerator chamber on a continuous basis. The burning sludge is then moved downward through each hearth by an intermittently rotating rake assembly. The rakes move the sludge from inner to outer areas of one hearth then back toward the center of the next hearth as it passes downward insuring more complete burning. Combustion air is supplied to the unit via induced draft and controlled by dampers around the chamber perimeter. Ash is removed to a landfill by truck.

Exhaust gases from the incinerator are split into two streams, one flowing through a precooler, and the other passing to a waste heat recovery boiler. Steam from the waste heat recovery boiler is utilized in the sludge thermal conditioning process. These two gas streams enter the scrubber from separate ducts. Scrubber exhausts then pass through an I.D. fan and on to the stack. Prior to entry into the stack, center shaft and shell cooling air enters the breeching just upstream of the smoke stack.

The normal wet sludge incineration feed rate ranges from 7,000 lbs/hr during summer operations to 12,000 lb/hr during winter operations. During the testing, the facility attempted to maintain the wet feed rate in the range of 10,000 to 12,000 pounds per hour. Feed rates were measured using belt scales. Three different incinerator feed compositions were used. Table 2.1 lists for each of the tests: the data, time period, feed composition and feed rates to the incinerator. Copies of the incinerator operation logs, and strip chart records indicating percent O_2 in stack gas, incinerator operating temperatures, belt scale readings, and percent opacity are contained in Appendix E along with feed sludge analytical data data for the tests.



Process Flow of Sludge Incinerators

TABLE 2.1

INCINERATOR FEED COMPOSITION AND FEED RATES
DURING EMISSIONS TESTING OF INCINERATOR NO. 2
AT GREEN BAY METROPOLITAN SEWERAGE DISTRICT

Date	Test Title	Test Time Start	Test Time Stop	Composition of Incinerator Feed (lbs Wet) Metro	Am Can	Total	Feed Rate (lbs.Wet/Hour) Metro	Am. Can	Total	
9/22/81	Burn 1 - Test 1	0950	1242	29,280	0	29,280	10,214	0	10,214	9,814
9/22/81	Burn 1 - Test 2	1515	1801	27,908	0	27,908	10,087	0	10,087	
9/22/81	Burn 1 - Test 3	1945	2225	24,374	0	24,374	9,140	0	9,140	
9/23/81	Burn 2 - Test 1	1000	1235	15,184	10,968	26,152	5,878	4,246	10,124	11,026
9/23/81	Burn 2 - Test 2	1340	1613	14,288	12,216	26,504	5,603 5,789	4,791 5,237	10,394	
9/23/81	Burn 2 - Test 3	1720	1953	15,010	17,020	32,030	5,886	6,675	12,561	
9/24/81	Burn 3 - Test 1	0900	1137	0	30,780	30,780	0	11,763	11,763	11,580
9/24/81	Burn 3 - Test 2	1250	1523	0	28,240	28,240	0	11,075	11,075	
9/24/81	Burn 3 - Test 3	1635	1907	0	30,150	30,150	0	11,901	11,901	

These aren't averages → See App. E

Burn 1 61.5% Moisture
Burn 2 64.1% Moisture
Burn 3 67.4% Moisture

During the three tests, identified as Burn 1, the incinerator was operated on GBMSD sludge only. During Burn 2, approximately equal amounts of GBMSD sludge and American Can solid waste were fed to the incinerator. During Burn 3, only American Can solid waste was burned.

TABLE 3.1

EMISSIONS FROM INCINERATOR NO. 2
DURING BURN NUMBER 1 AT GREEN BAY
METROPOLITAN SEWERAGE DISTRICT

Emission Rate Per Ton Dry Feed	Test 1[2]	Test 2	Test 3	Average[3]
Particulate (lbs)	0.487	0.600	0.454	0.527
Cadmium (mg)	-	72	-	-
Copper (mg)	-	74	-	-
Chromium (mg)	-	<41	-	-
Beryllium (mg)	-	<4	-	-
Nickel (mg)	-	<33	-	-
Zinc (mg)	-	<4	-	-
Sulfur Dioxide (lbs)	0.160	0.165	0.162	0.164
Concentration Per DSCF[1]				
Particulate (grains)	0.011	0.012	0.009	0.011
Cadmium (μg)	-	0.21	-	-
Copper (μg)	-	0.22	-	-
Chromium (μg)	-	<0.12	-	-
Beryllium (μg)	-	<0.01	-	-
Nickel (μg)	-	<0.10	-	-
Zinc (μg)	-	<0.01	-	-
Sulfur Dioxide (grains)	0.004	0.003	0.003	0.003

---

1 Dry standard cubic foot (68°F, 29.92 in. Hg). Corrected to 12% CO_2.

2 Results for Test 1 are suspect due to an unacceptable final leak check for the pitot tube and also a percent isokinetic sampling rate of 87 percent.

3 Test 1 excluded from average.

$$\frac{.22 \times 10^{-6}\ g}{ft^3} \times \frac{26{,}900\ ft^3}{min} \times \frac{60\ min}{Hr} \times \frac{lb}{453.59\ g} = 7.8 \times 10^{-4}\ lb/Hr$$

TABLE 3.5

EMISSIONS FROM INCINERATOR NO. 2
DURING BURN NUMBER 3 AT GREEN BAY
METROPOLITAN SEWERAGE DISTRICT

Emission Rate Per Ton Dry Feed	Test 1	Test 2	Test 3	Average
Particulate (lbs)	0.112	0.160	0.151	0.141
Cadmium (mg)	-	6	-	-
Copper (mg)	-	<17	-	-
Chromium (mg)	-	<43	-	-
Beryllium (mg)	-	<4	-	-
Nickel (mg)	-	<34	-	-
Zinc (mg)	-	<4	-	-
Sulfur Dioxide (lbs)	0.163	0.300	0.252	0.238
Concentration Per DSCF[1]				
Particulate (grains)	0.003	0.003	0.003	0.003
Cadmium (μg)	-	<0.02	-	-
Copper (μg)	-	<0.05	-	-
Chromium (μg)	-	<0.13	-	-
Beryllium (μg)	-	<0.01	-	-
Nickel (μg)	-	<0.10	-	-
Zinc (μg)	-	<0.01	-	-
Sulfur Dioxide (grains)	0.004	0.007	0.006	0.006

[1] Dry standard cubic foot (68°F, 29.92 in. Hg). Corrected to 12% CO_2.

TABLE 3.6

TEST DATA SUMMARY FOR BURN 3 AT
GREEN BAY METROPOLITAN SEWERAGE DISTRICT

	Test 1	Test 2	Test 3
Wet Feed Rate (lb/hr)	11,763	11,075	11,901
Dry Feed Rate (lb/hr)	3,905	3,544	3,880
Scrubber Inlet			
% CO_2 (dry basis)	15.93	14.97	14.50
% O_2 (dry basis)	3.50	4.50	5.17
% Excess Air	19.7	26.8	32.2
Scrubber Outlet Test Site			
% CO_2 (dry basis)	5.17	5.37	5.47
% CO_2 (adjusted)	5.28	5.47	5.61
% O_2 (dry basis)	15.20	14.97	14.87
% H_2O	3.40	3.88	4.22
% Excess Air	261.1	247.0	241.4
Volumetric Flow (acfm)	25,860	26,169	26,390
Gas Temperature (°F)	173	173	166
Volumetric Flow (dscfm)	20,740	20,853	21,183
% Isokinetic	100.3	100.1	99.1
Center Shaft Cooling Air			
Volumetric Flow (acfm)[1]	14,926	14,894	15,092
Gas Temperature (°F)	232	236	238
Volumetric Flow (dscfm)	11,244	11,134	11,235

[1] Based on estimated moisture content of 1 percent.

CHAPTER 4

SAMPLING LOCATIONS & PROCEDURES

Measurements were conducted at three locations during the sampling program. Figures 4.1 is a diagram showing the location. Emission sampling for particulate matter, SO_2 and heavy metals was conducted at the outlet of the wet scrubbler downstream of the center shaft cooling air duct. Velocity traverses of the center shaft cooling air duct were performed upstream of its junction with the outlet duct. Integrated gas samples for determination of O_2, CO_2 and excess air were collected upstream of the scrubber prior to the point where the duct splits to the precooler and waste heat recovery boiler. Each sampling location is described in more detail below.

Sampling Location - Scrubber Inlet

Combustion gases exiting from incinerator No. 2 pass horizontally through a 102" x 85.75" refractory lined steel duct approximately 5 feet to a vertically descending duct. The duct is then divided into two ducts. One carries the gases to a pre-cooler and the other carries gases to a waste heat recovery boiler. As illustrated in Figure 4.2 three 4" ports are located 12" downstream and 53" upstream from the nearest flow disturbance. These port locations do not meet the minimum EPA Method 1 requirements, however for the purpose of collecting the integrated gas samples the Wisconsin DNR approved the locations. Figure 4.3 is a diagram showing the sampling points used for the collection of integrated gas samples.

Sampling Location - Scrubber Outlet

As the scrubber exhaust gases leave the I.D. fan they pass through a 38" x 46-1/2" horizontal breeching to the stack. Seven 4" ports were located 83" (approximately 2 equivalent duct diameters) from the nearest upstream flow disturbance and 16" (approximately 0.4 equivalent duct diameters) from the nearest downstream flow disturbance. Figure 4.4 shows the location of the sampling ports. The sampling site did not meet EPA Method 1 requirements, however, the ports were installed at a location selected by the Wisconsin DNR and were approved for the purpose of this test program. Figure 4.5 is a diagram showing the location of the forty-nine traverse points used during sampling.

Center Shaft cooling Air

A 26.5" diameter duct carries the center shaft cooling air to the scrubber outlet breeching. Velocity traverses were performed through two

Test Locations for Incinerator No. 2
Green Bay Metropolitan Sewerage District

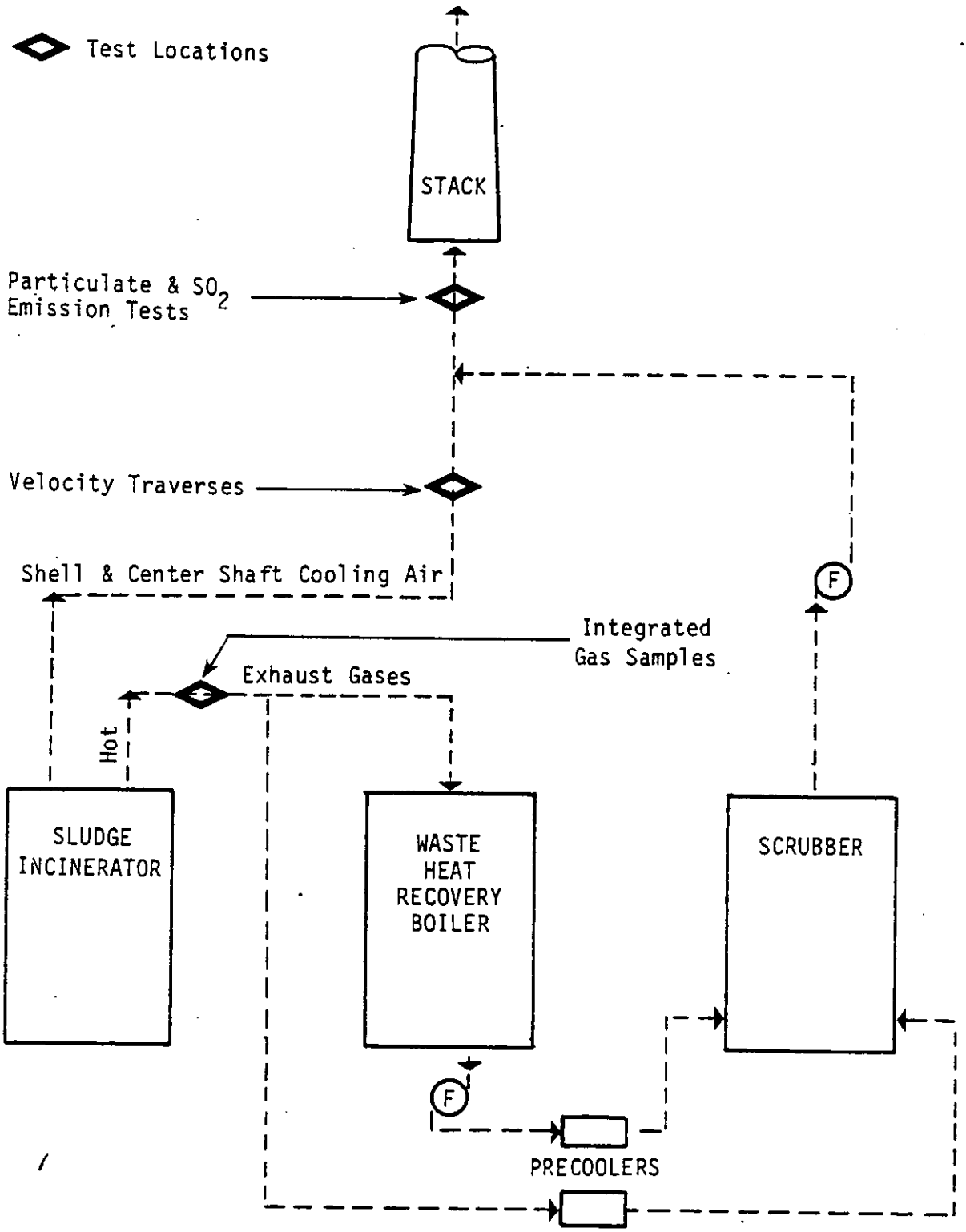


Diagram of Scrubber Inlet Sampling Location
Green Bay Metropolitan Sewerage District

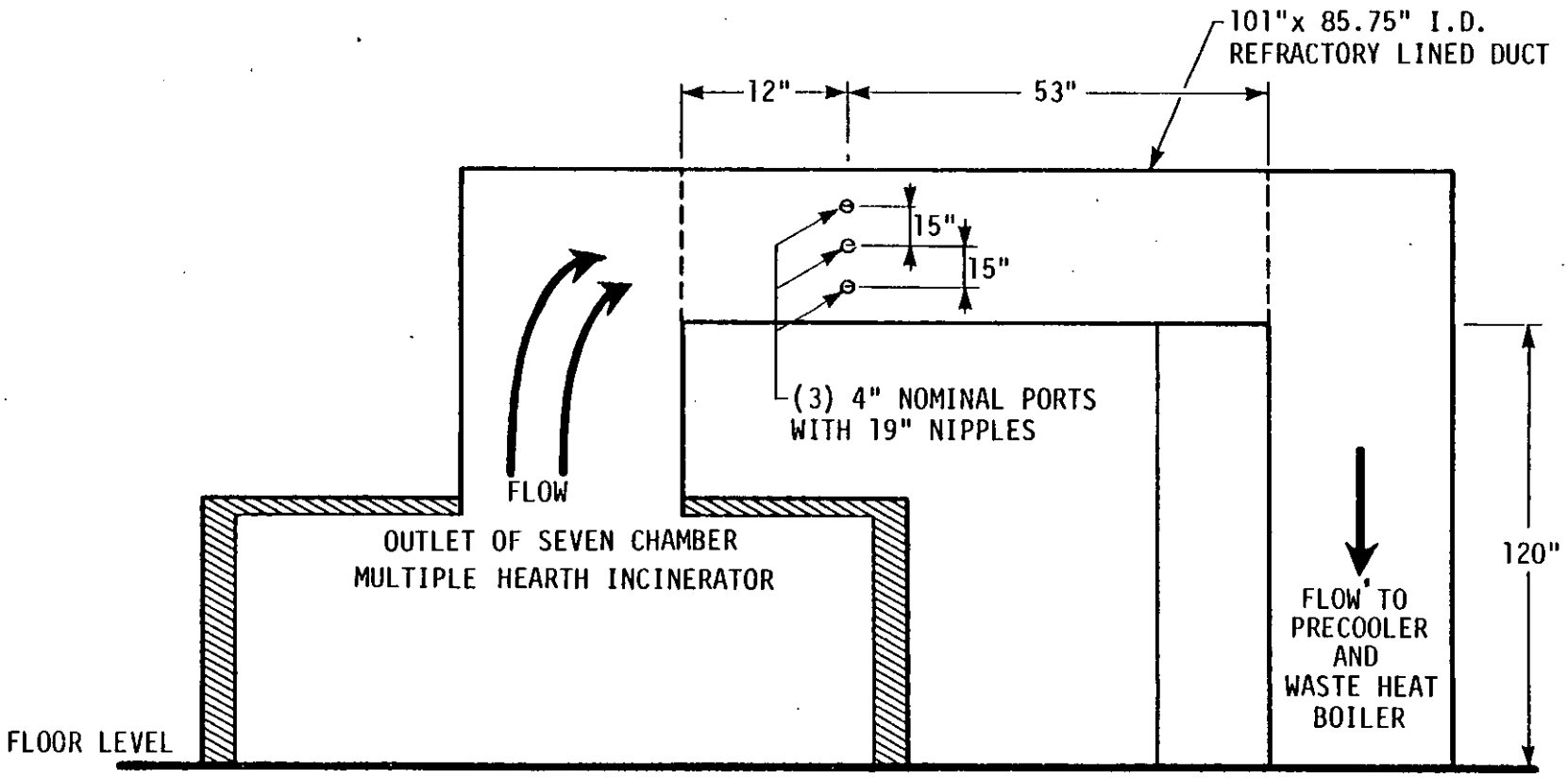
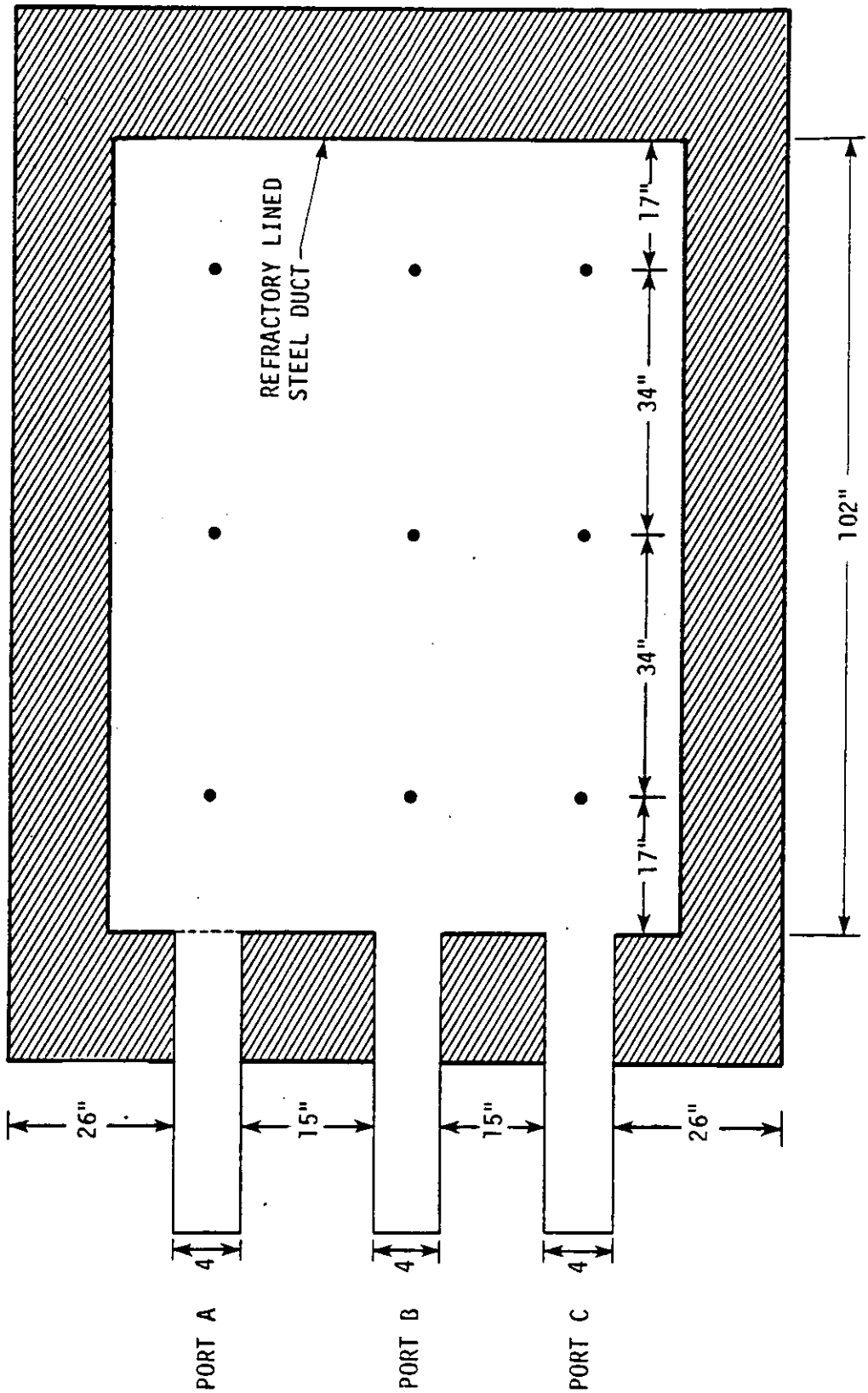


FIGURE 4.2

Cross Sectional Diagram Showing the Scrubber Inlet Sampling Locations
Green Bay Metropolitan Sewerage District



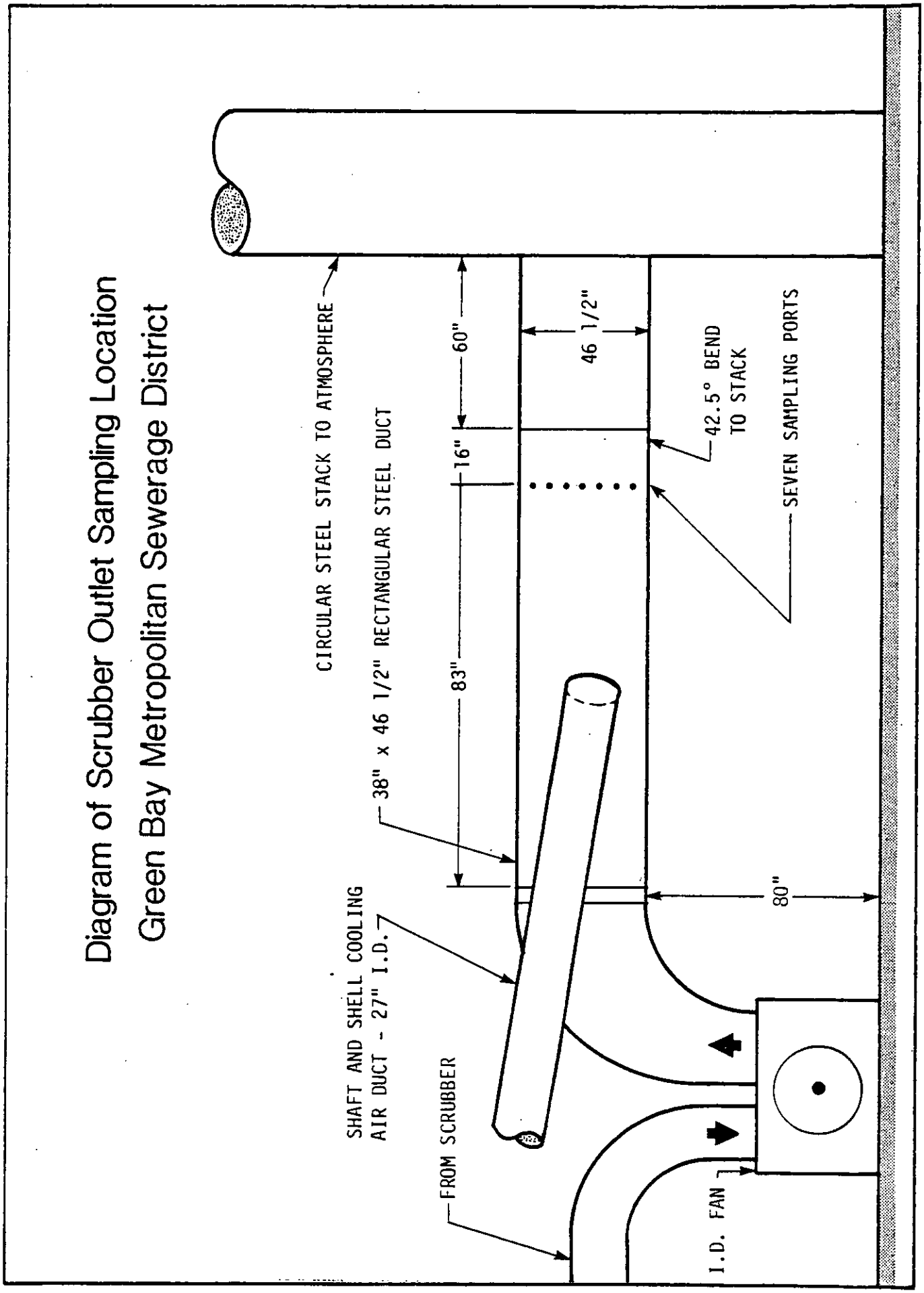
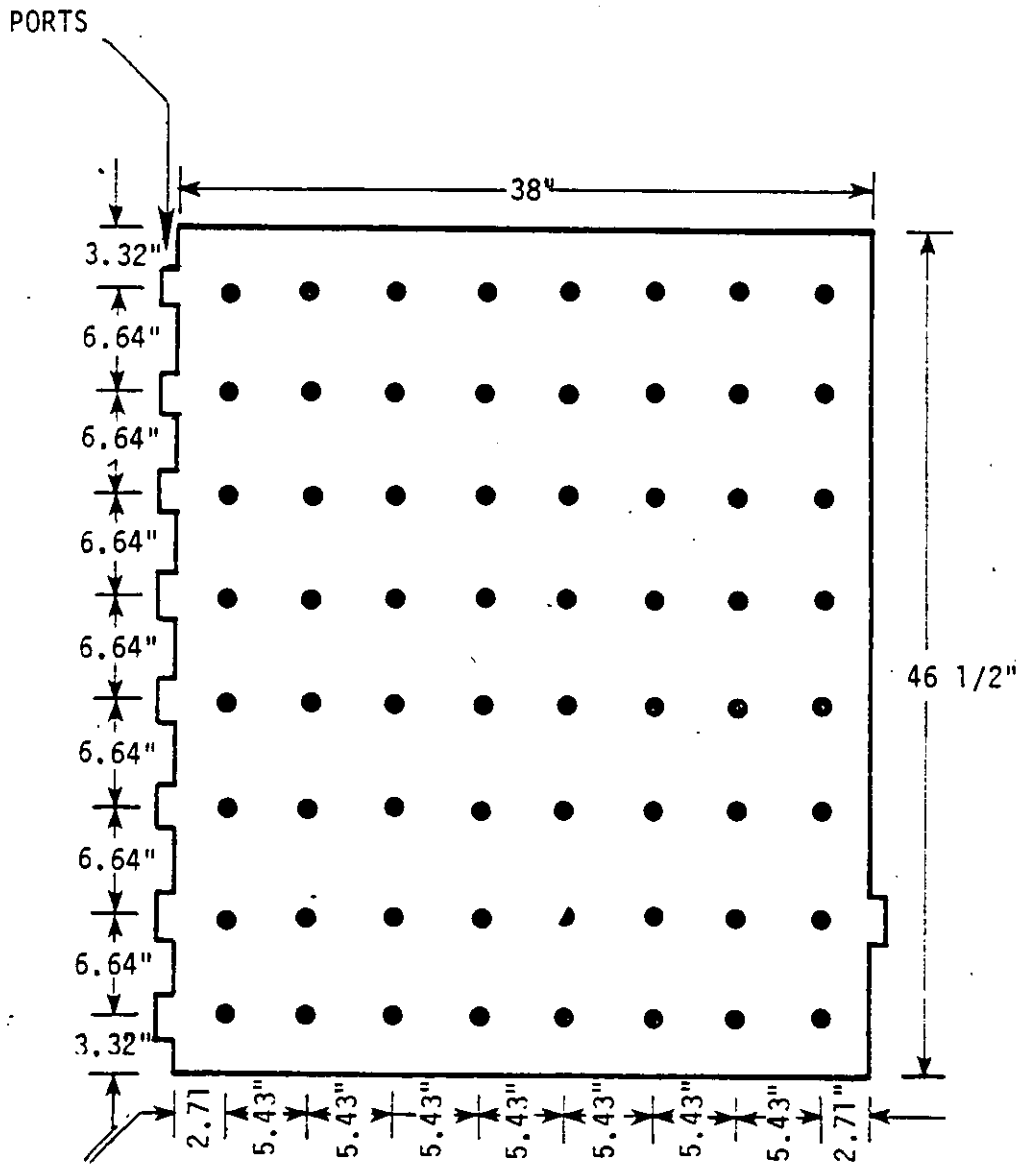


Diagram of Scrubber Outlet Sampling Location
Green Bay Metropolitan Sewerage District

Cross Sectional Diagram Showing the Scrubber Outlet Sampling Point Locations

Green Bay Metropolitan Sewerage District



ports located at right angles from each other. The ports were located 102" (3.85 diameters) from the nearest upstream flow distrubance and 59" (2.23 diameters) from the nearest downstream flow distrubance. Twenty-four traverse points, twelve on each port centerline were selected in accordance with EPA Reference Method 1 for conducting the velocity traverses.

Sampling Procedures

A standard EPA type particulate sampling train was used for collection of the particulate and SO_2, samples. For collection of SO_3, the train was modified by placing 150[a] ml of 80% isopropanol in the first impinger followed by a high purity glasswool plug in the U-tube between the first and second impingers. For collection of SO_2, the second and third impingers contained 200 ml each of 6% hydrogen peroxide solution. The fourth impinger was filled with approximately 400 grams of indicating silica gel desiccant. Moisture determinations were accomplished by weighing each impinger on a triple beam balance before and after a test. Figure 4.6 illustrates the Method 5 sampling train employed.

A five-foot sampling probe was used for all tests except for Test 1 where a three-foot probe was used. The probe consisted of a stainless steel sheath having a heated borosilicate glass liner and a 0.245 inch diameter stainless steel buttonhook sampling nozzle.

The probe assembly was equipped with a type "S" pitot tube for measuring gas velocity and a type K thermocouple for determining flue gas temperature. The probe assembly was also equipped with a 1/4 inch diameter gas sampling probe for collection of integrated Orsat samples.

Velocity head pressure was measured using a manometer with an inclined scale range of 0 to 1 inch of H_2O and a full scale of 10 inches. The sampling train incorporated a temperature sensor for measurement of the sample gas stream in the filter holder. This temperature was recorded as the sample box temperature on the field data.

Thermometers, pitot tubes, nozzles and meter boxes were calibrated before testing according to procedures outlined in EPA Methods 2 and 5.

Seven traverse points were sampled through each of the seven ports for a duration of 3 minutes each, resulting in a total sampling time of 2 hours and 27 minutes. Gas sampling for determination of dry gas molecular weight and excess air was performed following the multipoint integrated sampling and analytical procedure of EPA Method 3. During each test a variable speed peristaltic pump was used for collection of an integrated gas sample for subsequent Orsat analysis.

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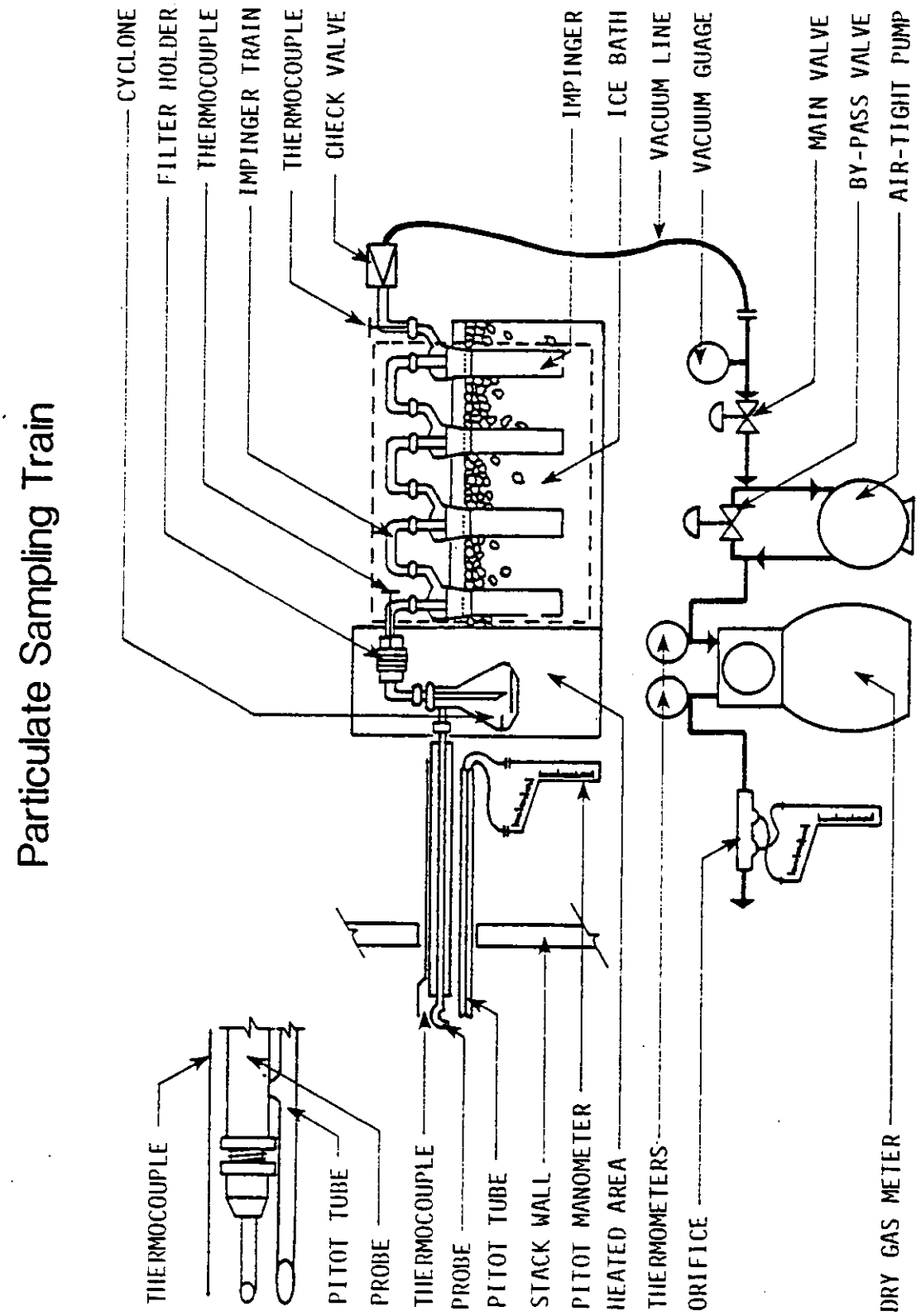
[a] 200 ml of 80 percent IPA was used in the first impinger for tests 1 through 4.

FIGURE 4.6



Particulate Sampling Train

Leak checks were conducted in accordance with procedures described in EPA Methods 2, 3 and 5. The pitot tube, pitot lines, and Orsat lines were leak checked prior to and at the conclusion of each test. The sample train was leak checked prior to and at the conclusion of each test. All leak checks except the final leak check of the pitot tube for test 1 were acceptable. The impact and static sides of the pitot tube on the 3 foot probe would not hold a steady vacuum of 3 inches H_2O at the conclusion of the test. The velocity measurements made during test 1 however did not appear to be significantly different than for tests 2 or 3.

Concurrent with each test at the scrubber outlet sampling site, an integrated gas sample for determination of O_2, CO_2 and excess air was collected at the scrubber inlet sampling site. The integrated gas sample was collected for an equal amount of time at each of the three sampling points within a port. Only one of the three ports was sampled during each test. A different port was sampled for each test during an incincerator Burn.

Due to a leak that developed in the stainless steel probe used for collecting the gas samples at the scrubber inlet site during the first 3 tests (Burn 1), the gas samples were invalid. The Wisconsin DNR agreed that it would be acceptable to repeat the samples while the incinerator was operated under the same conditons. Three integrated samples, one through each port were collected on 9/25/81. The average CO_2 and O_2 concentration for the three samples was used in calculating the excess air at the scrubber inlet for Burn 1.

A velocity traverse of the center shaft coling air duct was performed once during each test of the scrubber outlet. A single grab sample of the center shaft cooling air was collected for determination of O_2, CO_2 and dry gas molecular weight. The center shaft cooling air was found to contain no CO_2.

CHAPTER 5

ANALYTICAL PROCEDURES

All analytical procedures for determining mass emission rates are identical to those specified in EPA Method 5. A discussion of the procedures for the filters and acetone rinses used is presented below. The following general items apply to the discussion:

1. The term constant weight used in conjunction with tare weight refers to a weight change not greater than 0.5 mg from the previous weighing, with no less than six hours desiccation time between consecutive weighings.

2. The term constant weight used in conjunction with the exposed filters or acetone residue means a difference of no more than 0.5 mg or one percent of the total weight less the tare weight, whichever is greater, between two consecutive weighings, with no less than six hours of desiccation time between weighings.

3. All glassware used for evaporation and residue determinations are purchased new for this purpose. The new glassware is washed and rinsed with deionized distilled water followed by oven drying.

4. Anhydrous calcium sulfate is used for all desiccations.

Filters

Filters are checked visually against light for irregularities, flaws, or pinhole leaks. Filters and petri dishes are numbered so that each filter petri dish set has its own number; i.e., the numbered filters are placed in their respective petri dishes, thus giving each filter-petri dish set its own identification number. Each filter-petri dish set is then desiccated, tare weighed, etc., as one unit.

The filters are desiccated in their respective petri dishes at 68°F ± 10°F and ambient pressure for at least 24 hours and weighed at intervals of at least six hours to a constant weight. During each weighing, the filter is not exposed to the laboratory atmosphere for a period greater than two minutes or a relative humidity above 50 percent. After tare weighing, the filter-petri dish sets are placed in plastic bags and stored in the original petri dish cartons.

Rubber bands, approximately 1-inch wide are used to secure the petri dish lids. Handling of the filters or petri dishes is done only with latex gloves or forceps.

After the samples are collected, the exposed filters in their respective petri dishes are desiccated for at least 24 hours. The filter-petri dish sets are weighed to a constant weight and the results reported to the nearest 0.1 mg.

Acetone Rinse

Only reagent-grade acetone is used. Prior to use, a blank is run on the acetone to determine the blank residue. A measured amount of acetone is evaporated to dryness in a tared 250 ml beaker on a steam bath. The residue concentration is then calculated. At no time is acetone that has a blank value greater than 0.001 percent used.

Numbered 250 ml beakers, prepared as noted in item 3 above, are desiccated for a minimum of 24 hours and weighed to a constant weight. Beakers are stored in a desiccator prior to use.

The volume of each acetone rinse is determined gravimetrically, using a triple beam balance and the following equation:

$$\frac{W_i - W_f - W_r}{D} = \text{Volume of Acetone}$$

Where:

W_i = Weight of sample bottle and rinse, (g);

W_f = Weight of sample bottle empty (after acetone rinse has been transferred to beaker, (g);

W_r = Weight of sample residue after evaporation of the acetone, (g);
D = Density of acetone, (g/ml).

The contents of each acetone rinse bottle are transferred to a previously tared and numbered 250 ml beaker and evaporated to dryness on a steam bath. Each bottle is rinsed with a known quantity of acetone, if possible from the same lot as the sample. If acetone from another lot is used, this necessitates the determination of another blank residue value. The dry beakers are desiccated for at least 24 hours and weighed to a constant weight. Results are reported to the nearest 0.1 mg.

Samples of acetone were collected at the test site from each lot used during sampling. These are labeled acetone blank and were handled in the same manner as the acetone rinses. Acetone blank values are reported to the nearest 0.1 mg.

Heavy Metals (Cd, Cu, Cr, Be, Ni, Zn)

The analyses for heavy metals were performed using a modified method for determination of lead in suspended particulate matter as published in Federal Register, Vol. 43, No. 194 - Thursday, October 5, 1978, pp. 46258 - 46261. The modifications were that the entire Method 5 filter and front half washings were digested using 3 M HNO_3 and then brought to 100 ml. This was directly aspirated into a Varian model AA-5 atomic absorption spectorphotometer fitted with the appropriate hollow cathode lamps for each element. Minimum detection limits are taken from Table 1 as published by EPA in Methods for Chemical Analysis of Water and Wastes, March 1979, pp. Metals - 3.

Sulfur Dioxide (SO_2)

Titrations for determination of SO_2 were performed on the combined contents of the peroxide impingers and glasswool plug. The analysis procedure detailed in EPA Reference Method 8 was followed.

A summary of this procedure follows:

1. 0.0100N $BaCl_2$ is standardized using 0.0100N H_2SO_4.

2. An IPA blank is titrated with 0.0100 N $BaCl_2$.

3. The volume of the peroxide sample (H_2O_2) sample is noted. An aliquot of the H_2O_2 sample is diluted with 100 percent isopropyl alcohol to make an 80 percent solution. This solution is titrated with standardized 0.0100N $BaCl_2$ using a thorin indication. Duplicate samples are titrated. The duplicates must argree within 1 percent or 0.2 ml which ever is greater.

The mg 1 sample is calculated as follows:

$$\text{mg/sample} = \frac{(32.03\ \text{mg/meq})(\text{Sample titer-Blank})(\text{N } BaCl_2)(\text{Sample vol.})}{\text{aliquot volume}}$$

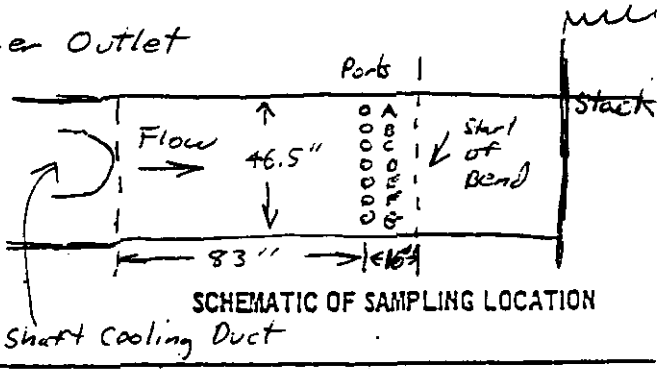
APPENDIX A

FIELD DATA

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

12.27 ft²

PLANT Green Bay Metro Sludge Incin
DATE 9/21/87
SAMPLING LOCATION Incinerator No. 2 - Scrubber Outlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 40"
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) 2"
STACK I.D., (DISTANCE A - DISTANCE B) 38"
NEAREST UPSTREAM DISTURBANCE
NEAREST DOWNSTREAM DISTURBANCE
CALCULATOR Greenberg



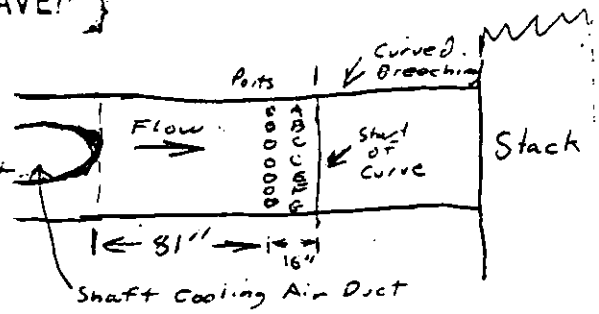
SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	Stack width ~~STACK I.D.~~	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOC FROM OUTSIDE OF NIP (SUM OF COLUMNS 4 &
1	1/14	38"	2.714	2"	4 3/4
2	3/14	↓	8.143	↓	10 1/8
3	5/14		13.571		15 5/8
4	7/2		19.6		21
5	9/14		24.429		26 3/8
6	11/14		29.857		31 7/8
7	13/14		35.286		38 1/4

EPA (Dur) 232
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/21/81
LOCATION Incinerator No 2 - Scrubber Outlet
STACK I.D.
BAROMETRIC PRESSURE, in. Hg 29.42
STACK GAUGE PRESSURE, in. H_2O -0.26 in H_2O
OPERATORS Greenberg + Gallagher



SCHEMATIC OF TRAVERSE POINT LAYOUT

1635 to 1700

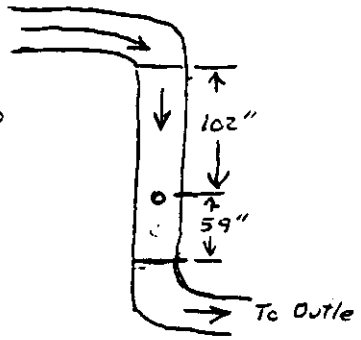
TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A - 7	0.99	155
6	1.05	162
5	1.15	169
4	1.20	174
3	1.15	173
2	1.10	178
1	0.93	173
B - 7	1.15	141
6	1.05	149
5	0.94	161
4	0.84	170
3	0.79	175
2	0.87	176
1	0.93	178
C - 7	0.92	144
6	0.76	146
5	0.69	149
4	0.73	152
3	0.81	159
2	0.83	162
1	0.77	164
D - 7	0.75	142
6	0.56	141
5	0.47	136
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
4	0.53	134
3	0.63	135
2	0.73	134
1	0.79	138
E - 7	0.69	132
6	0.52	128
5	0.44	123
4	0.50	121
3	0.63	118
2	0.79	119
1	0.85	119
F - 7	0.45	136
6	0.46	134
5	0.32	130
4	0.30	126
3	0.34	120
2	0.37	117
1	0.50	111
G 7	0.38	124
6	0.49	126
5	0.61	129
4	0.55	123
3	0.43	120
2	0.38	117
1	0.27	113
AVERAGE	0.7016	139.4

$\sqrt{\Delta p}_{Avg} = 0.8231$

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Green Bay Metro. Sldg. Incin
DATE 9/21/81
SAMPLING LOCATION Incinerator No. 2 - Center Shaft Cooling
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 29"
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) 2.5"
STACK I.D., (DISTANCE A - DISTANCE B) 26.5" 3.83 ft²
NEAREST UPSTREAM DISTURBANCE 102" (3.85 dia)
NEAREST DOWNSTREAM DISTURBANCE 59" (2.23 dia).
CALCULATOR Greenberg



SCHEMATIC OF SAMPLING LOCATION

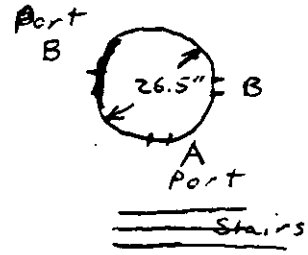
TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCA FROM OUTSIDE OF NIPP (SUM OF COLUMNS 4 &
1	0.021	26.5"	0.557	2.5"	3 1/2 *
2	0.067		1.776		4 1/4
3	0.118		3.127		5 5/8
4	0.177		4.691		7 1/4
5	0.250		6.625		9 1/8
6	0.356		9.434		11 7/8
7	0.644		17.066		19 5/8
8	0.750		19.875		22 3/8
9	0.823		21.810		24 1/4
10	0.882		23.373		25 7/8
11	0.933		24.724		27 1/4
12	0.979		25.944		28 1/2 *

EPA (Dur) 232
4/72

* adjusted to 1" from Stack wall

PRELIMINARY VELOCITY TRAVERSE

PLANT Green Bay Metro. Sldg Incin.
DATE 9/21/81
LOCATION Incinerator No. 2 - Center Shaft Cooling
STACK I.D. 26.5"
BAROMETRIC PRESSURE, in. Hg 29.42
STACK GAUGE PRESSURE, in. H_2O -0.1 " H_2O
OPERATORS Greenberg + Gallagher



SCHEMATIC OF TRAVERSE POINT LAYOUT

0835 to 1755

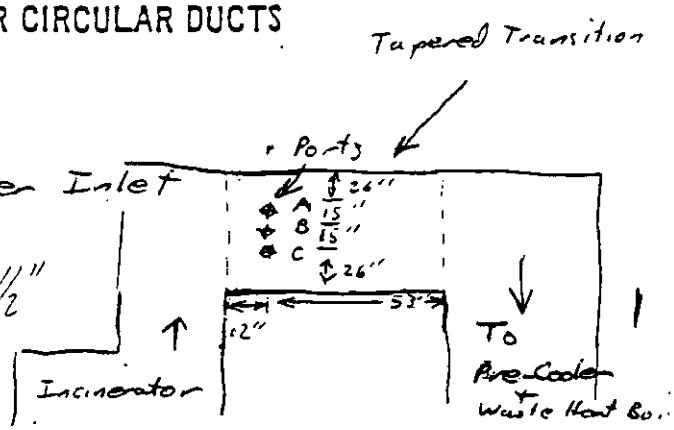
TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-12	0.98	243
11	0.99	249
10	0.99	245
9	0.97	244
8	0.91	244
7	0.87	243
6	0.83	244
5	0.85	245
4	0.95	246
3	0.98	249
2	0.93	247
1	0.86	247
B-12	0.99	252
11	1.00	253
10	0.99	251
9	0.98	251
8	0.92	249
7	0.85	247
6	0.69	241
5	0.69	239
4	0.71	237
3	0.70	238
2	0.72	237
1	0.68	235
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

40.53
3
123.99

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Green Bay Metro. Sldg. Incin
DATE 9/21/81
SAMPLING LOCATION Incinerator No. 2 - Scrubber Inlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) ~~[illegible]~~ 121"
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) 19" + 10 1/2" = 29 1/2"
STACK I.D., (DISTANCE A - DISTANCE B) 102"
NEAREST UPSTREAM DISTURBANCE 12"
NEAREST DOWNSTREAM DISTURBANCE 53"
CALCULATOR Greenberg



SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCA FROM OUTSIDE OF NIPP (SUM OF COLUMNS 4 &
1	1/6	102"	17	29.5	46 1/2"
2	1/2	102	51	↓	80 1/2"
3	5/6	102	85	↓	114 1/2"
	102" ÷ 3 =	34"			
	34" ÷ 2 = 17"				

EPA (Dur) 232
4/72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/21/81
SAMPLING TIME (24-hr CLOCK) 2000 - 2010
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) ~~Integrated~~ Grab
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR

COMMENTS: Preliminary Sample - Scrubber Outlet. Final Orsat Leak Check OK

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	4.9	4.9	5.0	5.0	5.0	5.0	4.98 ~~4.96~~	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	19.5	14.6	19.5	14.5	19.5	14.5	14.53	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4/72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg Incin.
DATE 9/21/81
SAMPLING TIME (24 hr CLOCK) 0800 - 1810
SAMPLING LOCATION Incinerator No. 2 - Scrubber Inlet
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Grab
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR J. Greenberg

COMMENTS: Preliminary Sample - Scrubber Inlet
Initial Orsat Leak Check OK
Final Orsat Leak Check OK

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	9.2	9.2	9.1	9.1	9.1	9.1	9.13	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	18.4	9.2	18.3	9.2	18.3	9.2	9.20	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	—							28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4/72

V = 102.243
$\sqrt{\Delta p}_{avg}$ = 0.7267
ΔH_{avg} = 1.517
$T_{s\,avg}$ = 153.6
$T_{M\,avg}$ = 85.3

FIELD DATA

PLANT Green Bay Metro Sludge Incin.
DATE 9/22/81
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE Combined Method 5/8
RUN NUMBER GBM - 1
OPERATOR J. Greenberg
AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE 29.49 @ 10:00 29.82 @ 12:00
STATIC PRESSURE, (P_s) -0.25 in H_2O
FILTER NUMBER (s) R-130

PROBE LENGTH AND TYPE 3ft glass
NOZZLE I.D. 0.250 No. 37
ASSUMED MOISTURE, % 18%
SAMPLE BOX NUMBER JB
METER BOX NUMBER ES-5
METER $\Delta H_@$ 1.81
C FACTOR 0.76 0.78
PROBE HEATER SETTING 30
HEATER BOX SETTING 80-90
REFERENCE Δp 0.67
Initial Leak Check 0.003 cfm @ 15 in Hg

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F 1	DRY GAS METER TEMPERATURE ~~INLET~~ AVG ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F 2	IMPINGER TEMPERATURE, °F 3
A-7	0	0950	457.694	0.98	2.7	2.7	173	78		8	254	66
6	3	0953	460.460	0.94	2.6	2.6	172	78		8	247	64
5	6	0956	463.200	0.90	2.45	2.45	188	79		7	244	61
4	9	0959	465.840	0.94	2.60	2.60	184	80		8	242	60
3	12	1002	468.580	0.80	2.22	2.22	190	80		7	241	59
2	15	1005	471.180	0.85	2.40	2.40	189	81		7	242	61
1	18	1008	473.790	0.90	1.12	1.12	180	82		5	244	65
	21	1011	475.737									
	Stop - Change Parts & Stop Orsat until next port											
B-7	21	1015	475.737	0.94	2.60	2.60	170	80		8	255	70
6	24	1018	478.500	0.78	2.17	2.17	178	82		7	257	69
5	27	1021	480.970	0.62	1.75	1.75	177	82		6	257	68
4	30	1024	483.340	0.62	1.75	1.75	176	83		6	259	65
3	33	1027	455.396	0.56	1.57	1.57	173	84		5.5	257	63
2	36	1030	487.560	0.58	1.62	1.62	176	84		5.5	259	64
1	39	1033	489.750	0.48	1.35	1.35	179	85		5.5	256	67
1	42	1036	491.773									
	Stop - Change Parts											
C-7	42	1039	491.773	0.67	1.84	1.84	170	83		6	263	70
6	45	1042	494.080	0.55	1.52	1.52	168	83		5	257	68
5	48	1045	496.280	0.50	1.41	1.41	163	84		5	254	66
4	51	1048	498.290	0.48	1.34	1.34	162	84		5	254	66
3	54	1051	500.21	0.60	1.68	1.68	160	84		5.5	252	65
2	57	1054	502.92	0.52	1.45	1.45	163	85		5	249	65
1	60	1057	504.52	0.40	1.12	1.12	163	85		5	249	65

COMMENTS:

Green Bay Metro Sldg. Incin. 9/22/81 Run GBM-1 Continued

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE ~~INLET~~ AVG ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F 2	IMPINGER TEMPERATURE, °F 3
C-1	63	1100	506.369	Stop - Change Ports								
D-7	63	1103	506.369	0.57	1.60	1.60	155	83		5.5	257	69
6	66	1106	508.490	0.52	1.46	1.46	154	84		5	250	69
5	69	1109	510.560	0.45	1.25	1.25	148	85		5	243	61
4	72	1112	512.49	0.47	1.30	1.30	144	85		5	245	59
3	75	1115	514.45	0.53	1.46	1.46	139	86		5	245	59
2	78	1118	516.53	0.50	1.40	1.40	137	86		5	241	59
1	81	1121	518.54	0.39	1.08	1.08	137	86		4.5	240	60
1	84	1124	520.354	Stop - Change Ports								
E-7	84	1127	520.354	0.48	1.35	1.35	144	89		5	248	67
6	87	1130	522.366	0.45	1.25	1.25	141	89		4.5	245	63
5	90	1133	524.200	0.40	1.12	1.12	139	85		4.5	244	61
4	93	1136	525.990	0.44	1.21	1.21	131	86		5	243	60
Ref ΔP → 3	96	1139	527.87	0.41	1.17	1.17	130	86		5	240	63
2	99	1142	529.73	0.40	1.15	1.15	128	88		5	241	64
1	102	1145	531.57	0.40	1.15	1.15	130	90		5.0	244	65
1	105	1148	533.400	Stop - Change Ports								
F-7	105	1152	533.400	0.57	1.63	1.63	156	88		6.0	257	69
6	108	1155	535.600	0.45	1.28	1.28	142	90		5	257	68
5	111	1158	537.55	0.31	0.87	0.87	139	90		4	258	68
4	114	1201	539.175	0.30	0.86	0.86	130	90		4	261	70
3	117	1204	540.800	0.33	0.95	0.95	128	90		4	263	70
2	120	1207	542.640	0.38	1.10	1.10	127	91		4.5	270	68
1	123	1210	544.250	0.42	1.20	1.20	125	92		5	277	65
1	126	1213	546.151	Stop - Change Ports								
G-7	126	1221	546.151	0.55	1.58	1.58	152	88		5.5	292	70
6	129	1224	548.370	0.58	1.67	1.67	148	88		5.5	239	63
5	132	1227	550.520	0.47	1.35	1.35	139	89		5.0	235	67
4	135	1230	552.520	0.45	1.28	1.28	137	90		5.0	231	64
3	138	1233	554.48	0.46	1.32	1.32	135	90		5	240	66
2	141	1236	556.43	0.37	1.05	1.05	132	90		4.5	252	67
1	144	1239	558.200	0.35	1.00	1.00	127	91		4.5	258	69
1	147	1242	559.937	Stop - End Test Final Leak Check 0.001 cfm @ 15 in Hg Impact at Final Pitot Leak Check — Unacceptable and Static Side would not hold steady 4 in H_2O								

ANALYTICAL DATA

PLANT Green Bay Metro Sldg. Incin.

DATE 9/22/81

SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet

SAMPLE TYPE Combined Method 5/8

RUN NUMBER GBM-1

SAMPLE BOX NUMBER

CLEAN-UP MAN

COMMENTS: Purged ~~Sample~~ Impinger train for 15 minutes at ΔH of 1.5 prior to recovery of impinger contents. Weigh impingers first.

FRONT HALF

LABORATORY RE

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____

FILTER NUMBER R-130 _____ — CONTAINER _____ _____

FRONT HALF SUBTOTAL _____

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER _____ _____

ETHER-CHLOROFORM EXTRACTION _____

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER _____ _____

BACK HALF SUBTOTAL _____

TOTAL WEIGHT _____

MOISTURE

IMPINGERS	1	
FINAL ~~VOLUME~~	561.2	ml g
INITIAL ~~VOLUME~~	585.9	ml g
NET ~~VOLUME~~	-24.7	ml g

IMPINGERS	2	3	4
FINAL WEIGHT	635.0	618.4	269.0 256.4
INITIAL WEIGHT	592.8	603.1	241.1 227.8
NET WEIGHT	42.2	15.3	27.9 28.6

TOTAL MOISTURE 89.3

EPA (Dup) 731

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/22/81
SAMPLING TIME (24-hr CLOCK) 0950-1242
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR J. Greenberg

COMMENTS: Run GBM-1 outlet
Final Orsat Analyzer Leak Check ok

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	4.3	4.3	4.3	4.3	4.4	4.4	4.33	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	19.4	15.1	19.3	15.0	19.4	15.0	15.33	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)	—							28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/22/81
SAMPLING TIME (24-hr CLOCK)
SAMPLING LOCATION Incin. No. 2. - Scrubber Inlet - for 1A
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR

COMMENTS: GBM-1 Inlet

lower port

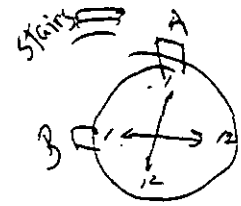
Not enough sample, leak in bag

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	1.6		1.6		1.6			44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	19.9	18.3	19.9	18.3	20.0	18.4		32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230

~~PRELIMINARY~~ VELOCITY TRAVERSE
TEST 1

PLANT Green Bay Metro. Sldg. Incin
DATE 9/22/81
LOCATION Incinerator No. 2 - Center Shaft Cooling
STACK I.D. 26.5"
BAROMETRIC PRESSURE, in. Hg 27.49
STACK GAUGE PRESSURE, in. H_2O -1.1
OPERATORS M. Gallagher



SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-12	1.1	249
11	1.1	248
10	1.1	246
9	1.0	245
8	1.0	245
7	.91	245
6	.85	245
5	.94	245
4	.98	247
3	.99	250
2	.97	250
1	.95	250
B-12	1.1	254
11	1.2	252
10	1.2	253
9	1.1	252
8	1.0	251
7	.87	247
6	.72	239
5	.77	239
4	.75	240
3	.76	239
2	.75	239
1	.72	240
AVERAGE	.949	246.25

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

$\sqrt{\Delta P} = .971$ Final leak check OK

V= 110.51

FIELD DATA

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/22/81
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE Combined Method 5/8
RUN NUMBER GBM-2
OPERATOR J. Greenberg
AMBIENT TEMPERATURE 82°F
BAROMETRIC PRESSURE 29.83
STATIC PRESSURE, (P_s) -0.27
FILTER NUMBER (s) R-131

PROBE LENGTH AND TYPE 5 ft glass
NOZZLE I.D. 0.295 No. N-8
ASSUMED MOISTURE, % 4%
SAMPLE BOX NUMBER
METER BOX NUMBER ES-5
METER $\Delta H_@$ 1.81
C FACTOR 1.01
PROBE HEATER SETTING 70%
HEATER BOX SETTING 80-90%
REFERENCE Δp 0.59

Initial Leak Check 0.002 cfm @ 15 in Hg

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE AVG INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
A-7	0	1515	561.087	0.78	2.4	2.4	184	82		6	270	70
7	1	1516	562.188	Stop - Fix Oiler Jar on pump, Jar too full								
7	1	1520	562.188	0.78	2.4	2.4	184	82		6	270	68
6	3	1522	564.520	0.94	2.92	2.92	192	82		6	256	69
5	6	1525	567.440	0.86	2.70	2.70	200	84		6	243	67
4	9	1528	570.230	0.78	2.4	2.4	188	86		6	240	66
3	12	1531	572.900	0.67	2.08	2.08	187	87		6	249	67
2	15	1534	575.330	0.68	2.12	2.12	188	87		6	250	70
1	18	1537	577.83	0.52	1.62	1.62	186	90		5	252	69
1	21	1540	580.035	Stop - Change Ports								
B-7	21	1542	580.035	1.0	3.20	3.20	182	90		7	275	71
6	24	1545	583.040	0.78	2.40	2.40	177	92		6	248	70
5	27	1548	585.700	0.58	1.82	1.82	178	92		5	252	68
4	30	1551	588.090	0.58	1.82	1.82	176	92		5	257	69
3	33	1554	590.380	0.60	1.88	1.88	174	93		5	255	70
2	36	1557	592.875	0.60	1.88	1.88	174	93		5	258	72
1	39	1600	595.180	0.51	1.60	1.60	178	94		5	252	74
1	42	1603	597.294	Stop - Change Parts								
C-7	42	1606	597.294	0.90	2.80	2.80	169	93		6	272	80
6	45	1609	600.160	0.81	2.51	2.51	165	94		6	242	82
5	48	1612	602.850	0.53	1.67	1.67	162	94		4	241	87
4	51	1615	605.010	0.58	1.84	1.84	158	94		5	249	90
3	54	1618	607.350	0.64	2.00	2.00	156	94		5	252	94

COMMENTS:

Green Bay Metro. Slg. Incin. 9/22/81 Run GBM-2 Continued

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE ~~AVG~~ INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F 2	IMPINGER TEMPERATURE, °F 3
2	57	1621	609.62	0.58	1.83	1.83	155	94		5	246	95
1	60	1624	611.970	0.48	1.51	1.51	159	95		4	251	93
1	63	1627	614.122	Stop	Change	Ports						~~83~~
D-7	63	1629	614.122	0.74	2.3	2.3	162	93		6	264	83
6	66	1632	616.780	0.49	1.53	1.53	151	94		4	242	84
5	69	1635	618.930	0.44	1.40	1.40	147	94		4	243	82
4	72	1638	620.95	0.46	1.45	1.45	143	94		4	244	81
3	75	1641	623.00	0.45	1.42	1.42	135	95		4	249	82
Ref ΔP 2	78	1644	625.08	0.52	1.63	1.63	135	95		4	243	81
0.55 1	81	1647	627.29	0.47	1.58	1.58	137	95		4.5	242	82
1	84	1650	629.444	Stop - Change Ports								
E-7	84	1652	629.444	0.62	2.10	2.10	155	95		5	261	78
6	87	1655	632.01	0.42	1.41	1.41	149	95		4	246	74
5	90	1658	634.00	0.33	1.12	1.12	138	95		4	249	72
4	93	1701	635.83	0.29	1.00	1.00	135	95		4	253	72
3	96	1704	637.63	0.31	1.03	1.03	130	95		4	256	73
2	99	1707	639.38	0.34	1.15	1.15	130	95		4	257	73
1	102	1710	641.23	0.44	1.41	1.41	132	96		4	254	75
1	105	1713	643.319	Stop - Change Ports								
F-7	105	1716	643.319	0.51	1.79	1.79	161	94		5	271	74
6	108	1719	645.69	0.45	1.52	1.52	148	94		4.5	260	70
5	111	1722	647.80	0.31	1.04	1.04	143	95		3	259	72
4	114	1725	649.58	0.25	0.84	0.84	137	95		3	261	72
3	117	1728	651.20	0.30	1.01	1.01	138	95		3.5	267	73
2	120	1731	652.99	0.30	1.01	1.01	134	95		3.5	263	72
1	123	1734	654.69	0.38	1.29	1.29	130	95		4.0	262	72
1	126	1737	656.582	Stop - Change Ports								
G-7	126	1740	656.582	0.52	1.76	1.76	149	93		5.0	277	75
6	129	1743	658.850	0.58	1.95	1.95	157	95		5.0	255	71
5	132	1746	661.210	0.56	1.87	1.87	153	95		5.0	247	72
4	135	1749	663.67	0.50	1.70	1.70	150	95		5.0	244	75
3	138	1752	665.83	0.43	1.45	1.45	152	95		5.0	245	76
2	141	1755	667.95	0.38	1.30	1.30	147	94		4.5	246	76
1	144	1758	669.94	0.25	0.85	0.85	137	94		3	250	76
1	147	1801	671.598	Stop - End Test. Final Leak Check 0.001 cfm @ 15 in Hg								
				Final Pitot Leak Check OK								

ANALYTICAL DATA

(B)

PLANT Green Bay Metro. Sldg. Incin.

DATE 9/22/81

SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet

SAMPLE TYPE Combined Method 5/8

RUN NUMBER GBM - 2

SAMPLE BOX NUMBER

CLEAN-UP MAN

COMMENTS: Purged impinger train for 15 minutes at ΔH of 1.5 prior to recovery of impinger contents. Weighed impinger first

FRONT HALF

LABORATORY RE

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____

FILTER NUMBER R-131 _____ — CONTAINER _____ _____

FRONT HALF SUBTOTAL _____

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER _____ _____

ETHER-CHLOROFORM EXTRACTION _____

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER _____ _____

BACK HALF SUBTOTAL _____

TOTAL WEIGHT _____

MOISTURE

IMPINGERS	1	
FINAL ~~VOLUME~~	521.1 ml	g
INITIAL ~~VOLUME~~	563.5 ml	g
NET ~~VOLUME~~	-42.4 ml	g

IMPINGERS	2	3	4	
FINAL WEIGHT	648.5 g	637.2 g	277.3 277.6	g
INITIAL WEIGHT	617.8 g	617.8 g	221.0 253.0	g
NET WEIGHT	30.7 g	19.4 g	56.3 24.6	g

TOTAL MOISTURE 88.6

EPA (Dur) 231

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/22/81
SAMPLING TIME (24-hr CLOCK) 1515 to 1801
SAMPLING LOCATION Incinerator No. 2 - Scrubber ~~Outlet~~ Inlet Port B
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR J. Greenberg

COMMENTS: Run GBM-2 ~~Outlet~~ Inlet
Final Orsat Analyzer
Leak Check Ok

At middle port

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	6.7	6.7	6.6	6.6	6.6	6.6	6.63	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	19.3	12.6	19.2	12.6	19.2	12.6	12.60	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Slg. Incin.
DATE 9/22/81
SAMPLING TIME (24-hr CLOCK) 1515 to 1801
SAMPLING LOCATION Incin. No. 2 - Scrubber ~~Inlet~~ Outlet
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR J. Greenberg

COMMENTS: Run GBM-2 ~~Inlet~~ Outlet
Final Orsat Analyzer Leak Check OK

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	4.7	4.7	4.7	4.6	4.6	4.6	4.67	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	19.9	15.2	19.7	15.0	19.7	15.1	15.10	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4/72

~~PRELIMINARY~~ VELOCITY TRAVERSE
TEST 2

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/22/81
LOCATION Incinerator No. 2 - Center Shaft Cooling
STACK I.D. 26.5"
BAROMETRIC PRESSURE, in. Hg 29.83
STACK GAUGE PRESSURE, in. H_2O 1.1
OPERATORS M. Gallagher

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-12	1.2	243
11	1.2	245
10	1.0	245
9	1.0	244
8	1.0	244
7	0.93	243
6	0.90	244
5	0.89	249
4	0.94	249
3	0.98	249
2	0.95	249
1	0.93	249
B-12	1.2	250
11	1.2	250
10	1.2	250
9	1.1	250
8	1.0	249
7	0.92	245
6	0.72	243
5	0.75	239
4	0.73	239
3	0.75	237
2	0.72	239
1	0.72	237
AVERAGE	$\sqrt{\Delta p_{avg}} = 0.973$	245.7

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

Final Leak check OK

V = 105.67

$\sqrt{\Delta p}_{avg}$ = 0.6907

ΔH_{avg} = 1.604

FIELD DATA

T_s = 156.9

T_m = 91.88

PLANT Green Bay Metro. Sld. Incin.
DATE 9/22/81
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE Combined Method 5/8
RUN NUMBER GBM-3
OPERATOR J. Greenberg
AMBIENT TEMPERATURE 80
BAROMETRIC PRESSURE 29.49
STATIC PRESSURE, (P_s) -0.28
FILTER NUMBER (s) R-132

PROBE LENGTH AND TYPE 5 ft glass
NOZZLE I.D. 0.275 Ka. N-8
ASSUMED MOISTURE, % 4%
SAMPLE BOX NUMBER
METER BOX NUMBER FS-5
METER $\Delta H_@$ 1.81
C FACTOR 1.01
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 0.59

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F 1	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F 2	IMPINGER TEMPERATURE, °F 3
A-7	0	1945	671.882	0.84	2.63	2.63	185	81		8	242	70
6	3	1948	674.650	0.92	2.90	2.90	195	84		8	238	73
5	6	1951	677.54	0.88	2.75	2.75	193	87		8	234	76
4	9	1954	680.38	0.74	2.30	2.30	189	89		7	258	81
3	12	1957	682.98	0.68	2.15	2.15	191	90		7	271	90
2	15	2000	685.55	0.61	1.92	1.92	186	91		6	269	99
1	18	2003	687.95	0.45	1.32	1.32	185	91		5	266	98
1	21	2006	689.965	Stop - Change Ports								
B-7	21	2009	689.965	0.95	3.00	3.00	189	90		8	271	91
6	24	2012	692.890	0.70	2.2	2.2	183	91		6	271	75
5	27	2015	695.460	0.56	1.77	1.77	177	91		5	268	67
4	30	2018	697.75	0.53	1.69	1.69	172	92		5	265	66
3	33	2021	699.97	0.46	1.47	1.47	169	92		5	261	65
2	36	2024	702.08	0.52	1.65	1.65	173	92		5	259	67
1	39	2027	704.33	0.37	1.18	1.18	174	92		4.5	255	67
1	42	2030	706.198	Stop - Change Ports								
C-7	42	2032	706.198	0.83	2.61	261	174	91		7.5	247	70
6	45	2035	708.98	0.52	1.65	1.65	170	92		5.5	250	65
5	48	2038	711.20	0.46	1.45	1.45	164	92		5	253	65
4	51	2041	713.25	0.41	1.31	1.31	156	93		5	247	65
3	54	2044	715.23	0.43	1.37	1.37	154	93		5	247	64
2	57	2047	717.26	0.35	1.11	1.11	155	93		4.5	245	63
1	60	2050	719.09	0.28	0.96	0.96	157	92		4.0	245	62

Ref Δp 0.56 → 1

COMMENTS

Green Bay Metro Sldg. Incin. 9/22/81 Run GBM-3 Continued

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F 1	DRY GAS METER TEMPERATURE AVG ~~INLET~~ ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F 2	IMPINGER TEMPERATURE, °F 3
1	63	2053	720.772	Stop-Change Ports								
D-7	63	2055	720.772	0.71	2.35	2.35	174	92		7	244	62
6	66	2058	723.370	0.50	1.65	1.65	159	93		5.5	243	56
5	69	2101	725.61	0.44	1.46	1.46	150	93		5	242	56
4	72	2104	727.69	0.44	1.46	1.46	141	93		5	241	58
3	75	2107	729.75	0.49	1.62	1.62	138	93		5.5	239	58
2	78	2110	731.95	0.40	1.32	1.32	138	93		5	239	57
1	81	2113	733.96	0.34	1.12	1.12	138	94		4.5	243	58
1	84	2116	735.817	Stop-Change Ports								
E-7	84	2118	735.817	0.67	2.20	2.20	164	93		6.5	248	61
6	87	2121	738.33	0.43	1.42	1.42	149	93		5.0	250	55
5	90	2124	740.49	0.36	1.20	1.20	138	93		5.0	252	56
4	93	2127	742.33	0.30	0.99	0.99	132	93		4.0	253	57
3	96	2130	744.06	0.38	1.31	1.31	126	93		5.0	255	57
2	99	2133	746.02	0.35	1.21	1.21	128	93		5.0	255	57
1	102	2136	747.93	0.39	1.33	1.33	127	93		5.0	257	57
1	105	2139	749.937	Stop-Change Ports								
F-7	105	2141	749.937	0.52	1.8	1.8	153	92		5.5	257	60
6	108	2144	752.19	0.41	1.41	1.41	150	92		5	259	55
5	111	2147	754.26	0.28	0.96	0.96	138	92		4	258	57
4	114	2150	755.97	0.25	0.86	0.86	135	92		4	259	58
3	117	2153	757.58	0.25	0.86	0.86	135	92		4	262	59
2	120	2156	759.18	0.30	1.03	1.03	132	92		4	262	58
1	123	2159	760.93	0.36	1.24	1.24	129	93		5	260	58
1	126	2202	762.897	Stop-Change Ports								
G-7	126	2204	762.897	0.47	1.61	1.61	155	92		5.5	261	61
6	129	2207	765.04	0.54	1.85	1.85	157	93		6.0	260	57
5	132	2210	767.40	0.48	1.66	1.66	153	93		5.5	258	60
4	135	2213	769.62	0.47	1.61	1.61	145	94		5.5	257	62
3	138	2216	771.81	0.44	1.50	1.50	146	94		5.5	257	63
2	141	2219	773.92	0.38	1.30	1.30	138	94		5.0	257	65
1	144	2222	775.93	0.26	0.88	0.88	131	94		4.0	259	67
1	147	2225	777.552	Stop-End Test: Final Leak Check 0.002 cfm @ 15 in Hg								
							Final Pitot Tube Leak Check OK					
							Final Orsat Line Leak Check OK					

Ref Δp 0.54

ANALYTICAL DATA

PLANT Green Bay Metro. Sldg. Incin. COMMENTS:

DATE 9/22/81

SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet

SAMPLE TYPE Combined Method 5/8

RUN NUMBER GBM-3

SAMPLE BOX NUMBER

CLEAN-UP MAN

FRONT HALF

LABORATORY RE

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER

FILTER NUMBER R-132 — CONTAINER

FRONT HALF SUBTOTAL

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER

ETHER-CHLOROFORM EXTRACTION

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER

BACK HALF SUBTOTAL

TOTAL WEIGHT

MOISTURE

IMPINGERS	1
FINAL ~~VOLUME~~	558.0 ~~ml~~ g
INITIAL ~~VOLUME~~	589.7 ~~ml~~ g
NET ~~VOLUME~~	-31.7 ~~ml~~ g

IMPINGERS	2	3	4
FINAL WEIGHT	650.0 g	614.5 g	519.9 g
INITIAL WEIGHT	612.8 g	595.5 g	531.7/2314 g
NET WEIGHT	37.2 g	19.0 g	58.2 g

TOTAL MOISTURE 82.7

EPA (Dur) 231

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/22/81
SAMPLING TIME (24-hr CLOCK) 1945 to 2225
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR J Greenberg

COMMENTS: Run GBM-3 Outlet

Final Orsat Analyzer Leak Check OK

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	4.7	4.7	4.6	4.6	4.6	4.6	4.63	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	19.4	14.7	19.4	14.8	19.3	14.7	14.73	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/28/81
SAMPLING TIME (24-hr CLOCK) 1945 to 2225
SAMPLING LOCATION Incinerator No. 2 - Scrubber Inlet-Port C
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR J. Greenberg

COMMENTS: Run GBM-3 Inlet
Checked Orsat Sample Line For Leaks. Found Leak 71 inches from front end of Line. M Gallagher did not find this leak during previous leak checks on sample line DSG
Final Orsat Analyzer Leak Check Ok

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	5.8	5.8	5.6	5.6	5.6	5.6	5.67	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	19.5	13.7	19.3	13.7	19.5	13.9	13.77	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4/72

~~PRELIMINARY~~ VELOCITY TRAVERSE
TEST 3

PLANT Green Bay Metro Sldg. Incin
DATE 9/23/81
LOCATION Incinerator No. 2 - Center Shaft Cooling
STACK I.D. 26.5"
BAROMETRIC PRESSURE, in. Hg 29.49
STACK GAUGE PRESSURE, in. H_2O .31
OPERATORS M. Gallagher

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A - 12	1.1	245
11	1.2	245
10	1.2	245
9	1.1	245
8	1.0	245
7	.98	243
6	.88	244
5	.93	245
4	1.1	246
3	1.1	247
2	1.0	245
1	.97	245
B - 12	1.3	249
11	1.3	250
10	1.2	250
9	1.1	250
8	1.1	249
7	.91	245
6	.74	241
5	.74	239
4	.74	239
3	.81	237
2	.76	238
1	.70	237
AVERAGE	$\overline{\sqrt{\Delta p}} = 0.995$	244.3

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

Final pitot leak check OK

FIELD DATA

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/23/81
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE Combined Method 5/8
RUN NUMBER GBM - 4
OPERATOR J. Greenberg
AMBIENT TEMPERATURE 80 °F
BAROMETRIC PRESSURE 29.95
STATIC PRESSURE, (P_s) -0.24 in H_2O
FILTER NUMBER (s) R-135

PROBE LENGTH AND TYPE 5 ft glass
NOZZLE I.D. 0.245 No. N-8
ASSUMED MOISTURE, % 4%
SAMPLE BOX NUMBER
METER BOX NUMBER FS-5
METER $\Delta H_@$ 1.81
C FACTOR 1.01
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 0.59

Initial Leak Check 0.002 cfm @ 15 in Hg

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F 1	DRY GAS METER TEMPERATURE AVG ~~INLET~~ ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F 2	IMPINGER TEMPERATURE, °F
A-7	0	1000	780.272	0.89	2.75	2.75	189	80		8	243	64
6	3	1003	783.160	0.91	2.80	2.80	187	82		8	272	55
5	6	1006	785.98	0.75	2.36	2.36	181	84		7	271	52
4	9	1009	788.61	0.69	2.17	2.17	179	85		7	267	54
3	12	1012	791.15	0.67	2.10	2.10	176	86		6.5	261	55
2	15	1015	793.61	0.56	1.76	1.76	177	88		6	259	60
1	18	1018	795.91	0.43	1.35	1.35	173	89		5	257	63
1	21	1021	797.918	Stop - Change Ports								
B-7	21	1022	797.918	0.92	2.91	2.91	174	89		8.5	257	64
6	24	1025	800.83	0.72	2.27	2.27	173	91		7	253	63
5	27	1028	803.46	0.56	1.76	1.76	167	91		6	251	62
4	30	1031	805.72	0.50	1.59	1.59	162	92		5.5	253	62
3	33	1034	807.88	0.58	1.83	1.83	164	92		6.0	256	62
2	36	1037	810.26	0.44	1.40	1.40	165	93		5.0	258	62
1	39	1040	812.26	0.43	1.35	1.35	167	93		5.0	260	62
1	42	1043	814.262	Stop - Change Ports								
C-7	42	1044	814.262	0.86	2.70	2.70	163	93		8.0	263	63
6	45	1047	817.09	0.58	1.83	1.83	158	94		6.0	260	63
5	48	1050	819.38	0.50	1.59	1.59	156	94		5.5	260	62
4	51	1053	821.56	0.57	1.80	1.80	151	95		6.0	260	62
Ref Δp 0.55 → 3	54	1056	823.88	0.60	2.01	2.01	148	95		6.5	259	62
2	57	1059	826.32	0.58	1.98	1.98	148	96		6.5	259	60
1	60	1102	828.72	0.36	1.21	1.21	150	96		5	257	60

COMMENTS:

Green Bay Metro Sldg Incin. 9/23/81 Run GBM-4 Continued

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F 1	DRY GAS METER TEMPERATURE AVG ~~INLET~~ ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F 2	IMPINGER TEMPERATURE, °F 3
1	63	1105	830.676	Stop-Change Ports								
D-7	63	1107	830.676	0.63	2.1	2.1	159	94		6.5	258	~~68~~ 68
6	66	1110	833.150	0.93	1.47	1.47	151	95		5.5	260	60
5	69	1113	835.260	0.40	1.37	1.37	142	96		5	261	59
Ref Δp 4	72	1116	837.250	0.37	1.25	1.25	139	96		5	260	61
0.54 → 3	75	1119	839.200	0.35	1.20	1.20	139	96		5	261	60
2	78	1122	841.130	0.43	1.49	1.49	138	96		5	260	57
1	81	1125	843.23	0.28	0.96	0.96	134	96		4.5	259	56
1	84	1128	844.952	Stop-Change Ports								
E-7	84	1130	844.952	0.54	1.85	1.85	161	94		6.0	259	62
6	87	1133	847.28	0.35	1.20	1.20	152	96		5.0	262	54
5	90	1136	849.21	0.29	0.99	0.99	142	96		4.5	262	54
4	93	1139	850.93	0.25	0.86	0.86	136	95		4	262	56
3	96	1142	852.54	0.26	0.89	0.89	133	95		4	261	55
2	99	1145	854.18	0.27	0.92	0.92	131	95		4	260	54
1	102	1148	855.85	0.34	1.18	1.18	128	95		5	258	53
1	105	1151	857.713	Stop-Change Ports								
F-7	105	1152	857.713	0.43	1.49	1.49	153	95		5	255	55
6	108	1155	859.80	0.37	1.28	1.28	142	95		5	253	51
5	111	1158	861.77	0.26	0.89	0.89	137	95		4	252	53
4	114	1201	863.41	0.24	0.75	0.75	134	95		3	252	54
3	117	1204	864.89	0.27	0.92	0.92	136	94		4	253	55
2	120	1207	866.54	0.31	1.07	1.07	129	95		4.5	251	53
1	123	1210	868.29	0.40	1.39	1.39	124	95		5	249	53
1	126	1213	870.315	Stop-Change Ports								
G-7	126	1214	870.315	0.51	1.75	1.75	150	94		6	247	58
6	129	1217	872.58	0.58	2.00	2.00	146	95		6.5	243	56
5	132	1220	875.03	0.54	1.85	1.85	146	96		6	240	57
4	135	1223	877.38	0.53	1.82	1.82	141	96		6	240	60
3	138	1226	879.71	0.45	1.55	1.55	140	96		6	240	61
2	141	1229	881.88	0.36	1.25	1.25	136	96		5	241	63
1	144	1232	883.84	0.28	0.96	0.96	125	96		4.5	241	63
1	147	1235	885.565	Stop-End Test								

Final Leak Check: 0.002 cfm @ 10 in Hg

Final Pitot Leak Check Ok

Final Orsat Line Leak Check Ok

ANALYTICAL DATA

PLANT Green Bay Metro. Slg Incin.

COMMENTS:

DATE 9/23/81

SAMPLING LOCATION Incin. No. 2- Scrubber Outlet

SAMPLE TYPE Combined Method 5/8

RUN NUMBER GBM-4

SAMPLE BOX NUMBER

CLEAN-UP MAN

purged train for 15 min at 44.5 mL

FRONT HALF

LABORATORY RE

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER

FILTER NUMBER R-135 — CONTAINER

FRONT HALF SUBTOTAL

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER

ETHER-CHLOROFORM EXTRACTION

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER

BACK HALF SUBTOTAL

TOTAL WEIGHT

MOISTURE

IMPINGERS	1
FINAL ~~VOLUME~~	571.0 ml g
INITIAL ~~VOLUME~~	627.55 ml g
NET ~~VOLUME~~	-56.55 ml g

IMPINGERS	2	3	4
FINAL WEIGHT	648.2 g	634.1 g	532.9 g
INITIAL WEIGHT	592.8 g	603.1 g	231.0/241.2 g
NET WEIGHT	55.4 g	31.0 g	60.7 g

TOTAL MOISTURE 90.5

EPA (Dur) 231

~~PRELIMINARY~~ VELOCITY TRAVERSE
TEST 4

PLANT Green Bay Metro Sldge Incin.
DATE 9/23/81 10:00 AM (START)
LOCATION Incinerator No. 2 - Center Shaft Cooling
STACK I.D. 26.5"
BAROMETRIC PRESSURE, in. Hg 29.96
STACK GAUGE PRESSURE, in. H_2O 0.17 positive
OPERATORS GREENBERG & GALLAGHER

SCHEMATIC OF TRAVERSE POINT LAYOUT

	TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
B	12	1.3	235
	11	1.3	235
	10	1.2	239
	9	1.1	237
	8	1.0	235
	7	0.93	235
	6	0.72	230
	5	0.71	229
	4	0.72	229
	3	0.75	227
	2	0.68	225
	1	0.66	225
A	12	1.1	243
	11	1.1	240
	10	1.1	240
	9	1.05	239
	8	0.98	238
	7	0.94	237
	6	0.88	235
	5	0.91	235
	4	.97	237
	3	1.05	237
	2	0.97	237
	1	0.88	237
	AVERAGE	$\sqrt{\Delta p} = 0.958$	234.8

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

pre Leak check ok
post Leak check ok

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/23/81
SAMPLING TIME (24-hr CLOCK) 1000-1235
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR J. Greenberg

COMMENTS: Run GBM-4 Outlet
Final Orsat Analyzer Leak Check OK

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	4.7	4.7	4.8	4.8	4.7	4.7	4.73	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	20.0	15.3	20.0	15.2	20.0	15.3	15.27	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4/72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Greenbay Metro. Sldg. Incin.
DATE 9/23/81
SAMPLING TIME (24-hr CLOCK) 1000 – 1205
SAMPLING LOCATION Incin. No. 2 – Scrubber Inlet – Port A
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR J. Greenberg

COMMENTS: Run GBM-4 Inlet
Final Orsat Analyzer Leak Check Ok

GAS \ RUN	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	10.4	10.4	10.5	10.5	10.4	10.4	10.43	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	18.9	8.5	18.9	8.4	18.8	8.4	8.43	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

post leak check on line ok MG

EPA (Dur) 230
4/72

FIELD DATA

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/23/81
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE Combined Method 5/8
RUN NUMBER GBM-5
OPERATOR J. Greenberg
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 29.89
STATIC PRESSURE, (P_s) -0.27
FILTER NUMBER (s) R-137

PROBE LENGTH AND TYPE 5 ft glass
NOZZLE I.D. 0.245 No. N-8
ASSUMED MOISTURE, % 4
SAMPLE BOX NUMBER
METER BOX NUMBER ES-5
METER $\Delta H_@$ 1.81
C FACTOR 1.01
PROBE HEATER SETTING
HEATER BOX SETTING 8-100
REFERENCE Δp 0.59

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES

Initial Leak Check 0.003 cfm @ 15 in Hg

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F 1	DRY GAS METER TEMPERATURE ~~INLET~~ AVG ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F 2	IMPINGER TEMPERATURE, °F 3
A-7	0	1340	887.943	0.79	2.5	2.5	175	87		6	227	72
6	3	1343	890.670	0.82	2.6	2.6	175	90		6	234	68
5	6	1346	893.410	0.85	2.67	2.67	182	92		6	232	60
4	9	1349	896.250	0.71	2.22	2.22	181	93		5.5	245	62
3	12	1352	898.82	0.68	2.13	2.13	177	94		5	262	60
2	15	1355	901.34	0.60	1.90	1.90	178	95		5	269	63
1	18	1358	903.73	0.41	1.30	1.30	177	95		4	272	65
1	21	1401	905.738	Stop - Change Ports								
B-7	21	1402	905.738	0.92	2.90	2.90	177	95		6.5	271	68
6	24	1405	908.690	0.69	2.17	2.17	175	96		5	263	66
5	27	1408	911.28	0.60	1.90	1.90	173	96		5	256	63
4	30	1411	913.69	0.48	1.52	1.52	167	96		4	253	63
3	33	1414	915.85	0.34	1.07	1.07	167	96		3.5	252	66
2	36	1417	917.68	0.39	1.23	1.23	168	96		4	251	66
1	39	1420	919.65	0.35	1.11	1.11	173	96		4	249	64
1	42	1423	921.472	Stop - Change Ports								
C-7	42	1424	921.472	0.70	2.2	2.2	176	95		5	254	67
6	45	1427	923.13	0.45	1.42	1.42	169	95		4	247	62
5	48	1430	925.22	0.31	0.98	0.98	161	96		3	245	64
4	51	1433	926.98	0.28	0.89	0.89	154	96		3	247	66
Ref Δp 0.56 → 3	54	1436	928.66	0.36	1.20	1.20	149	96		4	248	66
2	57	1439	930.52	0.28	0.93	0.93	155	96		3.5	245	66
1	60	1442	932.22	0.33	1.10	1.10	154	96		3.5	245	66

COMMENTS:

Green Bay Metro Sldg Incin. 9/23/81 Run GBM-5 Continued

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F 1	DRY GAS METER TEMPERATURE ~~INLET~~ AVG ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F 2	IMPINGER TEMPERATURE, °F 3
C-1	63	1445	934.020	Stop - Change Ports								
D-7	63	1446	934.020	0.60	1.97	1.97	164	96		5	250	66
6	66	1449	936.39	0.44	1.47	1.47	151	96		4.5	241	61
5	69	1452	938.52	0.32	1.07	1.07	149	96		3.5	240	59
4	72	1455	940.33	0.40	1.33	1.33	140	96		4.0	242	60
3	75	1458	942.30	0.46	1.52	1.52	135	96		4.5	242	59
2	78	1501	944.42	0.34	1.13	1.13	139	97		4.0	241	60
Ref Δp 0.54 → 1	81	1504	946.32	0.55	1.88	1.88	135	97		5	243	60
1	84	1507	948.625	Stop - Change Ports								
E-7	84	1508	948.625	0.54	1.85	1.85	142	96		5	246	63
6	87	1511	950.990	0.40	1.39	1.39	139	96		4	242	65
5	90	1514	952.97	0.34	1.18	1.18	132	96		4	248	66
4	93	1517	954.81	0.42	1.51	1.51	127	96		4.5	257	64
3	96	1520	956.98	0.36	1.25	1.25	127	97		4	261	62
2	99	1523	958.96	0.46	1.60	1.60	123	97		4.5	264	63
1	102	1526	961.10	0.47	1.61	1.61	124	97		5	265	61
1	105	1529	963.309	Stop - Change Ports								
F-7	105	1530	963.309	0.43	1.48	1.48	150	96		4.5	267	65
6	108	1533	965.400	0.36	1.24	1.24	143	96		4	268	68
5	111	1536	967.34	0.22	0.75	0.75	137	96		3	267	66
4	114	1539	968.88	0.23	0.78	0.78	134	96		3	269	68
3	117	1542	970.44	0.21	0.70	0.70	138	96		3	269	68
2	120	1545	971.88	0.29	1.00	1.00	134	96		4	270	71
1	123	1548	973.62	0.27	0.93	0.93	139	96		3.5	268	67
1	126	1551	975.285	Stop - Change Ports								
G-7	126	1552	975.285	0.50	1.71	1.71	156	96		5	266	67
6	129	1555	977.51	0.48	1.65	1.65	154	96		4.5	263	65
5	132	1558	979.73	0.44	1.51	1.51	155	97		4.5	260	65
4	135	1601	981.10	0.40	1.40	1.40	154	97		4.5	258	67
3	138	1604	983.94	0.36	1.23	1.23	155	97		4	258	69
2	141	1607	985.90	0.29	1.00	1.00	154	97		3.5	258	71
1	144	1610	987.65	0.19	0.66	0.66	150	97		3	259	71
1	147	1613	989.088	Stop - End Test. Final Leak Check 0.004 cfm @ 15 in Hg								
							Final Pitot Leak Check Ok					
							Final Orsat Line Leak Check Ok					

ANALYTICAL DATA

PLANT Green Bay Metro. Sldg Incin. COMMENTS: 3

DATE 9/23/81

SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet

SAMPLE TYPE Combined Method 5/8

RUN NUMBER GBM-5

SAMPLE BOX NUMBER

CLEAN-UP MAN M. Gallagher

FRONT HALF

LABORATORY RE

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____

FILTER NUMBER R-~~126~~ 137 _____ — CONTAINER _____ _____

_____ _____

_____ _____

FRONT HALF SUBTOTAL _____

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER _____ _____

ETHER-CHLOROFORM EXTRACTION _____

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER _____ _____

BACK HALF SUBTOTAL _____

TOTAL WEIGHT _____

MOISTURE

IMPINGERS

	1	
FINAL ~~VOLUME~~	555.8	ml g
INITIAL ~~VOLUME~~	605.2	ml g
NET ~~VOLUME~~	-49.4	ml g

IMPINGERS

	2	3	4
FINAL WEIGHT	678.1 g	647.5 g	510.6 g
INITIAL WEIGHT	617.8 g	612.8 g	221.5/240.0 g
NET WEIGHT	60.3 g	29.7 g	49.1 g

TOTAL MOISTURE 89.7

EPA (Dur) 231

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sld. Incin.
DATE 9/23/81
SAMPLING TIME (24-hr CLOCK) 1340-1613
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR

COMMENTS: Run GBM-5 Outlet
Final Orsat Leak Check OK

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	4.6	4.6	4.7	4.7	4.7	4.7	4.67	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	19.8	15.2	20.0	15.3	19.9	15.2	15.23	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4/72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg. Incin
DATE 9/23/81
SAMPLING TIME (24-hr CLOCK) 1340-1613
SAMPLING LOCATION Incin. No. 2 - Scrubber Inlet - Port B
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE 80°
OPERATOR J Greenberg

COMMENTS: Run GBM-5 Inlet
Final Orsat analyzer Leak Check Ok

GAS \ RUN	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	10.6	10.6	10.5	10.5	10.5	10.5	10.53	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	19.0	8.4	18.9	8.4	18.9	8.4	8.4	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4/72

~~PRELIMINARY~~ VELOCITY TRAVERSE
TEST 5

PLANT Green Bay Metro Sldg. Incin
DATE 9/23/81
LOCATION Incinerator No. 2 - Center Shaft Cooling
STACK I.D. 26.5"
BAROMETRIC PRESSURE, in. Hg ± 23
STACK GAUGE PRESSURE, in. H_2O 29.89
OPERATORS M. Gallagher
pre test leak check ok

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-12	1.0	233
11	1.0	233
10	1.0	233
9	.98	232
8	.97	233
7	.93	232
6	.86	230
5	.88	232
4	.92	233
3	.93	233
2	.95	232
1	.90	233
B-12	1.1	234
11	1.2	234
10	1.1	235
9	1.1	235
8	1.0	234
7	.86	231
6	.73	225
5	.75	225
4	.74	225
3	.74	225
2	.72	225
1	.64	225
AVERAGE	$\overline{\sqrt{\Delta p}}$ = 0.955	230.9

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

Final leak check ok

V = 108.863
$\sqrt{\Delta p}_{avg}$ = 0.7046
ΔH_{avg} = 1.696
Ts = 151.87
Tm = 92.51

FIELD DATA

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/23/81
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE Combined Method 5/8
RUN NUMBER GBM-6
OPERATOR J. Greenberg
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 29.82
STATIC PRESSURE, (P_s) -0.20
FILTER NUMBER (s) R-136

PROBE LENGTH AND TYPE 5 ft glass
NOZZLE I.D. 0.245 Na N-8
ASSUMED MOISTURE, % 4
SAMPLE BOX NUMBER
METER BOX NUMBER ES-5
METER $\Delta H_@$ 1.81
C FACTOR 1.01
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 0.58

SCHEMATIC OF TRAVERSE POINT LAYOUT

Initial Leak Check 0.003 cfm @ 15 in Hg

READ AND RECORD ALL DATA EVERY 3 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE ~~INLET~~ AVG ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
A-7	0	1720	992.589	0.82	2.60	2.60	174	88		6.5	230	68
6	3	1723	995.120	0.89	2.80	2.80	180	89		7.5	270	53
5	6	1726	997.99	0.90	2.85	2.85	179	91		8	268	48
4	9	1729	000.90	0.83	2.60	2.60	177	92		7.5	266	45
3	12	1732	003.69	0.74	2.30	2.30	179	93		7.0	271	45
2	15	1735	006.33	0.69	2.17	2.17	180	93		6.5	269	47
1	18	1738	008.83	0.53	1.70	1.70	176	93		5.5	260	47
1	21	1741	011.096	Stop - Change Ports								
B-7	21	1742	011.096	0.96	3.08	3.08	176	93		8	255	51
6	24	1745	014.100	0.73	2.30	2.30	176	94		6.5	254	51
5	27	1748	016.75	0.54	1.72	1.72	172	94		6	254	51
4	30	1751	019.04	0.51	1.62	1.62	165	94		5.5	251	50
3	33	1754	021.24	0.47	1.50	1.50	166	94		5	252	50
2	36	1757	023.35	0.43	1.38	1.38	168	95		5	252	50
1	39	1800	025.40	0.40	1.29	1.29	172	94		5	252	49
1	42	1803	027.358	Stop - Change Ports								
C-7	42	1804	027.358	0.78	2.49	2.49	171	94		7	251	51
6	45	1807	030.08	0.56	1.78	1.78	166	94		5.5	252	49
5	48	1810	032.38	0.49	1.56	1.56	159	94		5.5	251	48
4	51	1813	034.58	0.49	1.56	1.56	153	94		5.5	251	49
3	54	1816	036.75	0.45	1.51	1.51	150	94		5	250	50
2	57	1819	038.87	0.45	1.51	1.51	149	94		5	251	49
1	60	1822	041.00	0.39	1.30	1.30	152	94		5	251	48

Ref Δp 0.56

COMMENTS:

Green Bay Metro Stdg. Incin, 9/23/81 Run GBM-6 Continued

	TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F 1	DRY GAS METER TEMPERATURE ~~AVG INLET~~ ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F 2	IMPINGER TEMPERATURE, °F 3
	C-1	63	1825	043.005	Stop - Change Ports								
	D-7	63	1826	043.005	0.71	2.40	2.40	157	93		7	248	48
	6	66	1829	045.70	0.45	1.51	1.51	156	94		5.5	249	46
	5	69	1832	047.86	0.48	1.61	1.61	144	93		5.5	248	47
	4	72	1835	050.04	0.47	1.57	1.57	140	93		5	248	47
Ref Δp	3	75	1838	052.20	0.48	1.57	1.57	136	93		5.5	247	48
0.54	2	78	1841	054.35	0.56	1.91	1.91	134	93		6.0	246	48
	1	81	1844	056.74	0.52	1.80	1.80	133	93		6.0	245	49
	1	84	1847	059.069	Stop - Change Ports								
	E-7	84	1848	059.069	0.64	2.19	2.19	152	92		6.5	249	50
	6	87	1851	061.60	0.43	1.49	1.49	143	93		5.5	245	51
	5	90	1854	063.76	0.36	1.24	1.24	133	93		5	249	51
	4	93	1857	065.66	0.34	1.18	1.18	128	92		4.5	245	52
	3	96	1900	067.52	0.42	1.47	1.47	125	92		5.	246	50
	2	99	1903	069.59	0.50	1.71	1.71	123	92		5.5	245	49
	1	102	1906	071.83	0.54	1.85	1.85	125	92		6.0	246	49
	1	105	1909	074.190	Stop - Change Ports								
	F-7	105	1910	074.190	0.50	1.71	1.71	146	92		5.5	249	51
	6	108	1913	076.41	0.42	1.47	1.47	142	92		5	249	50
	5	111	1916	078.48	0.29	1.00	1.00	134	91		4.5	252	51
	4	114	1919	080.30	0.30	1.03	1.03	134	91		4.5	253	54
	3	117	1922	081.98	0.24	0.84	0.84	134	91		4	254	52
	2	120	1925	083.57	0.29	1.00	1.00	131	91		4.5	255	52
	1	123	1928	085.30	0.34	1.17	1.17	130	91		5	257	51
	1	126	1931	087.154	Stop - Change Ports								
Ref Δp 0.56	G-7	126	1932	087.154	0.46	1.60	1.60	156	90		5.5	253	54
	6	129	1935	089.310	0.52	1.74	1.74	151	91		5.5	257	53
	5	132	1938	091.61	0.46	1.53	1.53	146	92		5.5	257	54
	4	135	1941	093.74	0.46	1.53	1.53	147	92		5	257	56
	3	138	1944	095.89	0.40	1.34	1.34	146	92		5	255	57
	2	141	1947	097.91	0.34	1.14	1.14	145	92		4.5	255	58
	1	144	1950	099.83	0.27	0.89	0.89	131	92		4	251	59
	1	147	1953	101.452	Stop - End Test: Final Leak Check: 0.002 cfm @ 15 in Hg								
								Final Pitot Leak Check OK					
								Final Orsat Line Leak Check OK					

ANALYTICAL DATA

PLANT Green Bay Metro. Sldg Incin. COMMENTS:

DATE 9/23/81

SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet

SAMPLE TYPE Combined Method 5/8

RUN NUMBER GBM-6

SAMPLE BOX NUMBER

CLEAN-UP MAN M. Gallagher

purged train for 15 min at ΔH 1.5 mL

FRONT HALF

LABORATORY RE

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____

FILTER NUMBER R-136 _____ — CONTAINER _____ _____

FRONT HALF SUBTOTAL _____

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER _____ _____

ETHER-CHLOROFORM EXTRACTION _____

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER _____ _____

BACK HALF SUBTOTAL _____

TOTAL WEIGHT _____

MOISTURE

IMPINGERS	1	
FINAL ~~VOLUME~~	596.5 ml	g
INITIAL ~~VOLUME~~	631.40 ml	g
NET ~~VOLUME~~	-34.9 ml	g

IMPINGERS	2	3	4
FINAL WEIGHT	670.9 g	626.4 g	533.7 g
INITIAL WEIGHT	612.8 g	595.5 g	240.0/241.1 g
NET WEIGHT	58.1 g	30.9 g	52.6 g

TOTAL MOISTURE 106.7

EPA (Dur) 231

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg. Incin
DATE 9/23/81
SAMPLING TIME (24-hr CLOCK)
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR

COMMENTS: Run GBM-6 Outlet
Final Orsat Analyzer Leak Check OK

GAS \ RUN	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	5.5	5.5	5.4	5.4	5.5	5.5	5.47	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	20.0	14.5	20.0	14.6	20.1	14.6	14.57	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4/72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/23/81
SAMPLING TIME (24 hr CLOCK) 1720-1953
SAMPLING LOCATION Incin. No. 2 - Scrubber Inlet - Port C
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR

COMMENTS: Run GBM - 6 Inlet
Final Orsat Analyzer Leak Check OK

ORSAT SAMPLE LINE LEAK CHECKS OK.
Ok

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	11.0	11.0	10.9	10.9	10.9	10.9	10.9	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	19.1	8.1	19.0	8.1	19.1	8.2	8.13	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4/72

PRELIMINARY VELOCITY TRAVERSE
TEST 6

PLANT Green Bay Metro Sldg. Incin.
DATE 9/23/81
LOCATION Incinerator No. 2 - Center Shaft Cooling
STACK I.D. 26.5"
BAROMETRIC PRESSURE, in. Hg 29.82
STACK GAUGE PRESSURE, in. H_2O +.22
OPERATORS M. Gallagher

pre leak check ok
post test leak check OK

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-12	1.1	233
11	1.1	233
10	1.0	233
9	.99	233
8	.93	232
7	.87	230
6	.88	233
5	.84	233
4	.93	233
3	.96	234
2	.86	234
1	.87	234
B-12	1.2	237
11	1.3	237
10	1.2	235
9	1.1	235
8	1.05	235
7	.98	233
6	.68	229
5	.65	225
4	.70	225
3	.70	225
2	.61	225
1	.60	225
AVERAGE	$\sqrt{\Delta p} = 0.955$	231.7

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Greenbay Metro Sldg Bnem.
DATE 9-23-81
SAMPLING TIME (24-hr CLOCK) 18:40
SAMPLING LOCATION cooling stack INCINERATOR #2 Center Shaft cooling
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) orsat grab bag
ANALYTICAL METHOD orsat
AMBIENT TEMPERATURE 80
OPERATOR Mike Halloghan

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	0	0	0	0				44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	20.6	20.6	20.9	20.9				32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

Final orsat analyzer leak check OK
leak check on sample line OK

EPA (Dur) 230
4/72

FIELD DATA

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/24/81
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE Combined Method 5/8
RUN NUMBER GBM-7
OPERATOR J. Greenberg
AMBIENT TEMPERATURE 83
BAROMETRIC PRESSURE 29.81
STATIC PRESSURE, (P_s) -
FILTER NUMBER (s) R-138

PROBE LENGTH AND TYPE 5 ft/glass
NOZZLE I.D. 0.275" No. N-8
ASSUMED MOISTURE, % 4
SAMPLE BOX NUMBER
METER BOX NUMBER ES-5
METER $\Delta H_@$ 1.81
C FACTOR 1.01
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 0.58

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F 1	DRY GAS METER TEMPERATURE AVG ~~INLET~~ ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F 2	IMPINGER TEMPERATURE, °F 3
A-7	0	0900	101.658	0.95	3.00	3.00	195	83		8.5	236	65
6	3	0903	104.660	0.85	2.70	2.70	188	85		8	229	53
5	6	0906	107.520	0.83	2.60	2.60	189	86		7.5	235	50
4	9	0909	110.30	0.69	2.19	2.19	184	88		6.5	239	51
3	12	0912	112.87	0.62	1.98	1.98	180	89		6.5	242	53
2	15	0915	115.27	0.50	1.60	1.60	179	90		5.5	244	53
1	18	0918	117.51	0.30	0.96	0.96	183	90		4.5	243	54
1	21	0921	119.248	Stop - Change Parts								
B-7	21	0922	119.248	0.81	2.56	2.56	193	90		7.5	249	56
6	24	0925	122.00	0.44	1.40	1.40	184	92		5	248	53
5	27	0928	124.15	0.29	0.93	0.93	178	92		4	251	56
4	30	0931	125.88	0.28	0.90	0.90	173	92		4	253	56
3	33	0934	127.53	0.25	0.80	0.80	173	92		4	255	54
2	36	0937	129.10	0.25	0.80	0.80	174	92		4	256	53
1	39	0940	130.65	0.27	0.86	0.86	175	92		4	257	53
1	42	0943	132.263	Stop - Change Parts								
C-7	42	0945	132.263	0.72	2.30	2.30	187	92		7	259	54
6	45	0948	134.890	0.36	1.15	1.15	176	93		4	256	49
5	48	0951	136.820	0.28	0.90	0.90	167	93		4	257	50
4	51	0954	138.510	0.17	0.55	0.55	163	93		3	258	54
3	54	0957	139.820	0.18	0.58	0.58	164	93		3	259	55
2	57	1000	141.160	0.23	0.76	0.76	166	93		3	260	55
1	60	1003	142.67	0.20	0.67	0.67	175	94		3	260	55

Ref Δp 0.56

COMMENTS:

Green Bay Metro. Slds. Incin 9/24/81 Run GBM-7 Continued

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F 1	DRY GAS METER TEMPERATURE ~~AVG~~ INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F 2	IMPINGER TEMPERATURE, °F 3
1	63	1006	144.094	Stop-Change Ports								
D-7	63	1007	144.094	0.65	2.12	2.12	180	93		6.5	259	55
6	66	1010	146.62	0.33	1.10	1.10	169	94		4.5	253	49
5	69	1013	148.48	0.19	0.64	0.64	164	94		2.5	256	52
4	72	1016	149.99	0.13	0.39	0.39	162	94		2	256	55
3	75	1019	151.15	0.08	0.27	0.27	164	94		2	259	58
2	78	1022	152.09	0.09	0.30	0.30	166	94		2	261	58
1	81	1025	153.06	0.10	0.33	0.33	164	94			262	57
1	84	1028	154.09	Stop-Change Ports								
E-7	84	1031	154.09	0.64	2.1	2.1	178	93		6.5	262	54
6	87	1034	156.56	0.31	1.03	1.03	169	94		4	254	48
5	90	1037	158.40	0.15	0.52	0.52	164	94		3	256	48
4	93	1040	159.69	0.10	0.33	0.33	162	94		2	258	54
3	96	1043	160.71	0.07	0.24	0.24	161	94		1.5	259	57
2	99	1046	161.56	0.06	0.20	0.20	163	93		1.5	259	61
1	102	1049	162.36	0.12	0.37	0.37	156	93		2	262	60
1	105	1052	163.454	Stop Change Ports								
F-7	105	1053	163.454	0.64	2.1	2.1	178	94		6.5	261	51
6	108	1056	159.97	0.40	1.33	1.33	180	95		5	252	46
5	111	1059	168.04	0.20	0.67	0.67	165	95		3.5	253	49
4	114	1102	169.50	0.17	0.57	0.57	166	94		3.	256	49
3	117	1105	170.82	0.10	0.32	0.32	167	94		3	254	53
2	120	1108	171.10	0.09	0.30	0.30	160	93		3	259	56
1	123	1111	172.82	0.18	0.60	0.60	170	94		3	258	54
1	126	1114	174.171	Stop-Change Ports								
G-7	126	1116	174.171	0.76	2.55	2.55	182	93		7.5	256	53
6	129	1119	176.87	0.66	2.20	2.20	180	94		7	252	47
5	132	1122	179.46	0.54	1.80	1.80	174	96		6	250	48
4	135	1125	181.81	0.50	1.67	1.67	174	96		6	250	52
3	138	1128	184.00	0.43	1.42	1.42	176	96		5	248	53
2	141	1131	186.08	0.30	1.0	1.0	175	95		4	249	57
1	144	1134	187.82	0.16	0.53	0.53	171	94		3.	250	58
1	147	1137	188.807	Stop-End Test. Final Leak Check 0.003 cfm @ 15 in Hg								
							Final Pitot Leak Check OK					
							Final Orsat Leak Check OK					

ANALYTICAL DATA

PLANT Green Bay Metro. Sldg. Incin.

DATE 9/24/81

SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet

SAMPLE TYPE Combined Method 5/8

RUN NUMBER GBM - 7

SAMPLE BOX NUMBER

CLEAN-UP MAN Mike Gallagher

COMMENTS: (A)

Purged train for 15 min at Δ# of 1.5 MG.

FRONT HALF

LABORATORY RE

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER

CONTAINER

FILTER NUMBER R-138

CONTAINER

FRONT HALF SUBTOTAL

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER

CONTAINER

ETHER-CHLOROFORM EXTRACTION

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER

CONTAINER

BACK HALF SUBTOTAL

TOTAL WEIGHT

MOISTURE

IMPINGERS	1	
FINAL ~~VOLUME~~	562.5 ~~ml~~	g
INITIAL ~~VOLUME~~	627.6 ~~ml~~	g
NET ~~VOLUME~~	-65.1 ~~ml~~	g

IMPINGERS	2	3	4
FINAL WEIGHT	654.2 g	628.0 g	516.7 g
INITIAL WEIGHT	592.8 g	603.1 g	219.0/259.1 g
NET WEIGHT	61.4 g	25.9 g	38.6 g

TOTAL MOISTURE 60.8

EPA (Dur) 231

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg. Incin
DATE 9/29/81
SAMPLING TIME (24-hr CLOCK) 0900-1137
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR J Greenberg

COMMENTS: Run GBM-7 Outlet
Final Orsat Analyzer Leak Check Ok

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	5.2	5.2	5.1	5.1	5.2	5.2	5.17	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	20.4	15.2	20.3	15.2	20.4	15.2	15.2	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4/72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/24/81
SAMPLING TIME (24-hr CLOCK) 0900-1137
SAMPLING LOCATION Incin. No. 2 - Scrubber Inlet - Port C
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR J Greenberg

COMMENTS: Run GBM-7 Inlet
Final Orat Analyzer Leak Check OK

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	16.0	16.0	15.9	15.9	15.9	15.9	15.93	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	19.4	3.4	19.4	3.5	19.6	3.6	3.50	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

Leak check on line OK

EPA (Dur) 230
4/72

PRELIMINARY VELOCITY TRAVERSE
TEST 7

PLANT Green Bay Metro Sldge Incin.
DATE 9/24/81
LOCATION Incinerator No. 2 Center Shaft Cooling
STACK I.D. 26.5"
BAROMETRIC PRESSURE, in. Hg
STACK GAUGE PRESSURE, in. H_2O ?.21
OPERATORS Mike Gallagher

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-12	1.2	232
11	1.2	232
10	1.2	232
9	1.1	232
8	.97	232
7	.93	232
6	.90	231
5	.97	231
4	1.0	233
3	1.1	233
2	1.0	233
1	.97	234
B-12	1.3	237
11	1.3	239
10	1.3	239
9	1.1	235
8	1.1	235
7	.96	234
6	.75	227
5	.75	229
4	.78	225
3	.81	225
2	.80	225
1	.73	225
AVERAGE	$\sqrt{\Delta p}$ = 0.995	231.8

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

Leak check OK

FIELD DATA

PLANT Green Bay Metro. Sldg. Incin
DATE 9/24/81
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE Combined Method 5/8
RUN NUMBER GBM-8
OPERATOR J. Greenberg
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 29.77
STATIC PRESSURE, (P_s) -0.24
FILTER NUMBER (s) R-139

PROBE LENGTH AND TYPE 5 ft glass
NOZZLE I.D. 0.275 No N-8
ASSUMED MOISTURE, % 4
SAMPLE BOX NUMBER
METER BOX NUMBER ES-5
METER $\Delta H_@$ 1.81
C FACTOR 1.01
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 0.58

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F 1	DRY GAS METER TEMPERATURE ~~INLET~~ Avg ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F 2	IMPINGER TEMPERATURE, °F 3
A-7	0	1250	189.234	0.90	2.80	2.80	199	94		8.5	253	67
6	3	1253	192.120	0.79	2.49	2.49	195	96		8	251	63
5	6	1256	194.87	0.73	2.30	2.30	192	97		8	246	58
4	9	1259	197.54	0.59	1.87	1.87	185	99		6	243	57
3	12	1302	199.95	0.52	1.67	1.67	183	99		6	244	58
2	15	1305	202.20	0.46	1.47	1.47	182	99		5.5	244	59
1	18	1308	204.32	0.30	0.96	0.96	181	99		4.5	245	61
1	21	1311	206.04	Stop - Change Ports								
B-7	21	1312	206.04	0.83	2.61	2.61	194	98		8.5	249	63
6	24	1315	208.83	0.48	1.53	1.53	186	99		6	246	60
5	27	1318	210.99	0.31	0.99	0.99	178	98		4.5	248	61
4	30	1321	212.74	0.26	0.83	0.83	174	98		4	250	61
3	33	1324	214.35	0.27	0.86	0.86	174	97		4.5	252	61
2	36	1327	215.99	0.29	0.94	0.94	178	97		4.5	252	61
1	39	1330	217.67	0.29	0.94	0.94	179	97		4.5	256	61
1	42	1333	219.341	Stop - Change Ports								
C-7	42	1334	219.341	0.78	2.47	2.47	187	97		7	250	59
6	45	1337	222.06	0.46	1.47	1.47	177	98		5.5	244	57
5	48	1340	224.17	0.30	0.96	0.96	165	98		4.5	242	58
4	51	1343	225.89	0.21	0.67	0.67	164	97		3.5	247	61
3	54	1346	227.33	0.18	0.58	0.58	168	97		3.5	249	63
2	57	1349	228.68	0.20	0.65	0.65	167	97		3.5	251	63
1	60	1352	230.09	0.22	0.70	0.70	170	96		3.5	252	63

COMMENTS:

Green Bay Metro. Sldg. Incin. 9/24/81 Run GBM-8 Continued

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F 1	DRY GAS METER TEMPERATURE ~~AUG INLET~~ ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F 2	IMPINGER TEMPERATURE, °F 3
C-1	63	1355	231.573	Stop - Change Ports								
D-7	63	1356	231.573	0.67	2.11	2.11	179	96		7	251	62
6	66	1359	234.080	0.42	1.35	1.35	166	97		5.5	245	58
Ref 5	69	1402	236.120	0.38	1.21	1.21	151	97		5	245	58
Δp → 4	72	1405	238.03	0.39	1.30	1.30	146	98		5	246	57
0.56 3	75	1408	240.03	0.28	0.93	0.93	146	97		4.5	244	58
2	78	1411	241.74	0.21	0.70	0.70	151	97		4	245	61
1	81	1414	243.27	0.11	0.37	0.37	161	97		2	249	63
1	84	1417	244.274	Stop - Change Ports								
E-7	84	1418	244.274	0.61	2.00	2.00	189	96		7	249	63
6	87	1421	246.71	0.27	0.90	0.90	177	97		4.5	248	60
5	90	1424	248.35	0.11	0.37	0.37	174	96		3	250	60
4	93	1427	249.465	0.06	0.21	0.21	176	96		2.5	255	65
3	96	1430	250.29	0.05	0.17	0.17	176	95		2	257	66
2	99	1433	251.01	0.05	0.17	0.17	176	95		2	259	66
1	102	1436	251.75	0.10	0.33	0.33	168	95		3	260	65
1	105	1439	252.764	Stop - Change Ports								
F-7	105	1440	252.764	0.69	2.26	2.26	191	95		8	260	60
6	108	1443	255.36	0.37	1.21	1.21	178	96		5	249	53
5	111	1446	257.34	0.20	0.67	0.67	173	96		4	250	56
4	114	1449	258.80	0.12	0.41	0.41	170	96		3	252	57
3	117	1452	259.97	0.08	0.27	0.27	168	95		2	255	62
2	120	1455	260.92	0.09	0.30	0.30	168	95		3	257	64
1	123	1458	261.92	0.14	0.48	0.48	161	95		3	259	65
1	126	1501	263.127	Stop - Change Ports								
G-7	126	1502	263.127	0.66	2.20	2.20	171	96		7.5	258	64
6	129	1505	265.66	0.56	1.85	1.85	168	97		6.5	249	57
5	132	1508	268.04	0.45	1.50	1.50	165	97		6	246	57
4	135	1511	270.20	0.42	1.41	1.41	162	98		5.5	246	58
3	138	1514	272.25	0.40	1.32	1.32	168	98		5.5	247	60
2	141	1517	274.30	0.32	1.07	1.07	169	98		5	247	61
1	144	1520	276.08	0.18	0.61	0.61	169	98		4	249	64
1	147	1523	277.474	Stop - End Test. Final Leak Check 0.003 cfm @ 15 in Hg.								
							Final Orsat Sample Line Leak Check OK					
							Final Pitot Leak Check OK					

ANALYTICAL DATA

PLANT Green Bay Metro. Sldg. Incin. COMMENTS: (B)

DATE 9/29/81

SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet

SAMPLE TYPE Combined Method 5/8

RUN NUMBER GBM-8

SAMPLE BOX NUMBER

CLEAN-UP MAN M. Gallagher

Purged train for 15 min @ 1.5 ΔH.

FRONT HALF

LABORATORY RE

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER _____ _____

FILTER NUMBER R-139 _____ — CONTAINER _____ _____

FRONT HALF SUBTOTAL _____

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER _____ _____

ETHER-CHLOROFORM EXTRACTION _____

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER _____ _____

BACK HALF SUBTOTAL _____

TOTAL WEIGHT _____

MOISTURE

IMPINGERS	1	
FINAL ~~VOLUME~~	553.5	~~ml~~ g
INITIAL ~~VOLUME~~	605.2	~~ml~~ g
NET ~~VOLUME~~	-51.7	~~ml~~ g

IMPINGERS	2	3	4
FINAL WEIGHT	676.3 g	643.3 g	535.3 g
INITIAL WEIGHT	617.8 g	617.8 g	248.8 | 248.8 g
NET WEIGHT	58.5 g	25.5 g	37.7 g

TOTAL MOISTURE 70.0

EPA (Dur) 231

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg Incin
DATE 9/27/81
SAMPLING TIME (24-hr CLOCK) 1250-1523
SAMPLING LOCATION Incin No. 2 - Scrubber Outlet
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE 80°
OPERATOR J Greenberg

COMMENTS: Run GBM-8 Outlet
Final Orsat Analyzer Leak Check OK

GAS \ RUN	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	5.5	5.5	5.3	5.3	5.3	5.3	5.37	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	20.4	14.9	20.3	15.0	20.3	15.0	14.97 ~~15.0~~	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4/72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg. Incin
DATE 9/24/81
SAMPLING TIME (24-hr CLOCK) 1250-1523
SAMPLING LOCATION Incin No. 2 - Scrubber Inlet - Port B
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE 80°
OPERATOR J. Greenberg

COMMENTS: Run GBM-8 Inlet
Final Orsat Analyzer Leak Check OK

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	15.0	15	14.9	14.9	15.0	15.0	14.97	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	19.5	4.5	19.4	4.5	19.5	4.5	4.50	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

Orsat line leak check OK
MG

EPA (Dur) 230
4/72

~~PRELIMINARY~~ VELOCITY TRAVERSE
TEST 8

PLANT Green Bay Metro Sldg. Incin.
DATE 9/24/81
LOCATION Incinerator No. 2 - Center Shaft Cooling
STACK I.D. 26.5"
BAROMETRIC PRESSURE, in. Hg 29.75
STACK GAUGE PRESSURE, in. H_2O +.27
OPERATORS Mike Dolhagher

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-12	1.1	235
11	1.1	235
10	1.0	234
9	1.2	235
8	1.0	236
7	.95	235
6	.90	237
5	.96	238
4	1.0	238
3	1.0	238
2	1.0	238
1	.94	239
B-12	1.3	243
11	1.3	242
10	1.3	242
9	1.1	242
8	1.1	240
7	.93	239
6	.72	233
5	.75	231
4	.79	231
3	.80	231
2	.73	229
1	.70	227
AVERAGE	$\overline{\sqrt{\Delta p}}$ = 0.989	236.2

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

Leak check OK

$V = 68.88\ L$
$\sqrt{\Delta p_{avg}} = 0.5775$
$\Delta H_{avg} = 1.176$
$T_s = 165.59$

FIELD DATA

$T_m = 97.08$

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/24/81
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE Combined Method 5/8
RUN NUMBER GBM - 9
OPERATOR J. Greenberg
AMBIENT TEMPERATURE 80°F
BAROMETRIC PRESSURE 29.73
STATIC PRESSURE, (P_s) -0.28
FILTER NUMBER (s) R-139

PROBE LENGTH AND TYPE 5ft glass
NOZZLE I.D. 0.245" No N-8
ASSUMED MOISTURE, % 4%
SAMPLE BOX NUMBER
METER BOX NUMBER ES-5
METER $\Delta H_@$ 1.81
C FACTOR 1.01
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp 0.58

SCHEMATIC OF TRAVERSE POINT LAYOUT

Initial Leak Check 0.004 cfm @ 15 in Hg

READ AND RECORD ALL DATA EVERY 3 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F 1	DRY GAS METER TEMPERATURE AVG ~~INLET~~ ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F 2	IMPINGER TEMPERATURE, °F 3
A-7	0	1635	279.110	0.85	2.71	2.71	196	90		8	272	60
6	3	1638	281.95	0.82	2.60	2.60	189	92		8	274	52
5	6	1641	284.75	0.73	2.32	2.32	185	93		7	272	51
4	9	1644	287.46	0.61	1.98	1.98	182	94		6.5	269	50
3	12	1647	289.84	0.50	1.60	1.60	179	95		5.5	265	53
2	15	1650	292.02	0.39	1.25	1.25	178	94		5	264	54
1	18	1653	293.95	0.35	1.12	1.12	176	95		4.5	263	57
1	21	1656	295.791	Stop - Change Ports								
B-7	21	1657	295.791	0.86	2.75	2.75	186	95		8	261	57
6	24	1700	298.68	0.58	1.85	1.85	178	96		6	252	55
5	27	1703	301.07	0.41	1.32	1.32	172	96		5	252	57
4	30	1706	303.08	0.35	1.12	1.12	167	97		4.5	253	58
3	33	1709	304.94	0.34	1.10	1.10	167	96		4.5	253	58
2	36	1712	306.76	0.33	1.07	1.07	171	96		4.5	252	60
1	39	1715	308.53	0.31	1.00	1.00	176	96		4.5	252	60
1	42	1718	310.263	Stop - Change Ports								
C-7	42	1719	310.263	0.76	2.40	2.40	181	97		7.5	252	61
6	45	1722	312.97	0.39	1.24	1.24	172	98		5	246	56
5	48	1725	314.96	0.27	0.86	0.86	162	98		4	249	57
4	51	1728	316.59	0.21	0.66	0.66	159	97		3.5	250	58
3	54	1731	318.03	0.19	0.61	0.61	162	97		3	252	59
2	57	1734	319.41	0.18	0.58	0.58	167	97		3	253	59
1	60	1737	320.77	0.16	0.52	0.52	169	98		3	254	61

COMMENTS:

Green Bay Metro. Sldg. Incin. 9/24/81 Run GBM-9 Continued

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F 1	DRY GAS METER TEMPERATURE AVG INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F 2	IMPINGER TEMPERATURE, °F 3
C-1	63	1740	322.042	Stop - Change Ports								
D-6	63	1741	322.042	0.35	1.12	1.12	168	97		5	254	60
7	66	1744	323.960	0.68	2.15	2.15	179	98		6.5	249	54
5	69	1747	326.36	0.19	0.61	0.61	160	99		3	245	56
4	72	1750	327.76	0.15	0.48	0.48	157	98		3	250	59
3	75	1753	329.98	0.15	0.48	0.48	152	98		3	252	59
2	78	1756	330.20	0.14	0.46	0.46	155	98		3	253	58
1	81	1759	331.39	0.13	0.42	0.42	157	97		3	253	58
1	84	1802	332.529	Stop - Change Ports								
E-7	84	1803	332.529	0.54	1.73	1.73	171	97		5.5	253	51
6	87	1806	334.80	0.38	1.21	1.21	162	98		5	246	50
5	90	1809	336.74	0.24	0.77	0.77	153	98		3.5	246	53
4	93	1812	338.27	0.17	0.55	0.55	150	98		3	246	54
Ref Δp 0.56 → 3	96	1815	339.52	0.13	0.44	0.44	151	98		3	249	58
2	99	1818	340.68	0.11	0.37	0.37	152	98		3	250	59
1	102	1821	341.73	0.15	0.48	0.48	152	97		3	249	59
1	105	1824	342.943	Stop - Change Ports								45
F-7	105	1825	342.943	0.58	1.95	1.95	167	97		6.5	247	56
6	108	1828	345.38	0.39	1.30	1.30	160	98		5	241	47
5	111	1831	347.38	0.26	0.87	0.87	153	98		4	240	50
4	114	1834	349.01	0.18	0.61	0.61	152	98		3.5	243	56
3	117	1837	350.40	0.11	0.37	0.37	154	98		3	245	60
2	120	1840	351.46	0.12	0.41	0.41	155	98		3	248	62
1	123	1843	352.59	0.18	0.61	0.61	156	98		3.5	250	60
1	126	1846	353.932	Stop - Change Ports								
G-7	126	1847	353.932	0.66	2.20	2.20	168	98		6.5	249	54
6	129	1850	356.47	0.50	1.67	1.67	164	99		5.5	249	50
5	132	1853	358.73	0.43	1.43	1.43	161	100		5	241	53
4	135	1856	360.86	0.39	1.30	1.30	159	100		5	241	56
3	138	1859	362.80	0.36	1.20	1.20	158	100		5	242	57
2	141	1902	364.72	0.31	1.04	1.04	158	100		4.5	243	57
1	144	1905	366.51	0.22	0.73	0.73	156	99		4	245	59
1	147	1908	367.992	Stop - End Test: Final Leak Check: 0.003 cfm @ 15 in. Hg								
								Final Pitot Leak Check				
								Final Orsat Line Leak Check				

ANALYTICAL DATA

PLANT Green Bay Metro. Sldg. Incin. COMMENTS:

DATE 9/24/81

SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet

SAMPLE TYPE Combined Method 5/8

RUN NUMBER GBM-9

SAMPLE BOX NUMBER

CLEAN-UP MAN

FRONT HALF

LABORATORY RE

ACETONE WASH OF NOZZLE, PROBE, CYCLONE (BYPASS), FLASK, FRONT HALF OF FILTER HOLDER — CONTAINER

FILTER NUMBER R-134 — CONTAINER

FRONT HALF SUBTOTAL

BACK HALF

IMPINGER CONTENTS AND WATER WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER

ETHER-CHLOROFORM EXTRACTION

ACETONE WASH OF IMPINGERS, CONNECTORS, AND BACK HALF OF FILTER HOLDER — CONTAINER

BACK HALF SUBTOTAL

TOTAL WEIGHT

MOISTURE

IMPINGERS	1
FINAL ~~VOLUME~~	580.1 ~~ml~~ g
INITIAL ~~VOLUME~~	631.4 ~~ml~~ g
NET ~~VOLUME~~	-51.3 ~~ml~~ g

IMPINGERS	2	3	4
FINAL WEIGHT	673.2 g	623.6 g	485.1 g
INITIAL WEIGHT	612.8 g	595.5 g	2300/216.5 g
NET WEIGHT	60.4 g	28.1 g	39.6 g

TOTAL MOISTURE 76.8

EPA (Rev) 231

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/24/81
SAMPLING TIME (24 hr CLOCK) 1635-1908
SAMPLING LOCATION Incin. No. 2 - Scrubber Inlet - Port A
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR J Greenberg

COMMENTS: Run GBM - 9 Inlet
Final Orsat Analyzer Leak Check OK

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	14.5	14.5	14.5	14.5	14.5	14.5	14.5	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	19.7	5.2	19.7	5.2	19.6	5.1	5.17	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4/72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/24/81
SAMPLING TIME (24-hr CLOCK) 1635-1908
SAMPLING LOCATION Incin. No. 2 - Scrubber Outlet
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR J. Greenberg

COMMENTS: Run GBM-9 Outlet
Final Orsat Analyzer Leak Check OK

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	5.5	5.5	5.5	5.5	5.4	5.4	5.47	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	20.3	14.8	20.4	14.9	20.3	14.9	14.87	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4/72

~~PRELIMINARY~~ VELOCITY TRAVERSE
TEST 9

PLANT Green Bay Metro. Sldg. Incin.
DATE 9/24/81
LOCATION Incinerator No. 2 - Center Shaft Cooling
STACK I.D. 26.5"
BAROMETRIC PRESSURE, in. Hg 29.73
STACK GAUGE PRESSURE, in. H_2O +.29
OPERATORS M. Gallagher

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-12	1.2	230
11	1.2	230
10	1.1	230
9	1.2	230
8	1.0	230
7	.93	229
6	.87	229
5	.97	229
4	1.0	229
3	1.1	230
2	1.1	230
1	1.0	229
B-12	1.3	231
11	1.3	231
10	1.2	232
9	1.2	232
8	1.1	232
7	.95	231
6	.78	225
5	.77	224
4	.78	223
3	.81	222
2	.79	220
1	.68	219
AVERAGE	$\overline{\sqrt{\Delta p}}$ = 1.00	228.2

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

Leak check ok

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro Sldg Incin
DATE 9/25/81
SAMPLING TIME (24-hr CLOCK) 0847 - 0854
SAMPLING LOCATION Incinerator No. 2 - Scrubber Inlet - Port A
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated Bag
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE 90°F
OPERATOR J. Greenberg

COMMENTS: Final Orsat Analyzer Leak Check OK

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	8.9	8.9	9.0	9.0	9.0	9.0	8.97	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	18.5	9.6	18.6	9.6	18.6	9.6	9.6	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

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4/72

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro Sldg. Incin.
DATE 9/25/81.
SAMPLING TIME (24-hr CLOCK) 0858 - 0903
SAMPLING LOCATION Incinerator No. 2 - Scrubber Inlet - Port B
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrated Bag
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE 90° F
OPERATOR J. Greenberg

COMMENTS: Final Orsat Analyzer Final Leak Check OK

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	8.8	8.8	8.7	8.7	8.7	8.7	8.73	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	19.7	9.9	19.6	9.9	19.7	10	9.93	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

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DRY MOLECULAR WEIGHT DETERMINATION

PLANT Green Bay Metro Sldg. Incin.
DATE 9/25/81
SAMPLING TIME (24-hr CLOCK) 0911-0916
SAMPLING LOCATION Incinerator No. 2 - Scrubber Inlet Port C
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Integrate Bag
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE 90
OPERATOR J. Greenberg

COMMENTS: Final Orsat Analyzer Leak Check OK

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb/lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	9.6	9.6	9.5	9.5	9.5	9.5	9.57	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	18.9	9.3	18.8	9.3	18.8	9.3	9.3	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EPA (Dur) 230
4/72

APPENDIX B

EXAMPLE CALCULATION FOR PARTICULATE MATTER
BURN 1, TEST 2 (RUN GBM-2)

&

COMPUTER CALCULATIONS FOR ALL RUNS

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************************
* EXAMPLE CALCULATIONS *
*          FOR         *
*         GBM-2        *
************************
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BAROMETRIC PRESSURE P(B)	29.83 IN. HG	
STACK DIMENSIONS D(S)	38.0 IN. BY	46.5 IN.
SAMPLING NOZZLE DIAMETER D(N)	0.245 IN.	
STACK GAS PRESSURE P(S)	29.81 IN. HG	
PITOT TUBE COEFFICIENT C(P)	0.850	
DRY GAS METER CORRECTION FACTOR G(M)	0.980	

OPERATIONAL DATA

VOLUME OF DRY GAS SAMPLED, METER COND. (UNCORRECTED) V	110.511 CU. FT.
VOLUME OF DRY GAS SAMPLED, METER COND. (CORRECTED) V(M)	108.301 CU. FT.
NET TIME OF TEST T(T)	147. MIN.
VOLUME OF WATER COLLECTED V(W)	88.6 ML.
PARTICULATES COLLECTED; FRONT HALF M(F).....	33.0 MG.
PARTICULATES COLLECTED, TOTAL M(T).....	NOT APPLICABLE
PERCENT CARBON DIOXIDE % CO2	4.67 %
PERCENT CARBON MONOXIDE % CO	0.0 %
PERCENT OXYGEN % O2	15.10 %
AVERAGE GAS METER TEMPERATURE T(M) ..	554.6 DEG. R
AVERAGE ORIFICE PRESSURE DROP P(M) ..	1.733 IN. H2O
AVERAGE STACK GAS TEMPERATURE T(S) ..	617.20 DEG. R

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FIELD DATA
FOR
GBM-2

SAMPLING POINT	VELOCITY HEAD	STACK TEMPERATURE
1	0.780	184.
2	0.940	192.
3	0.860	200.
4	0.780	188.
5	0.670	187.
6	0.680	188.
7	0.520	186.
8	1.000	182.
9	0.780	177.
10	0.580	178.
11	0.580	176.
12	0.600	174.
13	0.600	174.
14	0.510	178.
15	0.900	169.
16	0.810	165.
17	0.530	162.
18	0.580	158.
19	0.640	156.
20	0.580	155.
21	0.480	159.
22	0.740	162.
23	0.490	151.
24	0.440	147.
25	0.460	143.
26	0.450	135.
27	0.520	135.
28	0.470	137.
29	0.620	155.
30	0.420	149.

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FIELD DATA
FOR
GBM-2

SAMPLING POINT	VELOCITY HEAD	STACK TEMPERATURE
31	0.330	138.
32	0.290	135.
33	0.310	130.
34	0.340	130.
35	0.440	132.
36	0.510	161.
37	0.450	148.
38	0.310	143.
39	0.250	137.
40	0.300	138.
41	0.300	134.
42	0.380	130.
43	0.520	149.
44	0.580	157.
45	0.560	153.
46	0.500	150.
47	0.430	152.
48	0.380	147.
49	0.250	137.

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DERIVED DATA

PERCENT NITROGEN

$$\% N_2 = 100 - (\%CO_2 + \%O_2 + \%CO)$$

$$\% N_2 = 100 - (4.67 + 15.10 + 0.0) = 80.23 \%$$

AVERAGE PRESSURE AT THE ORIFICE

$$P(O) = P(B) + \frac{P(M)}{13.6}$$

$$P(O) = 29.83 + \frac{1.733}{13.6} = 29.957 \text{ IN. HG}$$

AREA OF STACK

$$A(S) = \frac{\text{LENGTH X WIDTH}}{4 \text{ X } 144}$$

$$A(S) = \frac{38.0 \text{ X } 46.5}{4 \text{ X } 144} = 12.271 \text{ SQ. FT.}$$

AREA OF NOZZLE

$$A(N) = \frac{PI \text{ X } D(N) \text{ X } D(N)}{4 \text{ X } 144}$$

$$A(N) = \frac{3.141591 \text{ X } 0.245 \text{ X } 0.245}{4 \text{ X } 144} = 3.27385 \text{ X } 10^{-4} \text{ SQ. FT.}$$

GAS ANALYSIS

VOLUME OF DRY GAS SAMPLED, STANDARD CONDITIONS

$$V(MST) = G(M) \times V \times \frac{T(ST)}{T(M)} \times \frac{P(O)}{P(ST)}$$

WHERE T(ST) IS THE TEMPERATURE AT STANDARD CONDITIONS (528 DEG. R), P(ST) IS THE PRESSURE AT STANDARD CONDITIONS (29.92 IN. HG), AND G(M) IS THE VALUE FOR THE DRY GAS METER GAMMA.

$$V(MST) = 0.980 \times 110.511 \times \frac{528}{554.6} \times \frac{29.957}{29.92} =$$

103.241 CU. FT.

VOLUME OF WATER VAPOR COLLECTED, STANDARD CONDITIONS

$$V(WVST) = (\ 0.04707\ ) \times (\ V(W)\ )$$

WHERE 0.04707 IS THE VOLUME, MEASURED IN CU. FT. AT STANDARD CONDITIONS, THAT 1.0 ML. OF LIQUID WATER WOULD OCCUPY UPON EVAPORATION.

$$V(WVST) = (\ 0.04707\ ) \times (\ 88.6) = 4.182 \text{ CU. FT.}$$

PERCENT MOISTURE IN STACK GAS

$$\%\ M = \frac{V(WVST)}{V(MST) + V(WVST)} \times 100\%$$

$$\%\ M = \frac{4.182}{103.241 + 4.182} \times 100\% = 3.89\ \%$$

PERCENT DRY GAS IN STACK GAS

$$\%\ V(M) = 100 - \%M$$

$$MD = \%\ V(M) = 100 - 3.89 = 96.11\ \%$$

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GAS ANALYSIS - CONTINUED

TOTAL GAS VOLUME COLLECTED, STACK CONDITIONS,

$$V(TS) = (V(MST) + V(WVST)) \times \frac{T(S)}{T(ST)} \times \frac{P(ST)}{P(S)}$$

$$V(TS) = (103.241 + 4.182) \times \frac{617.2}{528} \times \frac{29.92}{29.81} = 126.035 \text{ CU. FT.}$$

MOLECULAR WEIGHT OF DRY GAS

$$MW(D) = 0.44 \times (\%CO2) + 0.32 \times (\%O2) + 0.28 \times (\%N2 + \%CO)$$

$$MW(D) = 0.44 \times (4.67) + 0.32 \times (15.10) + 0.28 \times (80.23 + 0.0) = \underline{29.351}$$

MOLECULAR WEIGHT OF STACK GAS

$$MW = 0.01 \times ((MW(D) \times \%V(M)) + (18 \times \%M))$$

$$MW = 0.01 \times ((29.351 \times 96.11) + (18 \times 3.89)) = 28.909$$

29.351 X .96) + 18 (.04)

PERCENT EXCESS AIR

$$\% EA = \frac{\% O2 + (0.5) \times (\% CO)}{(0.264) \times (\%N2) - (\%O2) + (0.5) \times (\%CO)} \times 100\%$$

$$\% EA = \frac{15.10 - (0.5) \times (0.0)}{(0.264) \times (80.23) - (15.10) + (0.5) \times (0.0)} \times 100\% = 248.33 \%$$

GAS FLOW ANALYSIS

AVERAGE STACK GAS VELOCITY, STACK CONDITIONS

LET A EQUAL THE SUM FROM 1 TO N OF THE SQUARE ROOT OF THE PRODUCT OF T(S)′ AND DELTA-P′, WHERE T(S)′ AND DELTA-P′ ARE INDIVIDUAL VALUES OF N OBSERVATIONS OF STACK TEMPERATURE (IN DEGREES R) AND STACK GAS VELOCITY HEAD (IN INCHES H2O) RESPECTIVELY

LET B EQUAL THE SQUARE ROOT OF THE PRODUCT OF MW AND P(S).

$$V(S) = \frac{(85.49 \times C(P) \times A)}{(B \times N)}$$

A = 883.3506
B = 29.36

$$V(S) = \frac{(85.49 \times 0.850 \times 883.3506)}{(29.36 \times 49)} = 44.619 \text{ FT. PER SEC.}$$

STACK GAS FLOW RATE, STACK CONDITIONS

Q(A) = 60 X V(S) X A(S)

Q(A) = 60 X 44.619 X 12.271 = 32851. ACFM

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GAS FLOW ANALYSIS - CONTINUED

STACK GAS FLOW RATE, STANDARD CONDITIONS

$$Q(DS) = Q(A) \times \frac{T(ST)}{T(S)} \times \frac{P(S)}{P(ST)} \times \frac{\%V(M)}{100}$$

$$Q(DS) = 32851. \times \frac{528}{617.2} \times \frac{29.81}{29.92} \times \frac{96.11}{100}$$

$$= 26909. \text{ DSCFM}$$

AVERAGE STACK GAS VELOCITY, STANDARD CONDITIONS

$$V(SST) = \frac{Q(DS)}{60 \times A(S)}$$

$$V(SST) = \frac{26909.}{60 \times 12.271} = 36.55 \text{ FT. PER SEC.}$$

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CONCENTRATION OF PARTICULATES IN SAMPLE

FRONT HALF, DRY GAS, STANDARD CONDITIONS

$$C(AN) = 0.01543 \times \frac{M(F)}{V(MST)}$$

$$C(AN) = 0.01543 \times \frac{33.0}{103.241} = 0.005 \text{ GR./DSCF}$$

TOTAL, DRY GAS, STANDARD CONDITIONS

$$C(AO) = 0.01543 \times \frac{M(T)}{V(MST)}$$

** C(AO) IS NOT APPLICABLE FOR GBM-2

FRONT HALF, STACK GAS, STACK CONDITIONS

$$C(AT) = 0.01543 \times \frac{M(F)}{V(TS)}$$

$$C(AT) = 0.01543 \times \frac{33.0}{126.035} = 0.004 \text{ GR./ACF}$$

TOTAL, STACK GAS, STACK CONDITIONS

$$C(AU) = 0.01543 \times \frac{M(T)}{V(TS)}$$

** C(AU) IS NOT APPLICABLE FOR GBM-2

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PERCENT ISOKINETIC

LET:

$$A = T(S) \times 1.667 \times \left(0.002667 \times V(W) + \frac{V(M)}{T(M)} \times P(O) \right)$$

$$A = 617.2 \times 1.667 \times \left(0.002667 \times 88.60 + \frac{108.30}{554.6} \times 29.957 \right)$$

$$= 6262.664$$

LET:

$$B = T(T) \times V(S) \times P(S) \times A(N)$$

$$B = 147. \times 44.619 \times 29.81 \times 3.27385 \times 10^{-4} = 63.963$$

$$I = \frac{A}{B}$$

$$I = \frac{6262.664}{63.963} = 97.91\ \%$$

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EMISSION RATE

FRONT HALF

PMPC

$$C(AW) = 1.323 \times 10^{-4} \times \frac{M(F)}{V(MST)} \times Q(DS)$$

$$C(AW) = 1.323 \times 10^{-4} \times \frac{33.0}{103.241} \times 26909. = 1.135 \text{ LB./HR.}$$

1.138

TOTAL

$$C(AX) = 1.323 \times 10^{-4} \times \frac{M(T)}{V(MST)} \times Q(DS)$$

** C(AX) IS NOT APPLICABLE FOR GBM-2

$$PMPA = \frac{60}{147} \times \frac{.033}{453.59} \div \frac{12.271}{.000327} = 1.114$$

$$\% = \frac{1.114}{1.138} \times 100 = 97.9\%$$

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DRY FEED RATE

Duration of Burn 1, Test 2 = 166 minutes
Total Pounds Dry Feed = 10,493 lbs
Dry Feed Rate = F(D)

$$F(D) = \left(\frac{10{,}493 \text{ lbs}}{2{,}000 \text{ lbs/ton}}\right) \left(\frac{60 \text{ min/hr}}{166 \text{ min}}\right)$$

$$F(D) = 2.896 \text{ tons/hr}$$

EMISSION RATE PER TON DRY FEED

Emission Rate Per Ton Dry Feed = C(DF)

$$C(DF) = \frac{C(AW)}{F(D)}$$

$$C(DF) = \frac{1.135 \text{ lbs/hr}}{1{,}896 \text{ tons/hr}}$$

$$C(DF) = 0.60 \text{ lb/ton dry feed}$$

ADJUSTED OUTLET CO_2 CONCENTRATION

$$(\%CO_2)_{adj} = (\%CO_2)_{di} \quad \frac{100 + (\%\ EA)i}{100 + (\%\ EA)_o}$$

where:

$(\%\ CO_2)_{adj}$ is the adjusted outlet CO_2 percentage,

$(\%\ CO_2)_{di}$ is the percentage of CO_2, measured before the scrubber, dry basis.

$(\%\ EA)_i$ is the percentage of excess air at the inlet, and

$(\%\ EA)_o$ is the percentage of excess air at the outlet

$$(\%\ CO_2)_{adj} = (9.09) \quad \frac{(100 + 81.1)}{(100 + 248.3)} \quad = 9.09 \frac{(100 + 81.1)}{(100 + 162.9)}$$

$$(\%\ CO_2)_{adj} = 4.73$$

CONCENTRATION PER DSCF CORRECTED TO 12% CO_2

$$C(AN)_{adj.\ 12\%CO_2} = C(AN) \times \frac{(12\%)}{(\%CO_2)_{adj}}$$

$$= (0.0049\ gr/dscf) \quad \frac{(12\%)}{(4.73\%)}$$

$$= 0.012\ gr/dscf$$

PARTICULATE EMISSION DATA REPORT

Burn 1

GREEN BAY METROPOLITAN SEWERAGE DISTRICT RUN GBM-1 9/22/81 0950T01242

BAROMETRIC PRESSURE (IN. HG)	29.49
AVG. ORIFICE PRES. DROP (IN. H2O)	1.517
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (UNCORRECTED)	102.243
DRY GAS METER CORRECTION FACTOR (GAMMA)	0.980
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (CORRECTED)	100.198
AVG. METER TEMP. (F)	85.3
VOLUME OF DRY GAS SAMPLED (DSCF)	95.987
TOTAL H2O COLLECTED (ML)	89.3
VOLUME OF H2O COLLECTED (SCF)	4.21
% MOISTURE IN STACK GAS BY VOLUME	4.21
MOLE FRACTION OF DRY GAS	0.958
% CARBON DIOXIDE	4.33
% OXYGEN	15.33
% CARBON MONOXIDE	0.0
MOLECULAR WEIGHT OF DRY GAS	29.31
MOLECULAR WEIGHT OF STACK GAS	28.83
AVERAGE STACK GAS VELOCITY, STACK COND. (FPS)	45.0
AVERAGE STACK GAS TEMPERATURE (F)	153.6
ABSOLUTE STACK GAS PRESSURE (IN. HG)	29.47
STACK GAS FLOW RATE (ACFM)	32741.
STACK GAS FLOW RATE (DSCFM)	26581.
NET TIME OF TEST (MIN.)	147.
STACK DIMENSIONS (IN.)	38.0 X 46.0
SAMPLING NOZZLE DIAMETER (IN.)	0.250
% ISOKINETIC	87.6
% EXCESS AIR	260.7

PARM	MASS (IN MILLIGRAMS) FRONT	MASS (IN MILLIGRAMS) BACK	CONCENTRATION (GR/SCF) FRONT	CONCENTRATION (GR/SCF) BACK	EMISSION RATE (LB/HR) FRONT	EMISSION RATE (LB/HR) BACK
PART ..	0.268E+02	N/A	0.430E-02	N/A	0.979E+00	N/A
SO2 ..	N/A	0.880E+01	N/A	0.141E-02	N/A	0.322E+0

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Burn 1

GREEN BAY METROPOLITAN SEWERAGE DISTRICT RUN GBM-2 9/ /81 1515T01801

BAROMETRIC PRESSURE (IN. HG)	29.83
AVG. ORIFICE PRES. DROP (IN. H20)	1.733
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (UNCORRECTED)	110.511
DRY GAS METER CORRECTION FACTOR (GAMMA)	0.980
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (CORRECTED)	108.301
AVG. METER TEMP. (F)	94.6
VOLUME OF DRY GAS SAMPLED (DSCF)	103.241
TOTAL H20 COLLECTED (ML)	88.6
VOLUME OF H20 COLLECTED (SCF)	4.18
% MOISTURE IN STACK GAS BY VOLUME	3.89
MOLE FRACTION OF DRY GAS	0.961
% CARBON DIOXIDE	4.67
% OXYGEN	15.10
% CARBON MONOXIDE	0.0
MOLECULAR WEIGHT OF DRY GAS	29.35
MOLECULAR WEIGHT OF STACK GAS	28.91
AVERAGE STACK GAS VELOCITY, STACK COND. (FPS)	44.6
AVERAGE STACK GAS TEMPERATURE (F)	157.2
ABSOLUTE STACK GAS PRESSURE (IN. HG)	29.81
STACK GAS FLOW RATE (ACFM)	32851.
STACK GAS FLOW RATE (DSCFM)	26909.
NET TIME OF TEST (MIN.)	147.
STACK DIMENSIONS (IN.)	38.0 X 46.5
SAMPLING NOZZLE DIAMETER (IN.)	0.245
% ISOKINETIC	97.9
% EXCESS AIR	248.3

PARM	MASS (IN MILLIGRAMS) FRONT	MASS (IN MILLIGRAMS) BACK	CONCENTRATION (GR/SCF) FRONT	CONCENTRATION (GR/SCF) BACK	EMISSION RATE (LB/HR) FRONT	EMISSION RATE (LB/HR) BAC
PART ..	0.330E+02	N/A	0.492E-02	N/A	0.114E+01	N/A
SO2 ..	N/A	0.910E+01	N/A	0.136E-02	N/A	0.313E+0
CD ..	0.880E-02	N/A	0.131E-05	N/A	0.303E-03	N/A
CU ..	0.903E-02	N/A	0.135E-05	N/A	0.311E-03	N/A
CR ..	< 0.500E-02	N/A	< 0.746E-06	N/A	< 0.172E-03	N/A
BE ..	< 0.500E-03	N/A	< 0.746E-07	N/A	< 0.172E-04	N/A
NI ..	< 0.400E-02	N/A	< 0.597E-06	N/A	< 0.138E-03	N/A
ZN ..	< 0.500E-03	N/A	< 0.746E-07	N/A	< 0.172E-04	N/A

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Burn 1

GREEN BAY METROPOLITAN SEWERAGE DISTRICT RUN GBM-3 9/22/81 1945T02225

BAROMETRIC PRESSURE (IN. HG)	29.49
AVG. ORIFICE PRES. DROP (IN. H2O)	1.604
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (UNCORRECTED)	105.670
DRY GAS METER CORRECTION FACTOR (GAMMA)	0.980
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (CORRECTED)	103.557
AVG. METER TEMP. (F)	91.8
VOLUME OF DRY GAS SAMPLED (DSCF)	98.050
TOTAL H2O COLLECTED (ML)	82.7
VOLUME OF H2O COLLECTED (SCF)	3.90
% MOISTURE IN STACK GAS BY VOLUME	3.83
MOLE FRACTION OF DRY GAS	0.962
% CARBON DIOXIDE	4.63
% OXYGEN	14.73
% CARBON MONOXIDE	0.0
MOLECULAR WEIGHT OF DRY GAS	29.33
MOLECULAR WEIGHT OF STACK GAS	28.90
AVERAGE STACK GAS VELOCITY, STACK COND. (FPS)	42.8
AVERAGE STACK GAS TEMPERATURE (F)	156.9
ABSOLUTE STACK GAS PRESSURE (IN. HG)	29.47
STACK GAS FLOW RATE (ACFM)	31521.
STACK GAS FLOW RATE (DSCFM)	25554.
NET TIME OF TEST (MIN.)	147.
STACK DIMENSIONS (IN.)	38.0 X 46.5
SAMPLING NOZZLE DIAMETER (IN.)	0.245
% ISOKINETIC	97.9
% EXCESS AIR	224.6

PARM	MASS (IN MILLIGRAMS) FRONT	MASS BACK	CONCENTRATION (GR/SCF) FRONT	CONCENTRATION BACK	EMISSION RATE (LB/HR) FRONT	EMISSION RATE BAC
PART ..	0.233E+02	N/A	0.366E-02	N/A	0.801E+00	N/A
SO2 ..	N/A	0.830E+01	N/A	0.130E-02	N/A	0.285E+0

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Burn 2

GREEN BAY METROPOLITAN SEWERAGE DISTRICT RUN GBM-4 9/23/81 1000T01235

BAROMETRIC PRESSURE (IN. HG)	29.95
AVG. ORIFICE PRES. DROP (IN. H2O)	1.596
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (UNCORRECTED)	105.293
DRY GAS METER CORRECTION FACTOR (GAMMA)	0.980
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (CORRECTED)	103.187
AVG. METER TEMP. (F)	93.2
VOLUME OF DRY GAS SAMPLED (DSCF)	98.975
TOTAL H2O COLLECTED (ML)	90.5
VOLUME OF H2O COLLECTED (SCF)	4.27
% MOISTURE IN STACK GAS BY VOLUME	4.14
MOLE FRACTION OF DRY GAS	0.959
% CARBON DIOXIDE	4.73
% OXYGEN	15.27
% CARBON MONOXIDE	0.0
MOLECULAR WEIGHT OF DRY GAS	29.37
MOLECULAR WEIGHT OF STACK GAS	28.90
AVERAGE STACK GAS VELOCITY, STACK COND. (FPS)	42.0
AVERAGE STACK GAS TEMPERATURE (F)	151.7
ABSOLUTE STACK GAS PRESSURE (IN. HG)	29.93
STACK GAS FLOW RATE (ACFM)	30912.
STACK GAS FLOW RATE (DSCFM)	25588.
NET TIME OF TEST (MIN.)	147.
STACK DIMENSIONS (IN.) 38.0 X	46.5
SAMPLING NOZZLE DIAMETER (IN.)	0.245
% ISOKINETIC	98.7
% EXCESS AIR	261.0

PARM	MASS (IN MILLIGRAMS) FRONT	MASS (IN MILLIGRAMS) BACK	CONCENTRATION (GR/SCF) FRONT	CONCENTRATION (GR/SCF) BACK	EMISSION RATE (LB/HR) FRONT	EMISSION RATE (LB/HR) BAC
PART ..	0.122E+02	N/A	0.190E-02	N/A	0.416E+00	N/A
SO2 ..	N/A	0.124E+02	N/A	0.193E-02	N/A	0.423E+0

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Burn 2

GREEN BAY METROPOLITAN SEWERAGE DISTRICT RUN GBM-5 9/23/81 1340T01613

BAROMETRIC PRESSURE (IN. HG)	29.89
AVG. ORIFICE PRES. DROP (IN. H2O)	1.484
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (UNCORRECTED)	101.145
DRY GAS METER CORRECTION FACTOR (GAMMA)	0.980
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (CORRECTED)	99.122
AVG. METER TEMP. (F)	95.6
VOLUME OF DRY GAS SAMPLED (DSCF)	94.446
TOTAL H2O COLLECTED (ML)	89.7
VOLUME OF H2O COLLECTED (SCF)	4.23
% MOISTURE IN STACK GAS BY VOLUME	4.29
MOLE FRACTION OF DRY GAS	0.957
% CARBON DIOXIDE	4.67
% OXYGEN	15.23
% CARBON MONOXIDE	0.0
MOLECULAR WEIGHT OF DRY GAS	29.36
MOLECULAR WEIGHT OF STACK GAS	28.87
AVERAGE STACK GAS VELOCITY, STACK COND. (FPS)	40.5
AVERAGE STACK GAS TEMPERATURE (F)	153.9
ABSOLUTE STACK GAS PRESSURE (IN. HG)	29.87
STACK GAS FLOW RATE (ACFM)	29837.
STACK GAS FLOW RATE (DSCFM)	24518.
NET TIME OF TEST (MIN.)	147.
STACK DIMENSIONS (IN.)	38.0 X 46.5
SAMPLING NOZZLE DIAMETER (IN.)	0.245
% ISOKINETIC	98.3
% EXCESS AIR	257.4

PARM	MASS (IN MILLIGRAMS) FRONT	MASS (IN MILLIGRAMS) BACK	CONCENTRATION (GR/SCF) FRONT	CONCENTRATION (GR/SCF) BACK	EMISSION RATE (LB/HR) FRONT	EMISSION RATE (LB/HR) BACK
PART ..	0.118E+02	N/A	0.192E-02	N/A	0.404E+00	N/A
SO2 ..	N/A	0.930E+01	N/A	0.152E-02	N/A	0.319E+0
CD ..	0.248E-02	N/A	0.404E-06	N/A	0.850E-04	N/A
CU ..	0.333E-02	N/A	0.543E-06	N/A	0.114E-03	N/A
CR ..<	0.500E-02	N/A	< 0.815E-06	N/A	< 0.171E-03	N/A
BE ..<	0.500E-03	N/A	< 0.815E-07	N/A	< 0.171E-04	N/A
NI ..<	0.400E-02	N/A	< 0.652E-06	N/A	< 0.137E-03	N/A
ZN ..<	0.500E-03	N/A	< 0.815E-07	N/A	< 0.171E-04	N/A

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Burn 2

GREEN BAY METROPOLITAN SEWERAGE DISTRICT RUN GBM-6 9/23/81 1720T01953

BAROMETRIC PRESSURE (IN. HG)	29.82
AVG. ORIFICE PRES. DROP (IN. H2O)	1.696
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (UNCORRECTED)	108.863
DRY GAS METER CORRECTION FACTOR (GAMMA)	0.980
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (CORRECTED)	106.686
AVG. METER TEMP. (F)	92.5
VOLUME OF DRY GAS SAMPLED (DSCF)	102.037
TOTAL H2O COLLECTED (ML)	106.7
VOLUME OF H2O COLLECTED (SCF)	5.04
% MOISTURE IN STACK GAS BY VOLUME	4.70
MOLE FRACTION OF DRY GAS	0.953
% CARBON DIOXIDE	5.47
% OXYGEN	14.57
% CARBON MONOXIDE	0.0
MOLECULAR WEIGHT OF DRY GAS	29.46
MOLECULAR WEIGHT OF STACK GAS	28.92
AVERAGE STACK GAS VELOCITY, STACK COND. (FPS)	43.4
AVERAGE STACK GAS TEMPERATURE (F)	151.9
ABSOLUTE STACK GAS PRESSURE (IN. HG)	29.80
STACK GAS FLOW RATE (ACFM)	31979.
STACK GAS FLOW RATE (DSCFM)	26192.
NET TIME OF TEST (MIN.)	147.
STACK DIMENSIONS (IN.)	38.0 X 46.5
SAMPLING NOZZLE DIAMETER (IN.)	0.245
% ISOKINETIC	99.4
% EXCESS AIR	222.8

PARM	MASS (IN MILLIGRAMS) FRONT	MASS (IN MILLIGRAMS) BACK	CONCENTRATION (GR/SCF) FRONT	CONCENTRATION (GR/SCF) BACK	EMISSION RATE (LB/HR) FRONT	EMISSION RATE (LB/HR) BAC
PART ..	0.940E+01	N/A	0.142E-02	N/A	0.318E+00	N/A
SO2 ..	N/A	0.142E+02	N/A	0.214E-02	N/A	0.481E+0

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Barn 3

GREEN BAY METROPOLITAN SEWERAGE DISTRICT RUN GBM-7 9/24/81 0900T01137

BAROMETRIC PRESSURE (IN. HG)	29.81
AVG. ORIFICE PRES. DROP (IN. H2O)	1.167
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (UNCORRECTED)	87.149
DRY GAS METER CORRECTION FACTOR (GAMMA)	0.980
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (CORRECTED)	85.406
AVG. METER TEMP. (F)	92.6
VOLUME OF DRY GAS SAMPLED (DSCF)	81.534
TOTAL H2O COLLECTED (ML)	60.8
VOLUME OF H2O COLLECTED (SCF)	2.87
% MOISTURE IN STACK GAS BY VOLUME	3.40
MOLE FRACTION OF DRY GAS	0.966
% CARBON DIOXIDE	5.17
% OXYGEN	15.20
% CARBON MONOXIDE	0.0
MOLECULAR WEIGHT OF DRY GAS	29.44
MOLECULAR WEIGHT OF STACK GAS	29.05
AVERAGE STACK GAS VELOCITY, STACK COND. (FPS)	35.1
AVERAGE STACK GAS TEMPERATURE (F)	173.2
ABSOLUTE STACK GAS PRESSURE (IN. HG)	29.79
STACK GAS FLOW RATE (ACFM)	25860.
STACK GAS FLOW RATE (DSCFM)	20740.
NET TIME OF TEST (MIN.)	147.
STACK DIMENSIONS (IN.)	38.0 X 46.5
SAMPLING NOZZLE DIAMETER (IN.)	0.245
% ISOKINETIC	100.3
% EXCESS AIR	261.1

PARM	MASS (IN MILLIGRAMS) FRONT	MASS BACK	CONCENTRATION (GR/SCF) FRONT	CONCENTRATION BACK	EMISSION RATE (LB/HR) FRONT	EMISSION RATE BAC
PART ..	0.650E+01	N/A	0.123E-02	N/A	0.218E+00	N/A
SO2 ..	N/A	0.950E+01	N/A	0.179E-02	N/A	0.319E+0

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Burn 3

GREEN BAY METROPOLITAN SEWERAGE DISTRICT RUN GBM-8 9/24/81 1250T01523

BAROMETRIC PRESSURE (IN. HG)	29.77
AVG. ORIFICE PRES. DROP (IN. H2O)	1.170
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (UNCORRECTED)	88.240
DRY GAS METER CORRECTION FACTOR (GAMMA)	0.980
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (CORRECTED)	86.475
AVG. METER TEMP. (F)	96.9
VOLUME OF DRY GAS SAMPLED (DSCF)	81.818
TOTAL H2O COLLECTED (ML)	70.0
VOLUME OF H2O COLLECTED (SCF)	3.30
% MOISTURE IN STACK GAS BY VOLUME	3.88
MOLE FRACTION OF DRY GAS	0.961
% CARBON DIOXIDE	5.37
% OXYGEN	14.97
% CARBON MONOXIDE	0.0
MOLECULAR WEIGHT OF DRY GAS	29.46
MOLECULAR WEIGHT OF STACK GAS	29.01
AVERAGE STACK GAS VELOCITY, STACK COND. (FPS)	35.5
AVERAGE STACK GAS TEMPERATURE (F)	173.3
ABSOLUTE STACK GAS PRESSURE (IN. HG)	29.75
STACK GAS FLOW RATE (ACFM)	26169.
STACK GAS FLOW RATE (DSCFM)	20853.
NET TIME OF TEST (MIN.)	147.
STACK DIMENSIONS (IN.)	38.0 X 46.5
SAMPLING NOZZLE DIAMETER (IN.)	0.245
% ISOKINETIC	100.1
% EXCESS AIR	247.0

PARM	MASS (IN MILLIGRAMS) FRONT	MASS (IN MILLIGRAMS) BACK	CONCENTRATION (GR/SCF) FRONT	CONCENTRATION (GR/SCF) BACK	EMISSION RATE (LB/HR) FRONT	EMISSION RATE (LB/HR) BAC
PART ..	0.840E+01	N/A	0.158E-02	N/A	0.283E+00	N/A
SO2 ..	N/A	0.158E+02	N/A	0.297E-02	N/A	0.531E+0
CD ..	0.730E-03	N/A	0.137E-06	N/A	0.246E-04	N/A
CU ..<	0.200E-02	N/A	< 0.376E-06	N/A	< 0.673E-04	N/A
CR ..<	0.500E-02	N/A	< 0.941E-06	N/A	< 0.168E-03	N/A
BE ..<	0.500E-03	N/A	< 0.941E-07	N/A	< 0.168E-04	N/A
NI ..<	0.400E-02	N/A	< 0.753E-06	N/A	< 0.135E-03	N/A
ZN ..<	0.500E-03	N/A	< 0.941E-07	N/A	< 0.168E-04	N/A

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Barn 3

GREEN BAY METROPOLITAN SEWERAGE DISTRICT RUN GBM-9 9/24/81 1635T01908

BAROMETRIC PRESSURE (IN. HG)	29.73
AVG. ORIFICE PRES. DROP (IN. H2O)	1.176
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (UNCORRECTED)	88.882
DRY GAS METER CORRECTION FACTOR (GAMMA)	0.980
VOLUME OF DRY GAS SAMPLED, METER COND. (DCF) (CORRECTED)	87.104
AVG. METER TEMP. (F)	97.1
VOLUME OF DRY GAS SAMPLED (DSCF)	82.272
TOTAL H2O COLLECTED (ML)	76.8
VOLUME OF H2O COLLECTED (SCF)	3.62
% MOISTURE IN STACK GAS BY VOLUME	4.22
MOLE FRACTION OF DRY GAS	0.958
% CARBON DIOXIDE	5.47
% OXYGEN	14.87
% CARBON MONOXIDE	0.0
MOLECULAR WEIGHT OF DRY GAS	29.47
MOLECULAR WEIGHT OF STACK GAS	28.99
AVERAGE STACK GAS VELOCITY, STACK COND. (FPS)	35.8
AVERAGE STACK GAS TEMPERATURE (F)	165.6
ABSOLUTE STACK GAS PRESSURE (IN. HG)	29.71
STACK GAS FLOW RATE (ACFM)	26390.
STACK GAS FLOW RATE (DSCFM)	21183.
NET TIME OF TEST (MIN.)	147.
STACK DIMENSIONS (IN.)	38.0 X 46.5
SAMPLING NOZZLE DIAMETER (IN.)	0.245
% ISOKINETIC	99.1
% EXCESS AIR	241.4

PARM	MASS (IN MILLIGRAMS) FRONT	MASS (IN MILLIGRAMS) BACK	CONCENTRATION (GR/SCF) FRONT	CONCENTRATION (GR/SCF) BACK	EMISSION RATE (LB/HR) FRONT	EMISSION RATE (LB/HR) BAC
PART ..	0.860E+01	N/A	0.161E-02	N/A	0.292E+00	N/A
SO2 ..	N/A	0.144E+02	N/A	0.270E-02	N/A	0.489E+0

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APPENDIX C

EQUIPMENT CALIBRATION DATA

DRY GAS METER AND ORIFICE CALIBRATION

POST TEST GAMMA CHECK

Date 9-28-81 Box No. ES-5

Barometric pressure, P_b = 29.70 in. Hg Dry gas meter No. 78

Orifice manometer setting, ΔH, in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test Meter t_w, °F	Temperature: Dry gas meter Inlet t_{di}, °F	Temperature: Dry gas meter Outlet t_{do}, °F	Temperature: Dry gas meter Average t_d, °F	Time θ, min	γ	$\Delta H@$
0.5	7.29	7.876	73			109	11	.98	
1.0	7.39	7.999	73			108	11	.98	
2.0	6.64	7.222	73			110	10	.98	
4.0									
						Average		.98	

Avg. ΔH 1.5" H_2O
Highest vacuum 8" Hg

Calculations

ΔH	$\frac{\Delta H}{13.6}$	γ: $\frac{V_w P_b (t_d + 460)}{V_d\left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\Delta H@$: $\frac{0.0317\ \Delta H}{P_b (t_d + 460)}\left[\frac{(t_w + 460)\ \theta}{V_w}\right]^2$
0.5	0.0368	.9845	
1.0	0.0737	.9809	
2.0	0.147	.9796	
4.0	0.294		

γ = Ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01

$\Delta H@$ = Orifice pressure differential that gives 0.75 cfm of air at 70° F and 29.92 inches of mercury, in. H_2O. Tolerance - ± 0.15

DRY GAS METER AND ORIFICE CALIBRATION

Date 9-16-81 Box No. ES-5

Barometric pressure, P_b = 29.51 in. Hg Dry gas meter No. 78

Orifice manometer setting, ΔH, in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test: Meter t_w, °F	Temperature: Dry gas meter: Inlet t_{di}, °F	Temperature: Dry gas meter: Outlet t_{do}, °F	Temperature: Dry gas meter: Average t_d, °F	Time θ, min	Y	ΔH@
0.5	4.00	4.173	77			90	10	.98	1.76
1.0	5.54	5.770	77			91	10	.98	1.83
2.0	7.95	8.165	77			94	10	.99	1.82
4.0	11.00	11.446	77			95	10	.98	1.85
						Average		.98	1.81

Calculations

ΔH	$\frac{\Delta H}{13.6}$	Y: $\frac{V_w P_b (t_d + 460)}{V_d\left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	ΔH@: $\frac{0.0317\ \Delta H}{P_b (t_d + 460)}\left[\frac{(t_w + 460)\ \theta}{V_w}\right]^2$
0.5	0.0368	.9805	1.7601
1.0	0.0737	.9827	1.8318
2.0	0.147	.9869	1.8148
4.0	0.294	.9834	1.8451

Y = Ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01

ΔH@ = Orifice pressure differential that gives 0.75 cfm of air at 70° F and 29.92 inches of mercury, in. H_2O. Tolerance - ± 0.15

ES

ENGINEERING-SCIENCE, INC.

7903 WESTPARK DRIVE · McLEAN, VIRGINIA 22101 · 703/790-9300

CABLE ADDRESS: ENGINSCI
TELEX: 89-9401

SOURCE SAMPLING NOZZLE CALIBRATION

CALIBRATED BY Bob Jensen

DATE 9/13/81

CALIBRATION INSTRUMENT Mitutoyo

NOZZLE NUMBER	NOMINAL SIZE	Reading 1	2	3	AVG.
N-8		.244	.245	.245	.245
N-9		.245	.246	.247	.246
N-3		.367	.367	.366	.367

APPENDIX D

LABORATORY DATA

ENGINEERING-SCIENCE

PLANT/LOCATION Green Bay

DATE Oct 6, 1981

PARTICULATE WEIGHT, FILTER

Run No./Filter No.	GBM-1/R130	GBM-2/R131	GBM-3/R132	GBM-4/R135	GBM-5/R137
Filter, Gross Wt., g	28.8841	28.6743	28.0357	29.9271	31.4516
Initial Wt., g	28.8616	28.6543	28.0164	29.9186	31.4410
Net Wt., g	0.0225	0.0200	0.0193	0.0085	0.0106

RESIDUE WEIGHT, FRONT HALF ACETONE WASH

Run No.	GBM-1/G236	GBM-2/G237	GBM-3/G238	GBM-4/G239	GBM-5/G240
Acetone Blank Vol., ml	109	109	109	109	109
Acetone Blank Residue, g	0.0014	0.0014	0.0014	0.0014	0.0014
Acetone Blank Conc., g/l	0.0128	0.0128	0.0128	0.0128	0.0128
Wash Volume, ml	340	236	285	305	290
Gross Residue Wt., g	0.0087	0.0160	0.0077	0.0076	0.0049
Blank Wt., g	0.0044	0.0030	0.0037	0.0039	0.0037
Net Residue Wt., g	0.0043	0.0130	0.0040	0.0037	0.0012
Total Front Half Wt, g.	0.0268	0.0330	0.0233	0.0122	0.0118

PARTICULATE WEIGHT, FILTER

Run No./Filter No.	GBM-6/R136	GBM-7/R138	GBM-8/R139	GBM-9/R134	
Filter, Gross Wt., g	28.9539	28.9930	31.3019	33.1637	
Initial Wt., g	28.9446	28.9898	31.2947	33.1602	
Net Wt., g	0.0093	0.0032	0.0072	0.0035	

RESIDUE WEIGHT, FRONT HALF ACETONE WASH

Run No.	GBM-6/G241	GBM-7/G242	GBM-8/G243	GBM-9/G244	
Acetone Blank Vol., ml	109	109	109	109	
Acetone Blank Residue, g	0.0014	0.0014	0.0014	0.0014	
Acetone Blank Conc., g/l	0.0128	0.0128	0.0128	0.0128	
Wash Volume, ml	327	334	315	271	
Gross Residue Wt., g	0.0043	0.0076	0.0052	0.0086	
Blank Wt., g	0.0042	0.0043	0.0040	0.0035	
Net Residue Wt., g	0.0001	0.0033	0.0012	0.0051	
Total Front Half Wt. g.	0.0094	0.0065	0.0084	0.0086	

Greenbay SO_x 10/16/81

		V_t (ml)	V_{soln} (ml)	V_{std} (ft^3)	stack Flow (DSCFM)
GBM-1	8.8 mg/sample	1.325	520	95.99	26,581
GBM-2	9.1	1.485	480	103.24	26,909
GBM-3	8.3	1.15	565	98.05	25,554
GBM-4	12.4	1.82	530	98.98	25,588
GBM-5	9.3	1.27	575	94.45	24,518
GBM-6	14.2	1.85	595	102.04	26,192
GBM-7	9.5	1.30	570	81.53	20,704
GBM-8	15.8	2.22	550	81.82	20,853
GBM-9	14.4	2.15	525	82.27	21,183

All perioxide blanks = 0.0 = V_{tb}

$$Conc\ SO_2 = \frac{7.061 \times 10^{-5} (N)(V_t - V_{tb}) \left(\frac{V_{soln}}{V_{aliq.}}\right)}{V_{std}}$$

$$= \frac{7.061 \times 10^{-5} (.0102)(V_t - 0) \left(\frac{V_{soln}}{25}\right)}{V_{std}}$$

	Test #	Emission Conc		Emission Rate	
	1.	2.1×10^{-7}	lb/DSCF	0.33	Lb/Hr
Burn 1	2.	2.0×10^{-7}	"	0.32	"
	3.	1.9×10^{-7}	"	0.29	"
	4.	2.8×10^{-7}	"	0.43	"
Burn 2	5.	2.2×10^{-7}	"	0.32	"
	6.	3.1×10^{-7}	"	0.49	"
	7.	2.6×10^{-7}	"	0.32	"
Burn 3	8.	4.3×10^{-7}	"	0.54	"
	9.	4.0×10^{-7}	"	0.51	"
				AVE 0.39	"

Notebook No._____

PROJECT Greenbay

Continued From Page_____

	ml $BaCl_2$	Blank
5 ml 0.02 N H_2SO_4	10.02	0.03
	10.00	0.03

Sample	Vol. (ml)	Aliquot	N $BaCl_2$	T_1 (ml)	T_2 (ml)
6% H_2O_2 Blank 9-22-81	330	25 ml	0.0102 ~~1.002~~	0.03	0.0
6% H_2O_2 Blank 9-23-81	405	25 ml		0.03	0.0
6% H_2O_2 Blank 9-24-81	400	25 ml		0.03	0.0
GBM-1 H_2O_2 9-22-81	520 ✓	25 ml		1.30	1.3
GMB-2 H_2O_2 9-22-81	480 ✓	25 ml		1.47	1.5
GMB-3 H_2O_2 9-22-81	565 ✓	25 ml		1.15	1.1
GMB-4 H_2O_2 9-23-81	530 ✓	25 ml		1.82	1.8
GMB-5 H_2O_2 9-23-81	575 ✓	25 ml		1.27	1.
GMB-6 H_2O_2 9-23-81	595 ✓	25 ml		1.85	1.8
GMB-7 H_2O_2 9-24-81	590 ✓	25 ml		1.30	1.
GMB-8 H_2O_2 9-24-81	550 ✓	25 ml		2.22	2.
GMB-9 H_2O_2 9-24-81	525 ✓	25 ml		2.15	2.

$$\text{mg/sample} = \frac{(32.03\ \text{mg/meq})\ (\text{Sample Titer} - \text{BL})\ (\text{N } BaCl_2)\ \text{vol soln}}{\text{vol. Aliquot}}$$

.0102

25

GMB-1	~~[illegible]~~	8.8
GMB-2	~~[illegible]~~	~~9.3~~ 9.1
GBM-3	~~[illegible]~~	8.3
GBM-4	~~[illegible]~~	12.4
GBM-5	~~[illegible]~~	9.3
GBM-6	~~[illegible]~~	14.2
GBM-7	~~[illegible]~~	9.5
GBM-8	~~[illegible]~~	15.8
GBM-9	~~[illegible]~~	14.4

Continued on Page

Read and Understood By

Carol Churchill — Signed

10-1-81 — Date

Signed

Date

Date Received: OCT 13 1981
Date Requested: OCT 19 1981
Requested By: McLean Office
Project Number: 8042.04

Analysis Results

Analysis Performed

Sample Identification	Cd µg/filter	Cu µg/filter	Cr µg/filter	Be µg/filter	Ni µg/filter	Zn µg/filter		Customer Sample no.
100201	8.87	4.03	<5.0	<0.5	<4.0	<0.5		R131/6237
100202	2.48	3.33	<5.0	<0.5	<4.0	<0.5		R137/6240
100203	0.73	<2.0	<5.0	<0.5	<4.0	<0.5		R137/6243
100204	<0.5	<2.0	<5.0	<0.5	<4.0	<0.5		R140

Performed by : Humbert Deriada

TABLE 1

Atomic Absorption Concentration Ranges[1]

	Direct Aspiration					Furnace Procedure[4,5]			
Metal	Detection Limit mg/l	Sensitivity mg/l	Optimum Concentration Range mg/l			Detection Limit ug/l	Optimum Concentration Range ug/l		
Aluminum	0.1	1	5	-	50	3	20	-	200
Antimony	0.2	0.5	1	-	40	3	20	-	300
Arsenic[2]	0.002	-	0.002	-	0.02	1	5	-	100
Barium(p)	0.1	0.4	1	-	20	2	10	-	200
Beryllium	0.005	0.025	0.05	-	2	0.2	1	-	30
Cadmium	0.005	0.025	0.05	-	2	0.1	0.5	-	10
Calcium	0.01	0.08	0.2	-	7	-	-		-
Chromium	0.05	0.25	0.5	-	10	1	5	-	100
Cobalt	0.05	0.2	0.5	-	5	1	5	-	100
Copper	0.02	0.1	0.2	-	5	1	5	-	100
Gold	0.1	0.25	0.5	-	20	1	5	-	100
Iridium(p)	3	8	20	-	500	30	100	-	1500
Iron	0.03	0.12	0.3	-	5	1	5	-	100
Lead	0.1	0.5	1	-	20	1	5	-	100
Magnesium	0.001	0.007	0.02	-	0.5	-	-		-
Manganese	0.01	0.05	0.1	-	3	0.2	1	-	30
Mercury[3]	0.0002	-	0.0002	-	0.01	-	-		-
Molybdenum(p)	0.1	0.4	1	-	40	1	3	-	60
Nickel(p)	0.04	0.15	0.3	-	5	1	5	-	100
Osmium	0.3	1	2	-	100	20	50	-	500
Palladium(p)	0.1	0.25	0.5	-	15	5	20	-	400
Platinum(p)	0.2	2	5	-	75	20	100	-	2000
Potassium	0.01	0.04	0.1	-	2	-	-		
Rhenium(p)	5	15	50	-	1000	200	500	-	5000
Rhodium(p)	0.05	0.3	1	-	30	5	20	-	400
Ruthenium	0.2	0.5	1	-	50	20	100	-	2000
Selenium[2]	0.002	-	0.002	-	0.02	2	5	-	100
Silver	0.01	0.06	0.1	-	4	0.2	1	-	25
Sodium	0.002	0.015	0.03	-	1	-	-		-
Thallium	0.1	0.5	1	-	20	1	5	-	100
Tin	0.8	4	10	-	300	5	20	-	300
Titanium (p)	0.4	2	5	-	100	10	50	-	500
Vanadium (p)	0.2	0.8	2	-	100	4	10	-	200
Zinc	0.005	0.02	0.05	-	1	0.05	0.2	-	4

(1) The concentrations shown are not contrived values and should be obtainable with any satisfactory atomic absorption spectrophotometer.
(2) Gaseous hydride method.
(3) Cold vapor technique.
(4) For furnace sensitivity values consult instrument operating manual.
(5) The listed furnace values are those expected when using a 20 *ul* injection and normal gas flow except in the case of arsenic and selenium where gas interrupt is used. The symbol (p) indicates the use of pyrolytic graphite with the furnace procedure.

APPENDIX E

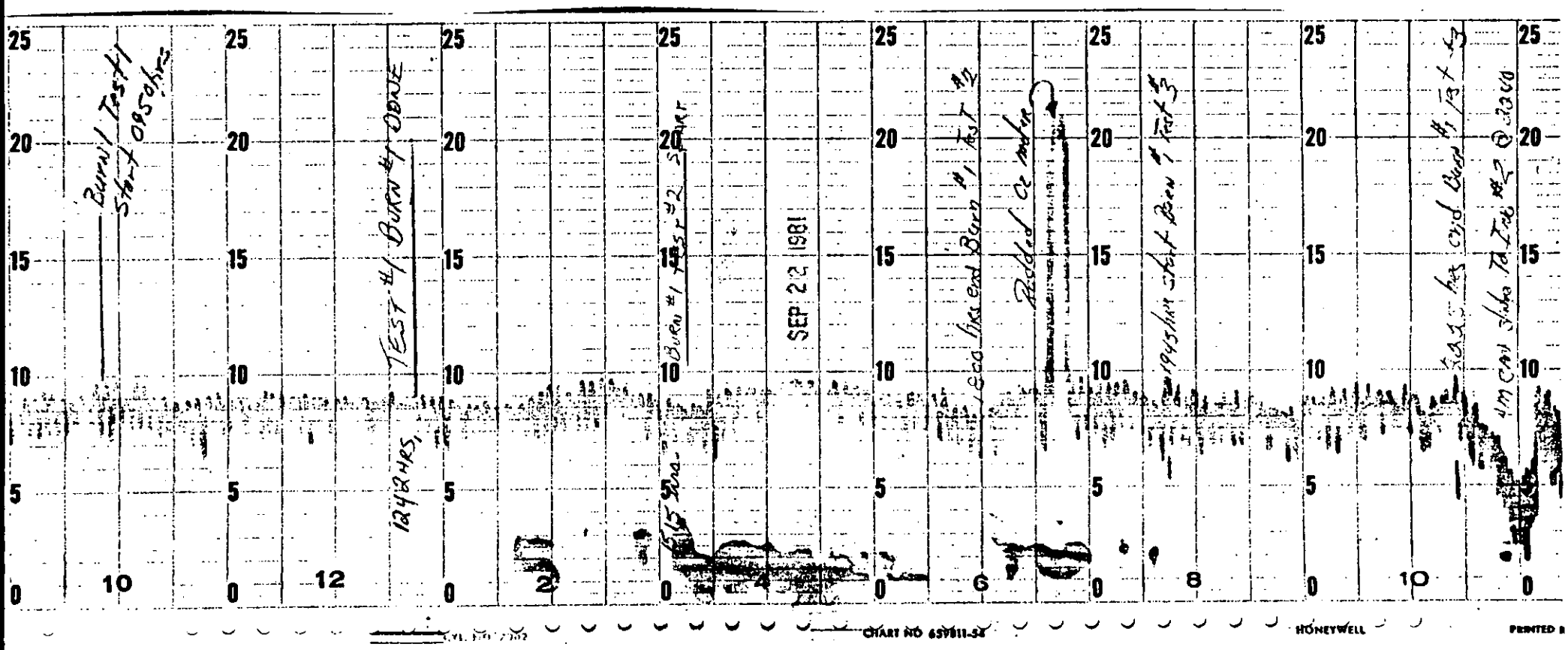
INCINERATOR PROCESS DATA

GBMSD

Incinerator #2

% O_2

9/22/81



GBMSD

Incinerator #2

% O_2

9/23/81

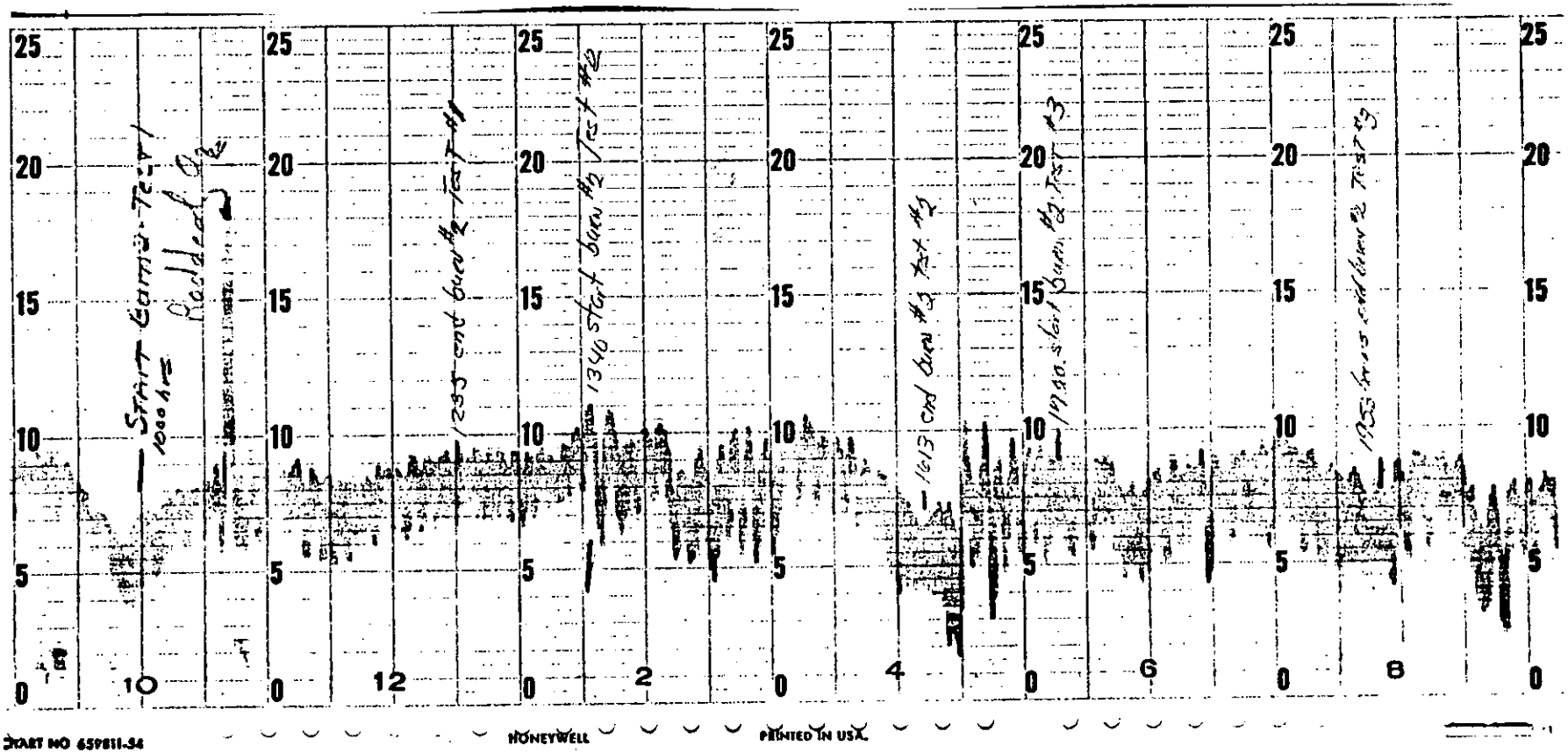


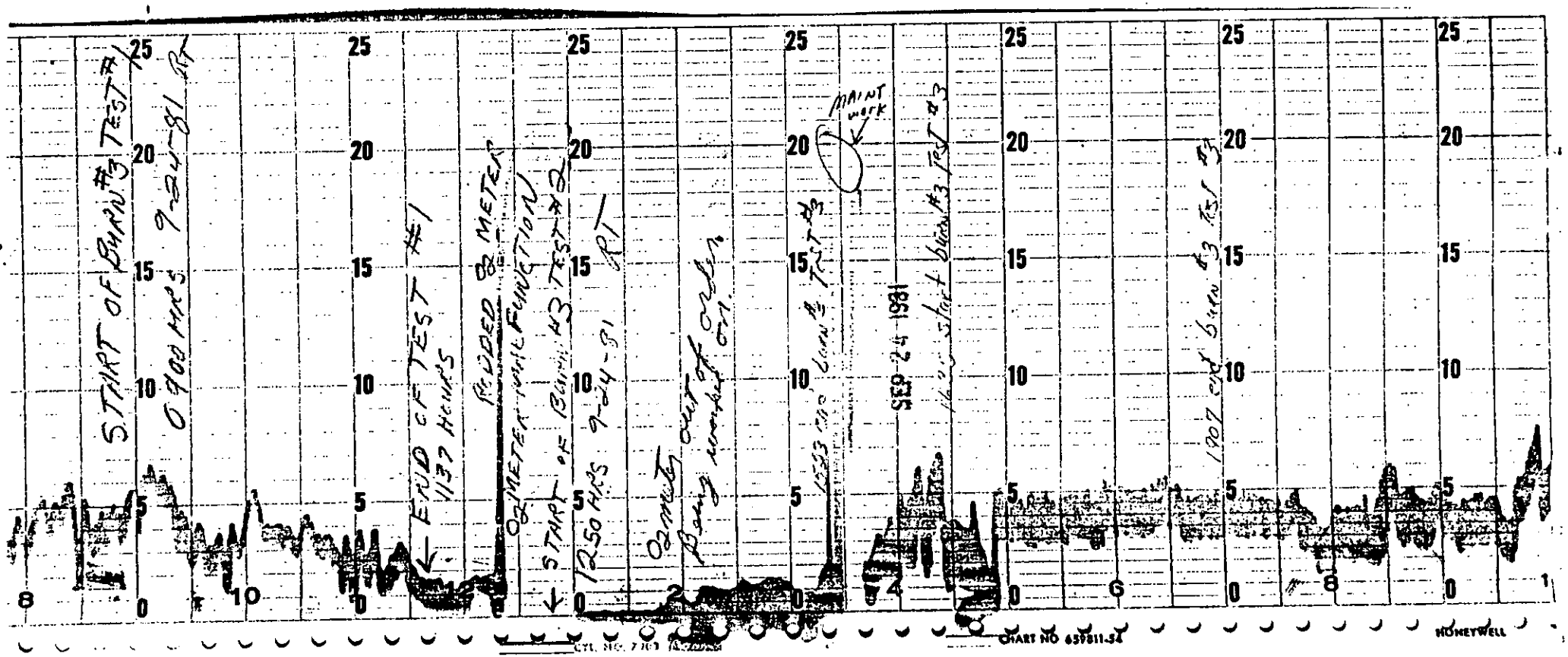
CHART NO 659811-54 HONEYWELL PRINTED IN USA

GBMSD

Incinerator #2

% O_2

9/24/81



4

SEP 22 1981

HUNDREDS OF DEGREES FAHRENHEIT

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

3

BURN #1 TEST #2 START @ 1515

2

HUNDREDS OF DEGREES FAHRENHEIT

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

1

1242 HRS.

BURN #1 TEST #1 DONE

HUNDREDS OF DEGREES FAHRENHEIT

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

12

NOON

9/22/81

11

HUNDREDS OF DEGREES FAHRENHEIT

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

10

START TEST #1

@ 0940 HRS

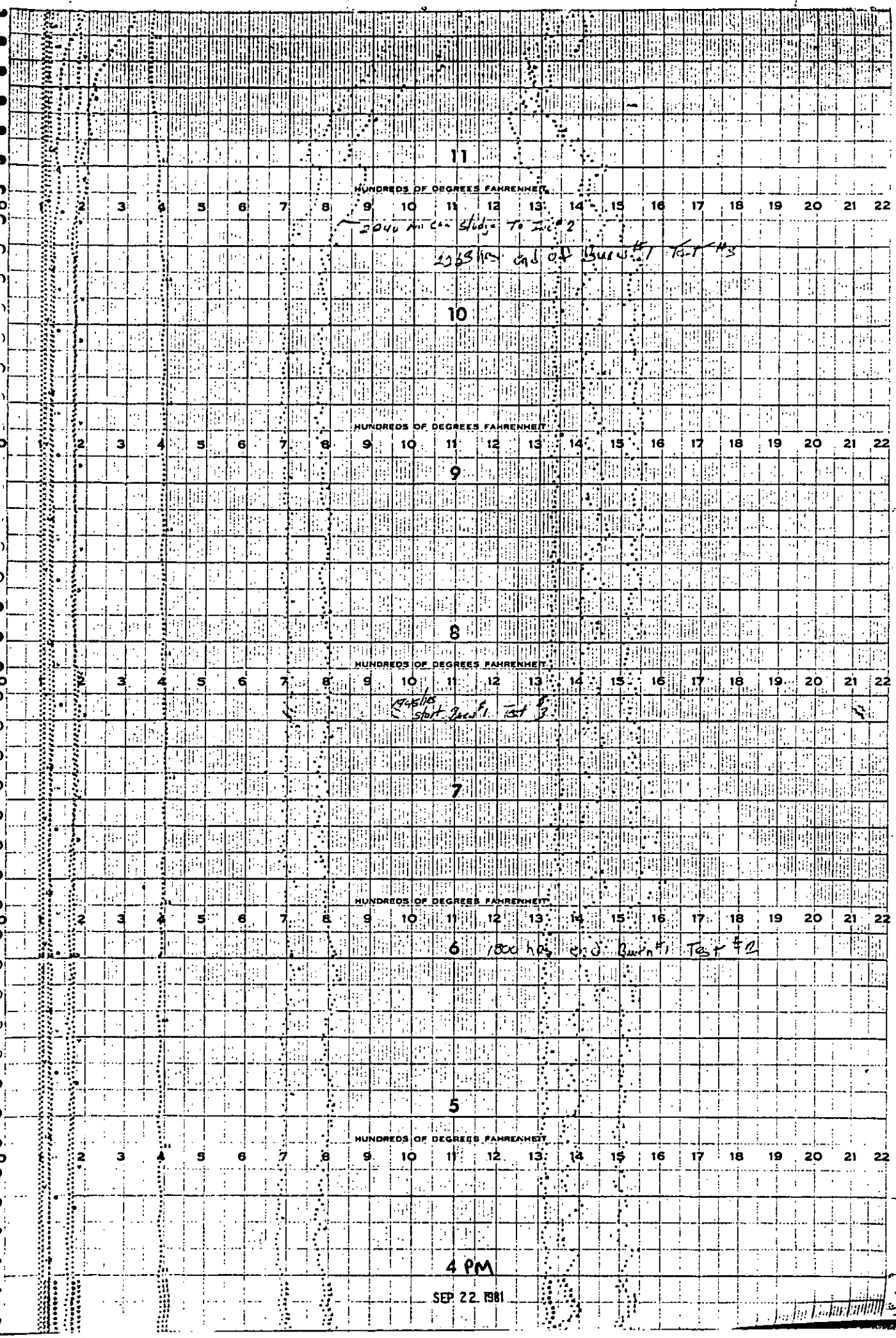
HUNDREDS OF DEGREES FAHRENHEIT

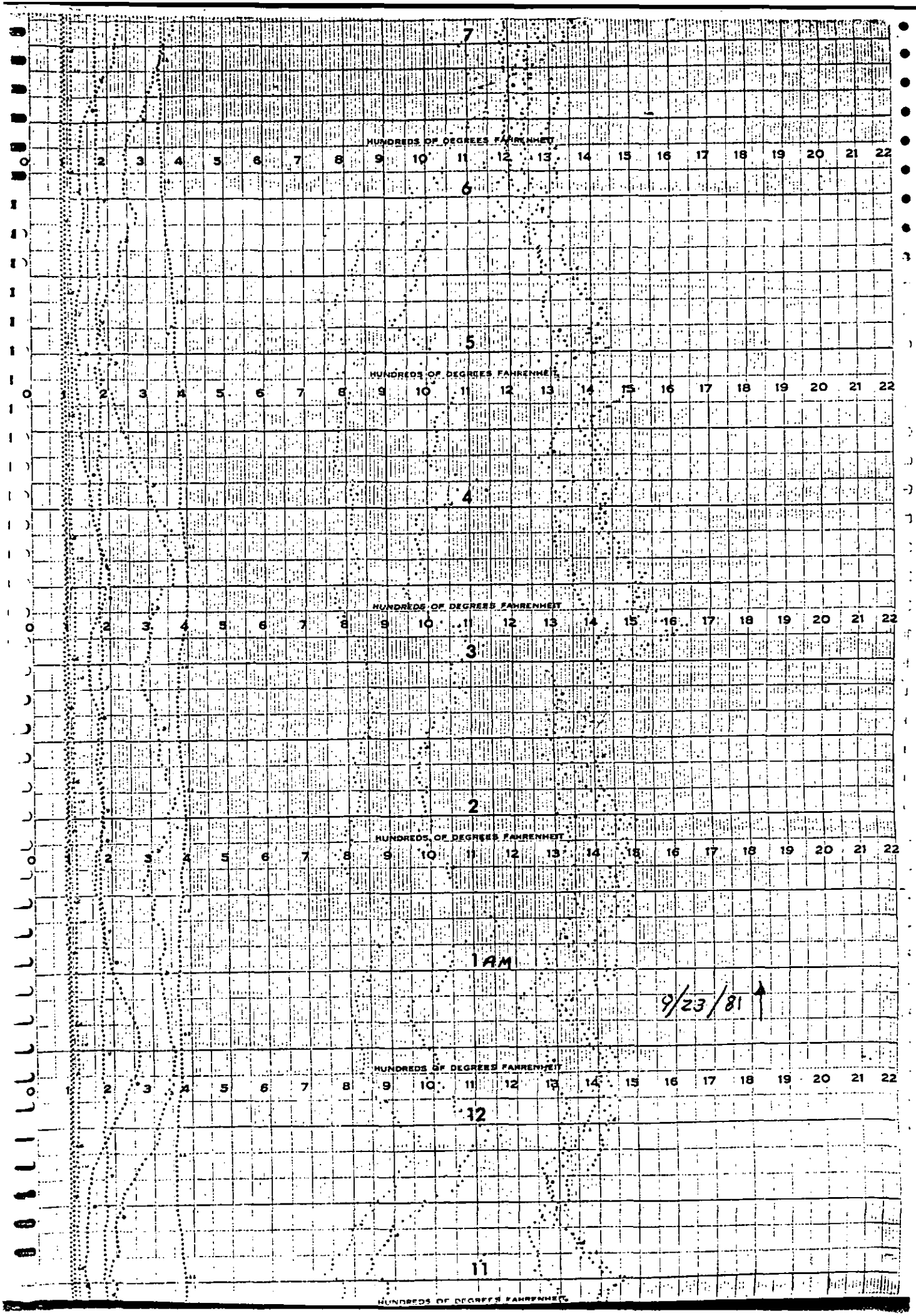
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

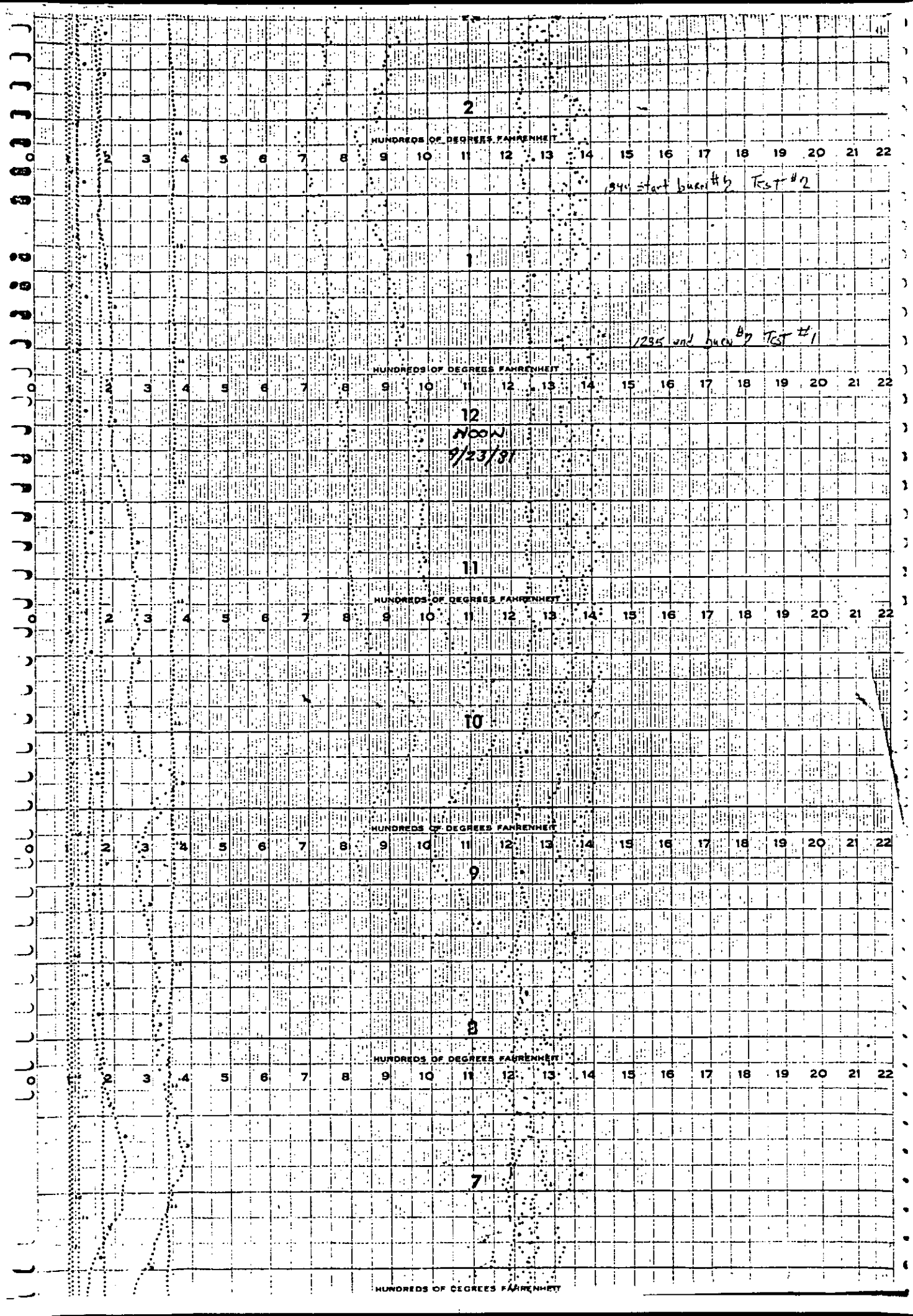
9

SEP 22 1981 SEP 22 1981 SEP 22 1981

RESET TO PROPER TIME


11
HUNDREDS OF DEGREES FAHRENHEIT
2040 hrs Can Sludge To Inc #2
2253 hrs end of Burn #1 Test #3
10
HUNDREDS OF DEGREES FAHRENHEIT
9
8
HUNDREDS OF DEGREES FAHRENHEIT
1945 hrs start Burn #1 Test #3
7
HUNDREDS OF DEGREES FAHRENHEIT
6
1800 hrs end Burn #1 Test #2
5
HUNDREDS OF DEGREES FAHRENHEIT
4 PM
SEP 22 1981


7
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
6
5
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
4
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
3
2
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
1AM
9/23/81
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
12
11
HUNDREDS OF DEGREES FAHRENHEIT


2
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
1345 start burn #2 Test #2
1
1235 end burn #1 Test #1
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
12
NOON
9/23/91
11
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
10
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
9
8
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
7
HUNDREDS OF DEGREES FAHRENHEIT

HUNDREDS OF DEGREES FAHRENHEIT

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

9

8

1953 end burn #3 Test #3

HUNDREDS OF DEGREES FAHRENHEIT

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

7

HUNDREDS OF DEGREES FAHRENHEIT

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

6

5

1720 Start burn #2 Test #3

HUNDREDS OF DEGREES FAHRENHEIT

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

4

1618 end burn #2 Test #2

HUNDREDS OF DEGREES FAHRENHEIT

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

3 PM

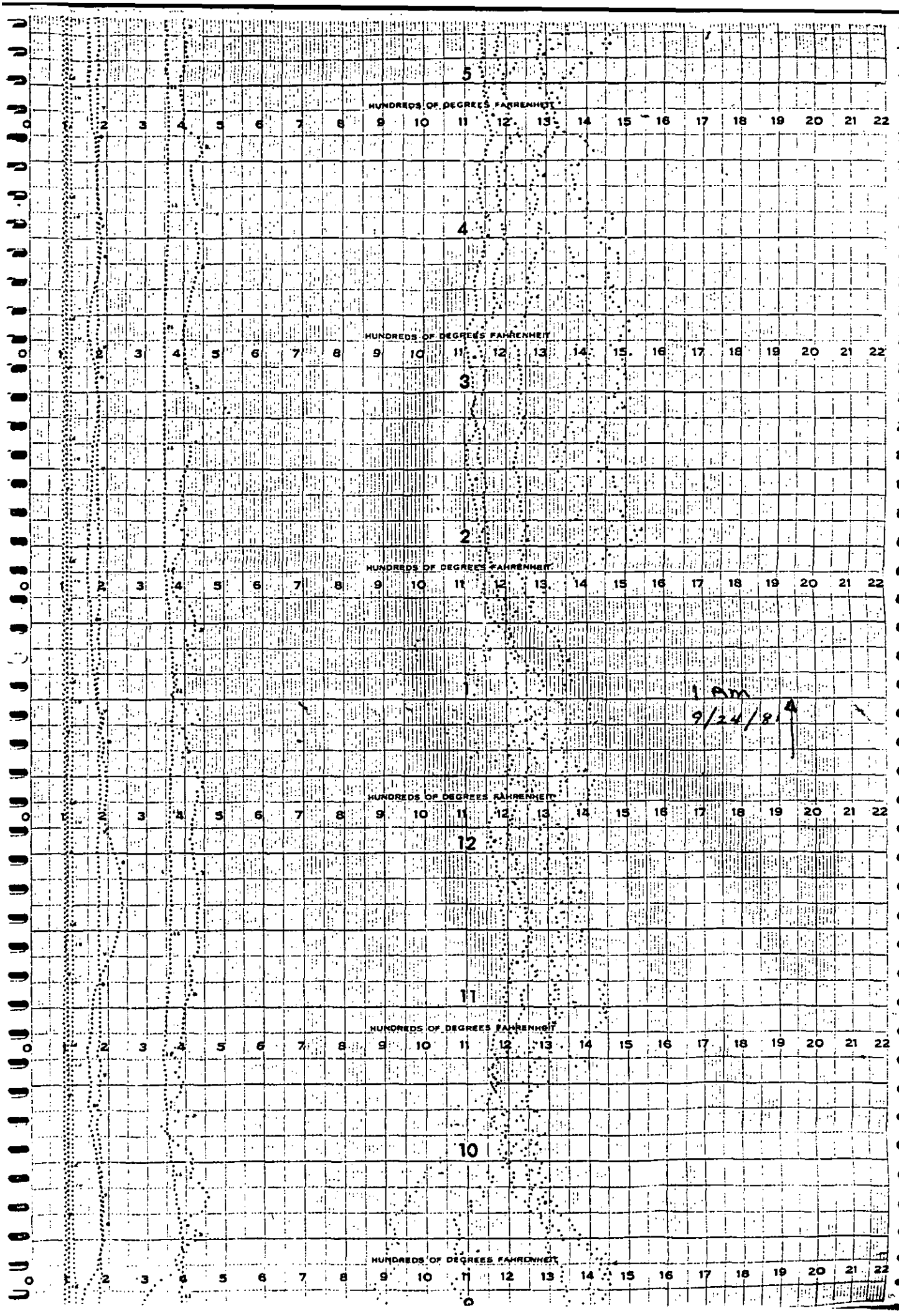
9/23/81

2

HUNDREDS OF DEGREES FAHRENHEIT

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

1340 Start burn #2 Test #2


5
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
4
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
3
2
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
1
1 AM
9/24/81
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
12
11
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
10
HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

START OF BURN #3 TEST #1 →
1250 HRS 9-24-81 RT

HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

12
NOON

9/24/81

END OF TEST #1 →
1437 HOURS

11

HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

10

HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

START OF BURN #3 TEST #1 → 9
0900 HRS 9-24-81

8

HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

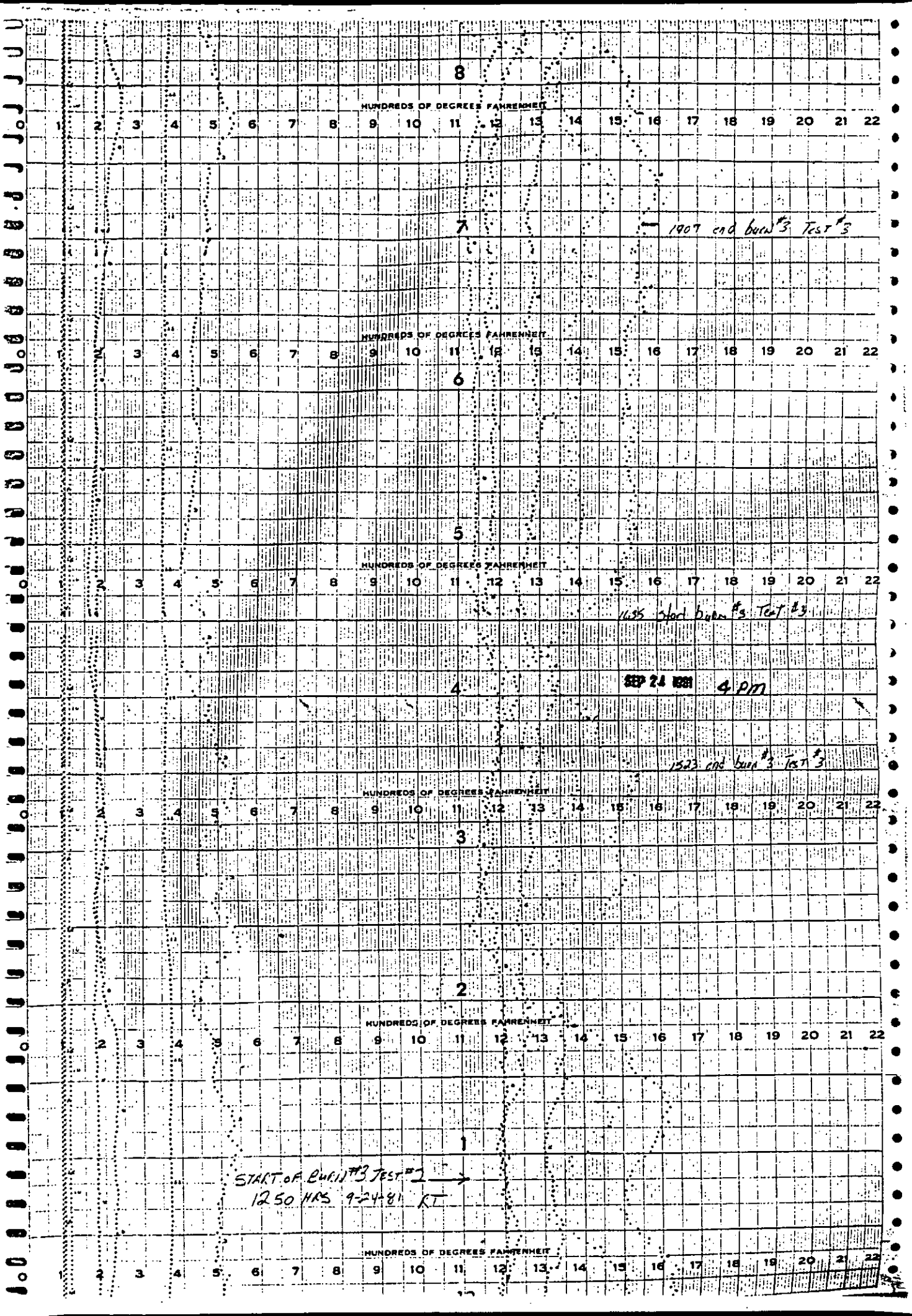
7

HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

6

5

HUNDREDS OF DEGREES FAHRENHEIT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

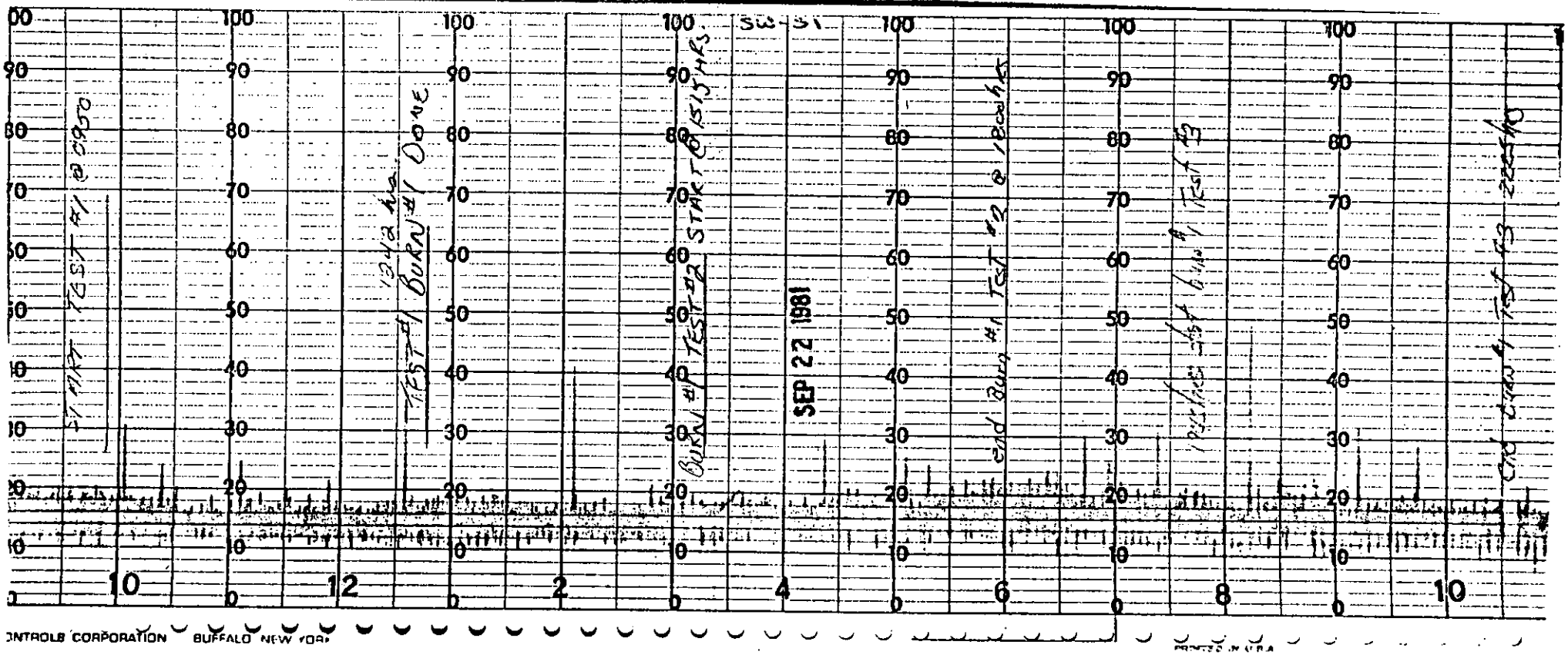

8
HUNDREDS OF DEGREES FAHRENHEIT
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
7
1907 end burn #3 Test #3
HUNDREDS OF DEGREES FAHRENHEIT
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
6
5
HUNDREDS OF DEGREES FAHRENHEIT
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
1635 start burn #3 Test #3
4
SEP 24 1981
4 PM
1523 end burn #3 Test #3
HUNDREDS OF DEGREES FAHRENHEIT
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
3
2
HUNDREDS OF DEGREES FAHRENHEIT
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
1
START OF BURN #3 TEST #2
1250 HRS 9-24-81 KT
HUNDREDS OF DEGREES FAHRENHEIT
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

GBMSD

Belt Scale - North (SW-S1)

0-36,000 LB/Hour Range of Scale

9/22/81



CONTROLS CORPORATION BUFFALO NEW YORK

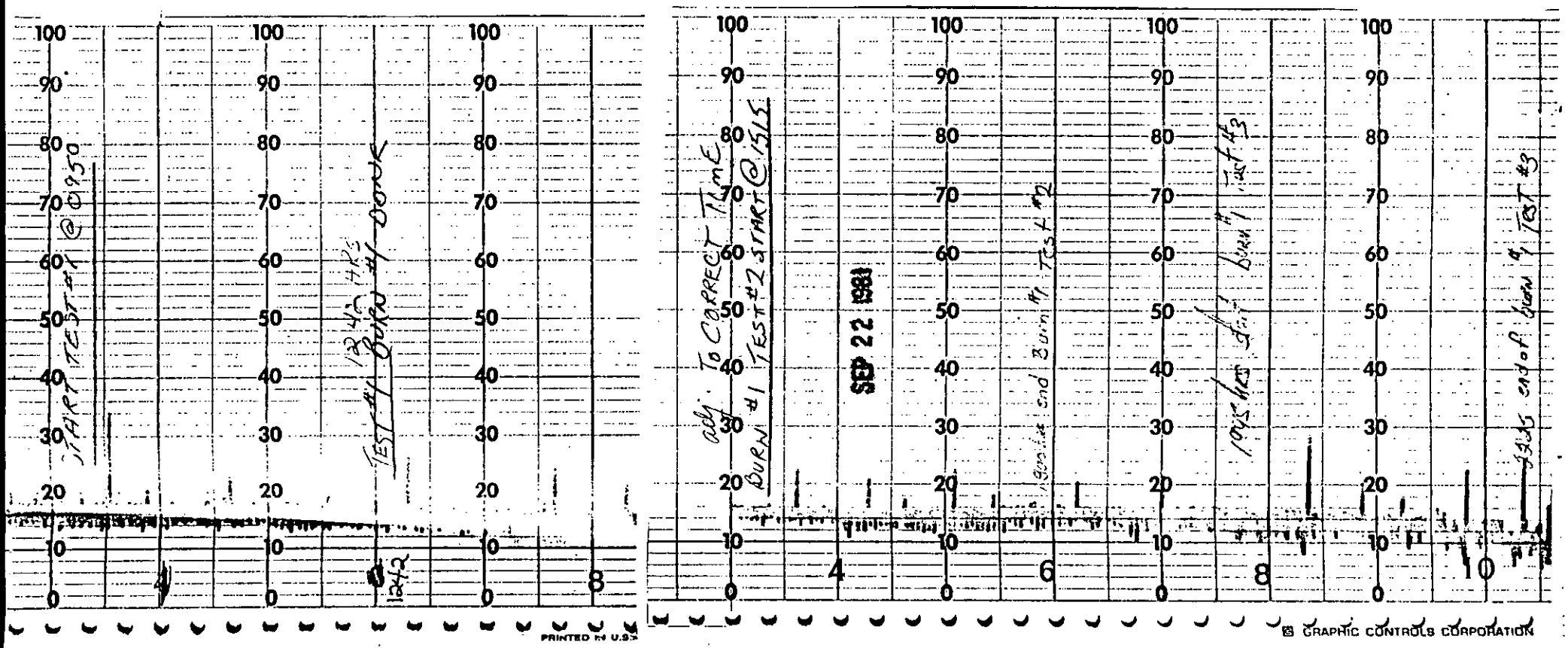
PRINTED IN U.S.A.

GBMSD

Belt Scale-South (SW-S2)

0-36,000 LB/hour Range of Scale

9/22/81

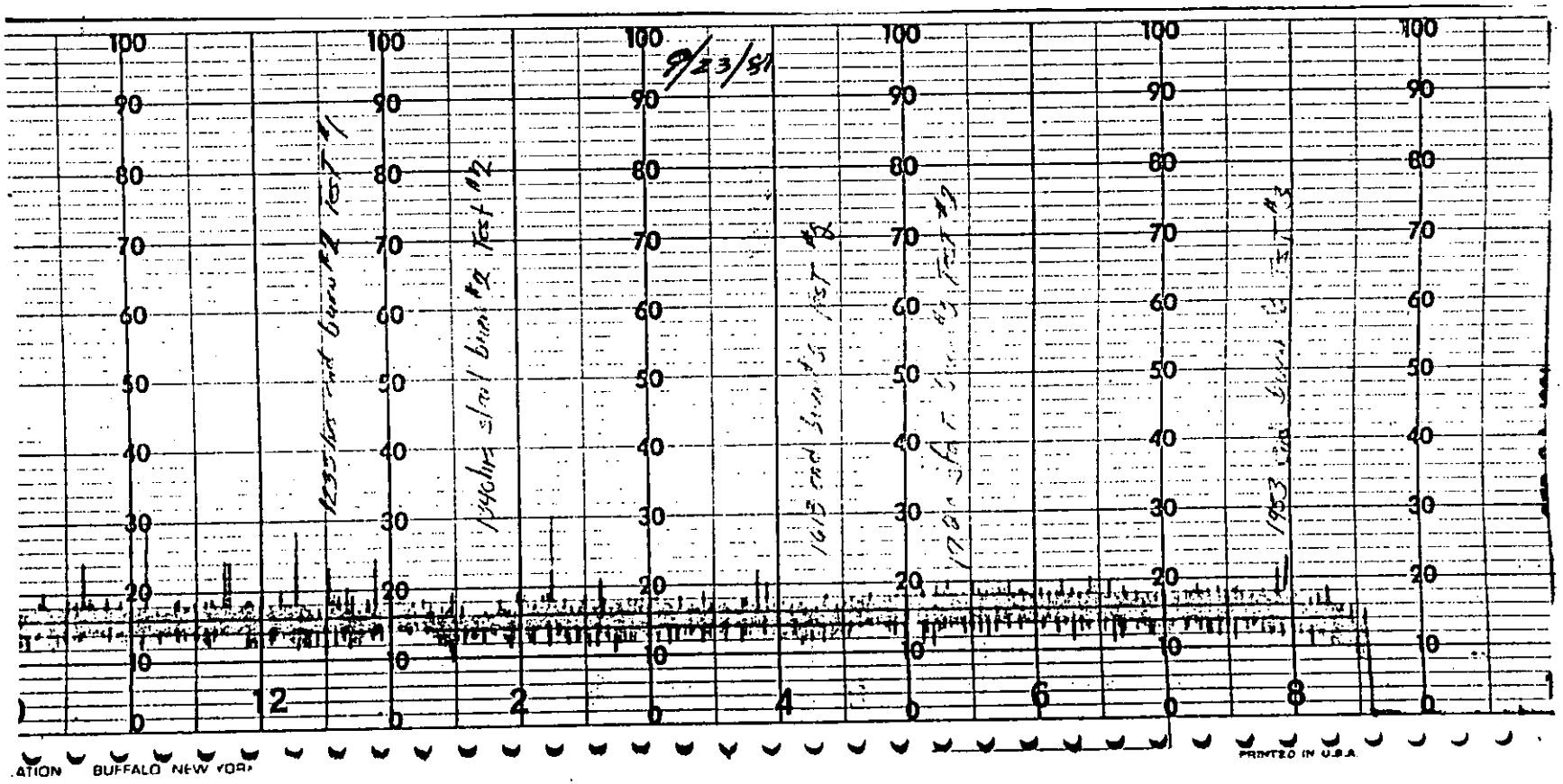


GBMSD

Belt Scale-North (SW-S1)

0-36,000 LB/Hour Range of Scale

9/23/81

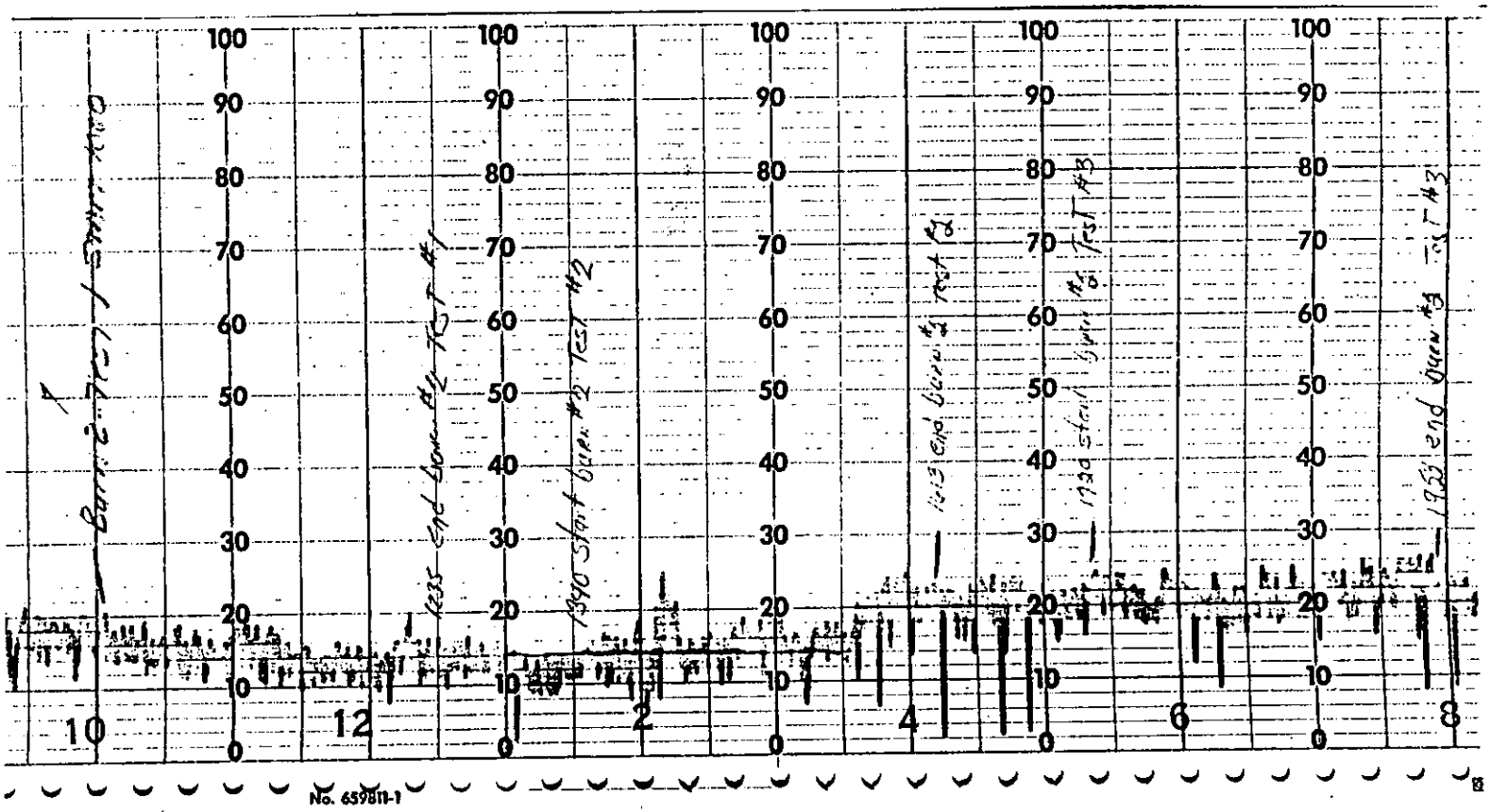


GBMSD

Belt Scale - South (SW-SZ)

0-36,000 LB/hour Range of Scale

9/23/81

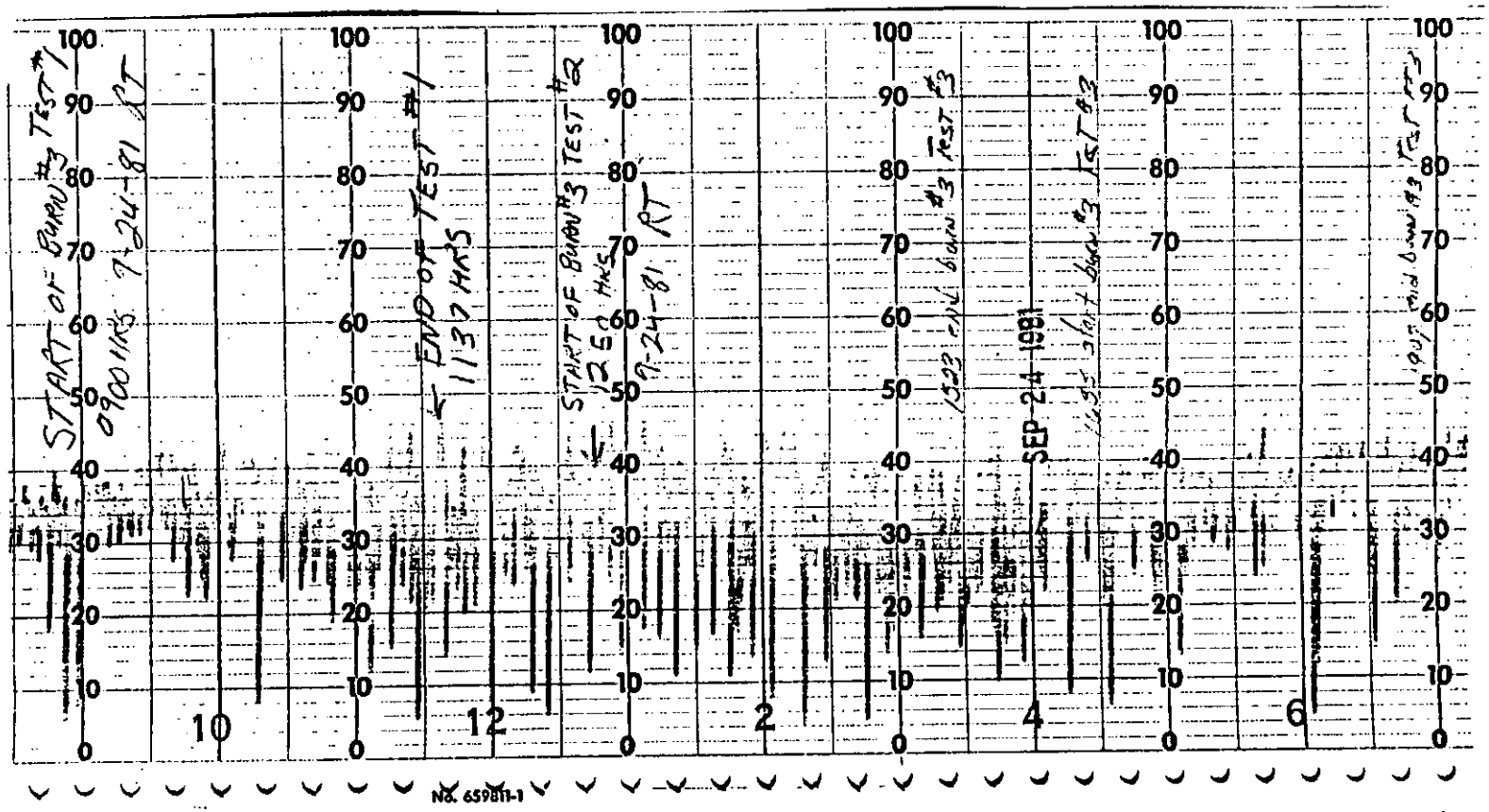


GBMSD

Belt Scale - South SW-32

0-36,000 LB/hour Range of Scale

9/24/81

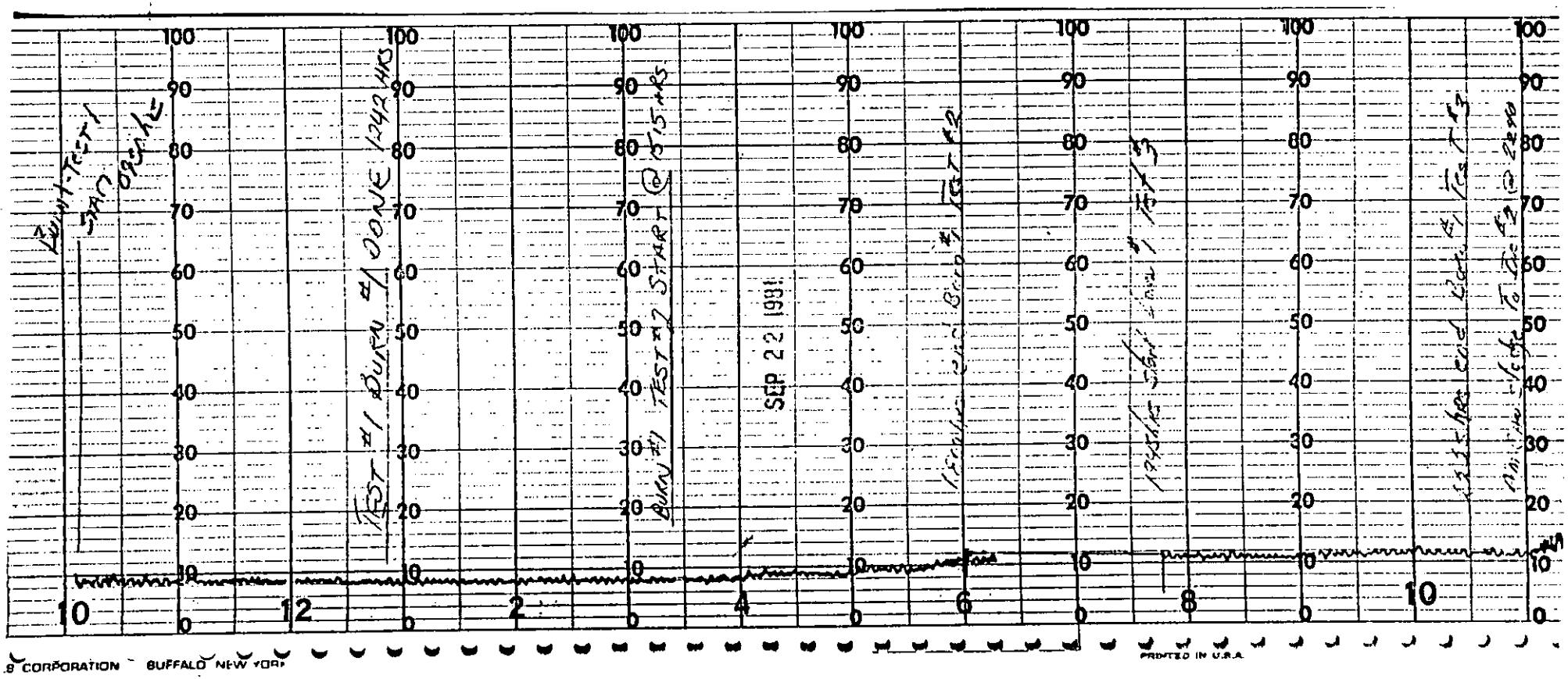


GBMSD

Incinerator #2

% Opacity

9/22/81



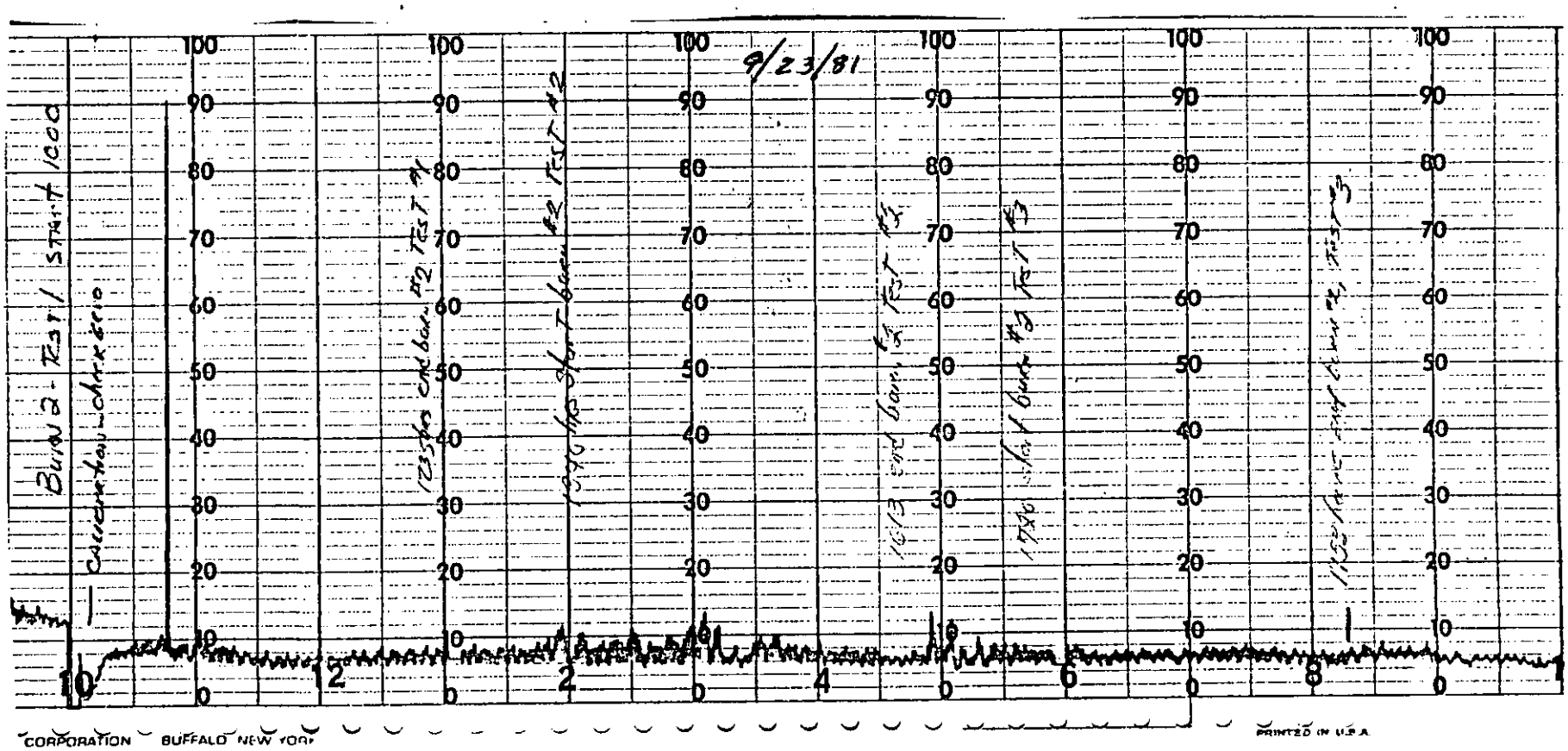
CORPORATION BUFFALO NEW YORK PRINTED IN U.S.A.

GBMSD

Incinerator #2

% Opacity

9/23/81



CORPORATION BUFFALO NEW YORK

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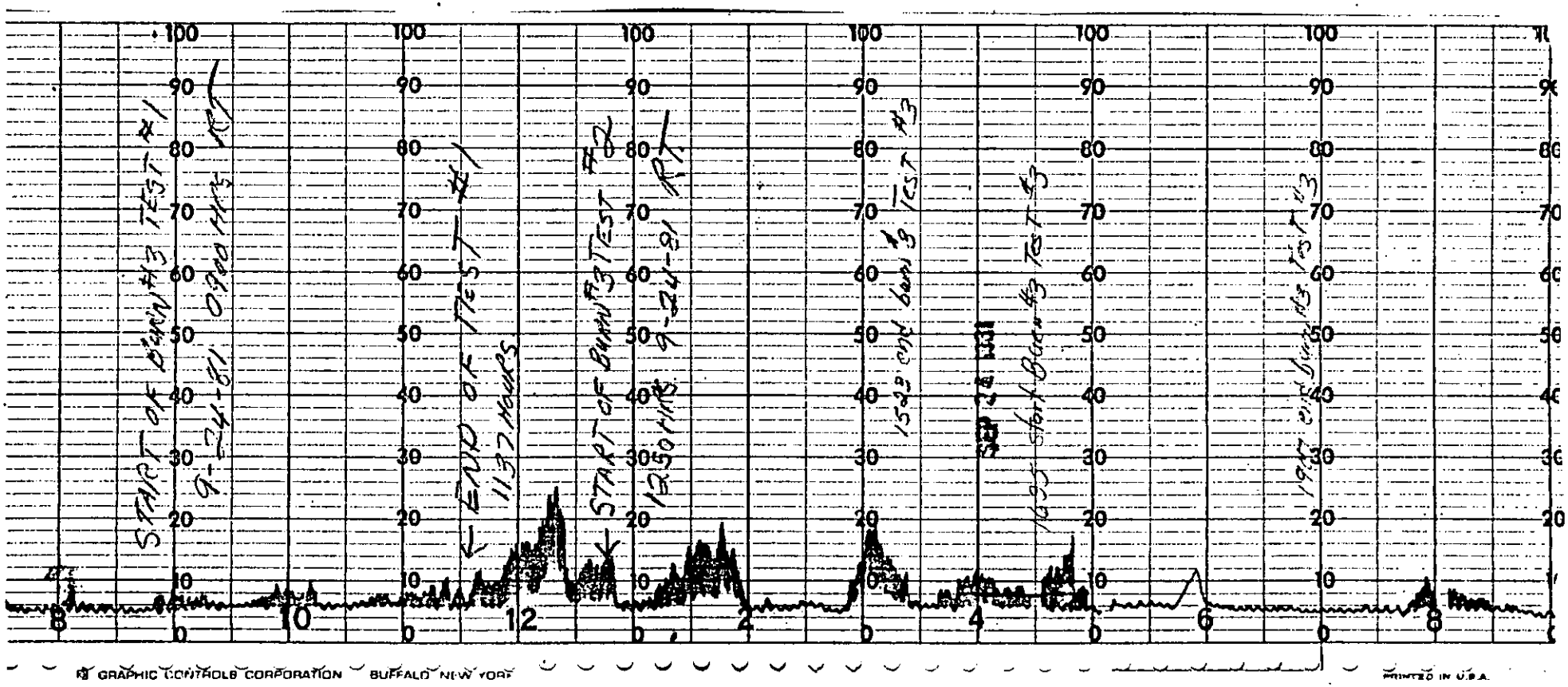
GBMSD

Incinerator #2

% Opacity

9/24/81



GRAPHIC CONTROLS CORPORATION BUFFALO NEW YORK

PRINTED IN U.S.A.

GREEN BAY METROPOLITAN
SEWERAGE DISTRICT

FILE NO. _____
DATE _____
BY _____
SHEET NO. _____ OF _____

SUBJECT _____

Incinerator Emissions Testing
Feed Sludge - Analytical Data

Date: 9-22-81

Burn # 1 Test # 1

Parameter	Metro	Am Can	Total
Wet LBS Feed	29,280	0	29,280
% Total Solids	39.3		
% Volatile Solids	71.1		
% Moisture	60.7		
Dry LBS Feed	11507		11507
Volatile LBS Feed	8181		8181
Water LBS Feed	17773		17773
Calorific Value Btu/LB Volatile	11653		
• Cadmium, Cd - ppm	33.80		
Copper, Cu - ppm	1137		
Chromium, Cr - ppm	1557		
Beryllium, Be - ppm	2.845		
Nickel, Ni - ppm	344.6		
Zinc, ZN - ppm	2751		
Mercury, Hg - ppm	0.3733		

• Heavy metals calculated on a [illegible] weight basis.

GREEN BAY METROPOLITAN
SEWERAGE DISTRICT

FILE NO. _____
DATE _____
BY _____
SHEET NO _____ OF _____

SUBJECT _____

Incinerator Emissions Testing
Feed Sludge - Analytical Data

Date: 9-22-81

Burn # 1 Test # 2

Parameter	Metro	Am Can	Total
Wet LBS Feed	27,908	0	27,908
% Total Solids	37.6		
% Volatile Solids	70.7		
% Moisture	62.4		
Dry LBS Feed	10493		10493
Volatile LBS Feed	7419		7419
Water LBS Feed	17415		17415
Calorific Value Btu/LB Volatile	11766		
• Cromium, Cd - ppm	32.63		
Copper, Cu - ppm	941.0		
Chromium, Cr - ppm	1486		
Beryllium, Be - ppm	3.429		
Nickel, Ni - ppm	344.1		
Zinc, ZN - ppm	2670		
Mercury, Hg - ppm	0.3429		

• Heavy metals calculated on a dry weight basis.

GREEN BAY METROPOLITAN
SEWERAGE DISTRICT

FILE NO. _____
DATE _____
BY _____
SHEET NO. _____ OF _____

SUBJECT _____

Incinerator Emissions Testing
Feed Sludge - Analytical Data

Date: 9-22-81

Burn # 1 Test # 3

Parameter	Metro	Am Can	Total
Wet LBS Feed	24,374	0	24,374
% Total Solids	38.6		
% Volatile Solids	70.2		
% Moisture	61.4		
Dry LBS Feed	9408		9408
Volatile LBS Feed	6604		6604
Water LBS Feed	14966		14966
Calorific Value Btu/LB Volatile	11767		
• Cromium, Cd - ppm	33.71		
Copper, Cu - ppm	745.5		
Chromium, Cr - ppm	1557		
Beryllium, Be - ppm	3.736		
Nickel, Ni - ppm	355.7		
Zinc, ZN - ppm	2737		
Mercury, Hg - ppm	0.2238		

• Heavy metals calculated on a dry volatile basis

GREEN BAY METROPOLITAN
SEWERAGE DISTRICT

FILE NO. _____
DATE _____
BY _____
SHEET NO. _____ OF _____

SUBJECT _____

Incinerator Emissions Testing
Feed Sludge - Analytical Data

Date: 9-23-81

Burn # 2 Test # 1

Parameter	Metro	Am Can	Total
Wet LBS Feed	15,184	10,968	26,152
% Total Solids	36.0	32.4	
% Volatile Solids	70.8	92.3	
% Moisture	64.0	67.6	
Dry LBS Feed	5466	3554	9020
Volatile LBS Feed	3870	3280	7150
Water LBS Feed	9718	7414	17132
Calorific Value Btu/LB Volatile	11615	7580	
• Cadmium, Cd - ppm	27.79	27.38	
Copper, Cu - ppm	826.4	466.7	
Chromium, Cr - ppm	1187	436.9	
Beryllium, Be - ppm	3.550	16.90	
Nickel, Ni - ppm	366.9	150.1	
Zinc, ZN - ppm	2818	715.6	
Mercury, Hg - ppm	0.3502	<.0002	

65.8 Avg

4.51 Tons

GREEN BAY METROPOLITAN
SEWERAGE DISTRICT

FILE NO. _____
DATE _____
BY _____
SHEET NO. _____ OF _____

SUBJECT _____

Incinerator Emissions Testing
Feed Sludge - Analytical Data

Date: 9-23-81

Burn # 2 Test # 2

Parameter	Metro	Am Can	Total
Wet LBS Feed	14288	12,216	26,504
% Total Solids	39.5	34.6	
% Volatile Solids	71.2	93.3	
% Moisture	60.5	62.95 65.4	
Dry LBS Feed	5644	4227	9871
Volatile LBS Feed	4019	3944	7963
Water LBS Feed	8644	7989	16633
Calorific Value Btu/LB Volatile	11606	7280	
* Cromium, Cd - ppm	23.83	14.72	
Copper, Cu - ppm	321.9	317.4	
Chromium, Cr - ppm	1341	244.6	
Beryllium, Be - ppm	4.707	31.81	
Nickel, Ni - ppm	369.3	109.0	
Zinc, ZN - ppm	2732	405.1	
Mercury, Hg - ppm	0.2964	<.0002	

* Heavy metals calculated on a dry weight basis

GREEN BAY METROPOLITAN
SEWERAGE DISTRICT

FILE NO. _____
DATE _____
BY _____
SHEET NO. _____ OF _____

SUBJECT _____

Incinerator Emissions Testing
Feed Sludge - Analytical Data

Date: 9-23-81

Burn # 2 Test # 3

Parameter	Metro	Am Can	Total
Wet LBS Feed	15,010	17,020	32,030
% Total Solids	38.9	33.7	
% Volatile Solids	70.+	92.+	
% Moisture	61.1	63.7 66.3	
Dry LBS Feed	5839	5736	11575
Volatile LBS Feed	4111	5300	9411
Water LBS Feed	9171	11284	20455
Calorific Value Btu/LB volatile	11030	7568	
* Cadmium, Cd - ppm	26.54	16.12	
Copper, Cu - ppm	726.6	387.2	
Chromium, Cr - ppm	1551	254.2	
Beryllium, Be - ppm	5.461	12.45	
Nickel, Ni - ppm	360.1	113.6	
Zinc, ZN - ppm	2222.3	443.6	
Mercury, Hg - ppm	0.3527	0.0092	

* Heavy metals calculated on a dry weight basis.

GREEN BAY METROPOLITAN
SEWERAGE DISTRICT

FILE NO. _____
DATE _____
BY _____
SHEET NO. _____ OF _____

SUBJECT _____

Incinerator Emissions Testing
Feed Sludge - Analytical Data

Date: 9/24/81

Burn # 3 Test # 1

Parameter	Metro	Am Can	Total
Wet LBS Feed	0	30,780	30780
% Total Solids		33.2	
% Volatile Solids		92.3	
% Moisture		66.8	
Dry LBS Feed		10219	10219
Volatile LBS Feed		9432	9432
Water LBS Feed		20561	20561
Calorific Value Btu/LB volatile		7390	
• Chromium, Cd - ppm		10.94	
Copper, Cu - ppm		283.1	
Chromium, Cr - ppm		209.6	
Beryllium, Be - ppm		9.009	
Nickel, Ni - ppm		21.39	
Zinc, ZN - ppm		357.6	
Mercury, Hg - ppm		0.0340	

• Heavy metals calculated on a dry weight basis

GREEN BAY METROPOLITAN
SEWERAGE DISTRICT

FILE NO. _____
DATE _____
BY _____
SHEET NO. _____ OF _____

SUBJECT _____

Incinerator Emissions Testing
Feed Sludge - Analytical Data

Date: 9/24/81

Burn # 3 Test # 2

Parameter	Metro	Am Can	Total
Wet LBS Feed	C	28240	28240
% Total Solids		32.0	
% Volatile Solids		92.0	
% Moisture		68.0	
Dry LBS Feed		9037	9037
Volatile LBS Feed		8314	8314
Water LBS Feed		19203	19203
Calorific Value Btu/LB Volatile		7462	
• Cromium, Cd - ppm		12.68	
Copper, Cu - ppm		277.7	
Chromium, Cr - ppm		219.0	
Beryllium, Be - ppm		10.44	
Nickel, Ni - ppm		76.11	
Zinc, ZN - ppm		427.0	
Mercury, Hg - ppm		0.0334	

• Heavy metals calculated on a dry weight basis.

GREEN BAY METROPOLITAN
SEWERAGE DISTRICT

FILE NO. _____
DATE _____
BY _____
SHEET NO. _____ OF _____

SUBJECT _____

Incinerator Emissions Testing
Feed Sludge - Analytical Data

Date: 9/24/81

Burn # 3 Test # 3

Parameter	Metro	Am Can	Total
Wet LBS Feed	0	30,150	30,150
% Total Solids		32.6	
% Volatile Solids		92.2	
% Moisture		67.4	
Dry LBS Feed		9829	9829
Volatile LBS Feed		9062	9062
Water LBS Feed		20321	20321
Calorific Value Btu/LB volatile		7528	
• Cromium, Cd - ppm		8.768	
Copper, Cu - ppm		250.0	
Chromium, Cr - ppm		259.6	
Beryllium, Be - ppm		10.83	
Nickel, Ni - ppm		79.44	
Zinc, ZN - ppm		386.3	
Mercury, Hg - ppm		0.0437	

• Heavy metals calculated on a dry weight basis.

SUMMARY

INCINERATOR FEED SLUDGES

EMISSIONS TESTING

Date	Test Title	Test Time Start	Test Time Stop	Incinerator Feed LBS Wet Metro	Incinerator Feed LBS Wet Am. Can	Incinerator Feed LBS Wet Total	Feed Rate LBS Wet/Hour Metro	Feed Rate LBS Wet/Hour Am. Can	Feed Rate LBS Wet/Hour Total
9/22/81	Burn 1 - Test 1	0950	1242	29,280	0	29,280	10,214	0	10,214
9/22/81	Burn 1 - Test 2	1515	1801	27,908	0	27,908	10,087	0	10,087
9/22/81	Burn 1 - Test 3	1945	2225	24,374	0	24,374	9,140	0	9,140
9/23/81	Burn 2 - Test 1	1000	1235	15,184	10,968	26,152	5,878	4,246	10,124
9/23/81	Burn 2 - Test 2	1340	1613	14,288	12,216	26,504	5,603	4,791	10,394
9/23/81	Burn 2 - Test 3	1720	1953	15,010	17,020	32,030	5,886	6,675	12,561
9/24/81	Burn 3 - Test 1	0900	1137	0	30,780	30,780	0	11,763	11,763
9/24/81	Burn 3 - Test 2	1250	1523	0	28,240	28,240	0	11,075	11,075
9/24/81	Burn 3 - Test 3	1635	1907	0	30,150	30,150	0	11,901	11,901