74-GRN-6 75052

(REPORT NUMBER)

AIR POLLUTION EMISSION TEST

KANSAS CITY TERMINAL ELEVATOR

(PLANT NAME)

Kansas City, Missouri

(PLANT ADDRESS)

U. S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Water Programs
Office of Air Quality Planning and Standards
Emission Standards and Engineering Division
Emission Measurement Branch
Research Triangle Park, N. C. 27711

Emission Testing Report

EMB Project No. 74-GRN-6

KANSAS CITY TERMINAL ELEVATOR

Kansas City, Missouri

Project Officer:

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Environmental Protection Agency
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

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APPENDICES

I. INTRODUCTION

In accordance with Section 111 of the Clean Air Act of 1970, the Environmental Protection Agency is charged with the establishment of performance standards for new installations or modifications of existing installations in stationary source categories which may contribute significantly to air pollution. A performance standard is a standard for emissions of air pollutants which reflects the best emission reduction systems that have been adequately demonstrated, taking into account economic considerations.

The development of realistic performance standards requires that representative data for pollutant emissions be supported by testing the various existing source categories. In the grain milling and handling industry, the emissions control systems (baghouses) of the Kansas City Terminal Elevator Company, Kansas City, Missouri, were designated by EPA as representing well-controlled grain handling emission collectors. These baghouses were therefore selected for the emission testing program. This report presents the results of the testing which was performed at the Kansas City installation.

The Kansas City Terminal Elevator Company purchases grain from nearby farms and smaller country elevators. The grain is graded, cleaned and stored before being sold to processing facilities. Emissions from the grain elevator are controlled by two separate control systems. One system associated with the cleaning operation which removes impurities and foreign matter from the grain while the other system collects fugitive dust emissions from the railcar loading operation. The exhaust gases from each control system are directed to separate baghouse collectors and then passed outward to the atmosphere through induced draft fans.

Modifications of the test sites were required before conducting the testing program. A sixty foot duct extension was installed on the exhaust outlet of the grain cleaner baghouse and a twenty foot duct extension was added to the exhaust output of the loading operations baghouse.

Testing at the grain cleaning baghouse included the determination of filterable and total particulate matter using EPA sampling Methods 1, 2, and 5. The detailed procedures for these methods may be found in the Standards of Performance for New Stationary Sources, Federal Register, Vol. 36, No. 247, December 23, 1971. Tests at the loading operation included the determination of filterable and total particulate matter and particle size measurements using a Brinks Cascade Impactor. Each particulate test was designed to measure average emission rates during specified process operations.

During the week of October 16, 1973, Midwest Research Institute collected three particulate samples and one particle size sample at the outlet of the loading operation baghouse along with one particulate sample from the grain cleaning baghouse outlet. Three particulate tests were planned along with one particle size test at each of the two control system baghouses. Problems occurred with plant operating schedules and at the end of the week only three particulate tests had been obtained at the loading collector and only a segment of one test at the cleaner collector, however, this segment was later completed during the week of October 22, 1973. A single particle size sample was collected at the loading baghouse but did not yield any results due to the extremely low grain loadings. Visible emissions of process and fugitive dust discharges were observed on October 16 through 19, 1973, and the results are reported in Appendix B. The particulate and particle size samples were returned to the MRI laboratories in Kansas City, Missouri for analysis and evaluation.

SUMMARY AND DISCUSSION OF RESULTS

Tables I and II summarize the results of the particulate sampling at the railcar loading and grain cleaning baghouse collectors. Additional data are presented in the Appendices to this report. Gas temperatures, moistures and velocities appeared relatively uniform during the testing periods. The cumulative results from each of the runs are reasonably consistent, particularly for this type of process.

Railcar Loading Operation

Tables I and IA contain the stack gas and particulate emission data for the railcar loading tests. Average particulate emissions for the three runs indicate negligible variations between the individual test results.

Two values are reported for the particulate concentrations and emissions. The value designated as "partial" represents the particulate collected in the front half of the sampling train, namely, the probe and filter. The "total" value is the amount of particulate collected in the entire train, which includes the front half plus the particulate collected in the impingers. The particulate collected in the impingers amounted to an average of 35% of the total particulate collected for the three tests. Isokinetic sampling rates ranged between 103 and 106.

The average "front" particulate concentration for the three tests was 0.00781 grains per dry standard cubic foot and the average emission rate was 0.34 pounds per hour. Averaging the results for the "total" particulate indicates a concentration of 0.0125 grains per dry standard cubic foot

TABLE I
Summary of Results for
Grain Loading Operations

PLANT: KANSAS CITY TERMINAL ELEVATOR
LOCATION: KANSAS CITY MISSOURI
OPERATOR: MIDWEST RESEARCH INSTITUTE

PARTICULATE SUMMARY IN ENGLISH UNITS

DESCRIPTION	UNITS	1	2	3	AVERAGE
DATE OF RUN		10-16-73	10-17-73	10-17-73	
STACK AREA	FT2	1.187	1.187	1.187	
NET TIME OF RUN	MIN	160.0	160.0	160.0	
BAROMETRIC PRESSURE	IN.HG	29.66	29.58	29.53	
AVG ORIFICE PRES DROP	IN.H2O	0.670	0.465	0.455	
VOL DRY GAS-METER COND	DCF	72.79	61.46	59.28	
AVG GAS METER TEMP	DEG.F	72.0	79.0	81.0	
VOL DRY GAS-STD COND	DSCF	71.99	59.80	57.37	
TOTAL H2O COLLECTED	ML	12.1	9.9	12.3	
VOL H2O VAPOR-STD COND	SCF	0.57	0.47	0.58	
PERCENT MOISTURE BY VOL		0.8	0.8	1.0	
MOLE FRACTION DRY GAS		0.992	0.992	0.990	
PERCENT CO2 BY VOL, DRY		0.4	0.4	0.4	
PERCENT O2 BY VOL, DRY		21.0	21.0	21.0	
PERCENT CO BY VOL, DRY		0.0	0.0	0.0	
PERCENT N2 BY VOL, DRY		78.6	78.6	78.6	
MOLECULAR WT-DRY STK GAS		28.90	28.90	28.90	
MOLECULAR WT-STK GAS		28.82	28.82	28.79	
AVG STACK TEMPERATURE	DEG.F	65.0	75.0	80.0	
NET SAMPLING POINTS		1	1	1	
STACK PRESSURE, ABSOLUTE	IN.HG	29.70	29.62	29.57	
AVG STACK GAS VELOCITY	FPS	86.180	71.124	69.970	75.758
STK FLOWRATE, DRY,STD CN	DSCFM	6099.	4926.	4782.	5269.
ACTUAL STACK FLOWRATE	ACFM	6136.	5064.	4982.	5394.
PERCENT ISOKINETIC		102.7	105.7	104.4	104.3
PARTICULATE WT-PARTIAL	MG	19.20	32.00	41.30	30.83
PARTICULATE WT-TOTAL	MG	26.10	54.80	66.90	49.27
PERC IMPINGER CATCH		26.4	41.6	38.3	35.4
PART. LOAD-PTL,STD CN	GR/DSCF	0.00411	0.00824	0.01109	0.00781
PART. LOAD-TTL,STD CN	GR/DSCF	0.00558	0.01411	0.01796	0.01255
PART. LOAD-PTL,STK CN	GR/ACF	0.00408	0.00801	0.01064	0.00758
PART. LOAD-TTL,STK CN	GR/ACF	0.00555	0.01372	0.01723	0.01217
PARTIC EMIS-PARTIAL	LB/HR	0.21	0.35	0.45	0.34
PARTIC EMIS-TOTAL	LB/HR	0.29	0.60	0.74	0.54
PART EMIS/WT PRD FD PTL	LB/TON	0.00061	0.00112	0.00098	0.00091
PART EMIS/WT PRD FD TTL	LB/TON	0.00084	0.00193	0.00158	0.00145

TABLE I-A
Summary of Results for
Grain Loading Operations

PLANT: KANSAS CITY TERMINAL ELEVATOR
LOCATION: KANSAS CITY MISSOURI
OPERATOR: MIDWEST RESEARCH INSTITUTE

PARTICULATE SUMMARY IN METRIC UNITS

DESCRIPTION	UNITS	1	2	3	AVERAGE
DATE OF RUN		10-16-73	10-17-73	10-17-73	
STACK AREA	M2	0.110	0.110	0.110	
NET TIME OF RUN	MIN	160.0	160.0	160.0	
BAROMETRIC PRESSURE	MM.HG	753.36	751.33	750.06	
AVG ORIFICE PRES DROP	MM.H20	17.018	11.811	11.557	
VOL DRY GAS-METER COND	DM3	2.06	1.74	1.68	
AVG GAS METER TEMP	DEG.C	22.2	26.1	27.2	
VOL DRY GAS-STD COND	DNM3	2.04	1.69	1.62	
TOTAL H20 COLLECTED	ML	12.1	9.9	12.3	
VOL H20 VAPOR-STD COND	NM3	0.02	0.01	0.02	
PERCENT MOISTURE BY VOL		0.8	0.8	1.0	
MOLE FRACTION DRY GAS		0.992	0.992	0.990	
PERCENT CO2 BY VOL, DRY		0.4	0.4	0.4	
PERCENT O2 BY VOL, DRY		21.0	21.0	21.0	
PERCENT CO BY VOL, DRY		0.0	0.0	0.0	
PERCENT N2 BY VOL, DRY		78.6	78.6	78.6	
MOLECULAR WT-DRY STK GAS		28.90	28.90	28.90	
MOLECULAR WT-STK GAS		28.82	28.82	28.79	
AVG STACK TEMPERATURE	DEG.C	18.3	23.9	26.7	
NET SAMPLING POINTS		1	1	1	
STACK PRESSURE, ABSOLUTE	MM.HG	754.38	752.35	751.08	
AVG STACK GAS VELOCITY	M/S	26.268	21.679	21.327	23.091
STK FLOWRATE, DRY,STD CN	DNM3/M	173.	139.	135.	149.
ACTUAL STACK FLOWRATE	AM3/M	174.	143.	141.	153.
PERCENT ISOKINETIC		102.7	105.7	104.4	104.3
PARTICULATE WT-PARTIAL	MG	19.20	32.00	41.30	30.83
PARTICULATE WT-TOTAL	MG	26.10	54.80	66.90	49.27
PERC IMPINGER CATCH		26.4	41.6	38.3	35.4
PART. LOAD-PTL,STD CN	MG/NM3	9.40	18.86	25.37	17.88
PART. LOAD-TTL,STD CN	MG/NM3	12.78	32.29	41.10	28.72
PART. LOAD-PTL,STK CN	MG/AM3	9.34	18.34	24.34	17.34
PART. LOAD-TTL,STK CN	MG/AM3	12.69	31.40	39.43	27.84
PARTIC EMIS-PARTIAL	KG/HR	0.10	0.16	0.21	0.15
PARTIC EMIS-TOTAL	KG/HR	0.13	0.27	0.33	0.25
PART EMIS/WT PRD FD PTL	KG/MTON	0.00031	0.00056	0.00049	0.00045
PART EMIS/WT PRD FD TTL	KG/MTON	0.00042	0.00096	0.00079	0.00072

and an emission rate of 0.54 pounds per hour. No major testing problems occurred during sampling although brief delays were experienced due to exchanging railcars at the loading spout. Further detailed information pertaining to the sampling and analytical procedures used during the testing is presented in Section VI, "Sampling and Analytical Procedures." Observations of the railcar loading collection system during the testing indicated that emissions were controlled adequately. Visible emissions of fugitive dust from the loading area did not exceed 20% opacity for more than three minutes per hour.

Grain Cleaning Operation

Due to limited plant operation, only one test was conducted at this site. The results for this test are presented in Tables II and IIA. Sampling was carried out intermittently over a period of several days, however, the test results are considered to be representative of the grain cleaning process.

Since the air entering both collection systems experiences no change (i.e., combustion) an assumption of atmospheric properties (air) was made for the calculations.

During the sample analysis volumetric measurements of the solvent blanks and sample washes were not recorded prior to evaporation, as a result the quantity of wash solvent could not be determined exactly. MRI offered to retest the facility at their expense to correct this error. An attempted retest during the week of January 28, 1974, proved futile as only half of the required number of grain cars needed for the test were available thus preventing the collection of representative samples.

TABLE II
Summary of Results for
Grain Cleaning Operations

PLANT: KANSAS CITY TERMINAL ELEVATOR
LOCATION: KANSAS CITY MISSOURI
OPERATOR: MIDWEST RESEARCH INSTITUTE

PARTICULATE SUMMARY IN ENGLISH UNITS

DESCRIPTION	UNITS	1	AVERAGE
DATE OF RUN		10-16-73 10-23-73	
STACK AREA	FT2	2.182	
NET TIME OF RUN	MIN	105.0	
BAROMETRIC PRESSURE	IN.HG	29.70	
AVG ORIFICE PRES DROP	IN.H2O	1.170	
VOL DRY GAS-METER COND	DCF	61.29	
AVG GAS METER TEMP	DEG.F	74.0	
VOL DRY GAS-STD COND	DSCF	60.55	
TOTAL H2O COLLECTED	ML	29.5	
VOL H2O VAPOR-STD COND	SCF	1.40	
PERCENT MOISTURE BY VOL		2.3	
MOLE FRACTION DRY GAS		0.977	
PERCENT CO2 BY VOL, DRY		0.4	
PERCENT O2 BY VOL, DRY		21.0	
PERCENT CO BY VOL, DRY		0.0	
PERCENT N2 BY VOL, DRY		78.6	
MOLECULAR WT-DRY STK GAS		28.90	
MOLECULAR WT-STK GAS		28.66	
AVG STACK TEMPERATURE	DEG.F	59.0	
NET SAMPLING POINTS		1	
STACK PRESSURE, ABSOLUTE	IN.HG	29.74	
AVG STACK GAS VELOCITY	FPS	29.467	29.467
STK FLOWRATE, DRY,STD CN	DSCFM	3826.	3826.
ACTUAL STACK FLOWRATE	ACFM	3857.	3857.
PERCENT ISOKINETIC		96.5	96.5
PARTICULATE WT-PARTIAL	MG	10.90	10.90
PARTICULATE WT-TOTAL	MG	15.60	15.60
PERC IMPINGER CATCH		30.1	30.1
PART. LOAD-PTL,STD CN	GR/DSCF	0.00277	0.00277
PART. LOAD-TTL,STD CN	GR/DSCF	0.00397	0.00397
PART. LOAD-PTL,STK CN	GR/ACF	0.00275	0.00275
PART. LOAD-TTL,STK CN	GR/ACF	0.00393	0.00393
PARTIC EMIS-PARTIAL	LB/HR	0.09	0.09
PARTIC EMIS-TOTAL	LB/HR	0.13	0.13
PART EMIS/WT PRD FD PTL	LB/TON	0.00325	0.00325
PART EMIS/WT PRD FD TTL	LB/TON	0.00465	0.00465

TABLE II-A
Summary of Results for
Grain Cleaning Operations

PLANT: KANSAS CITY TERMINAL ELEVATOR
LOCATION: KANSAS CITY MISSOURI
OPERATOR: MIDWEST RESEARCH INSTITUTE

PARTICULATE SUMMARY IN METRIC UNITS

DESCRIPTION	UNITS	1	AVERAGE
DATE OF RUN		10-16-73 10-23-73	
STACK AREA	M2	0.203	
NET TIME OF RUN	MIN	105.0	
BAROMETRIC PRESSURE	MM.HG	754.38	
AVG ORIFICE PRES DROP	MM.H2O	29.718	
VOL DRY GAS-METER COND	DM3	1.74	
AVG GAS METER TEMP	DEG.C	23.3	
VOL DRY GAS-STD COND	DNM3	1.71	
TOTAL H2O COLLECTED	ML	29.5	
VOL H2O VAPOR-STD COND	NM3	0.04	
PERCENT MOISTURE BY VOL		2.3	
MOLE FRACTION DRY GAS		0.977	
PERCENT CO2 BY VOL, DRY		0.4	
PERCENT O2 BY VOL, DRY		21.0	
PERCENT CO BY VOL, DRY		0.0	
PERCENT N2 BY VOL, DRY		78.6	
MOLECULAR WT-DRY STK GAS		28.90	
MOLECULAR WT-STK GAS		28.66	
AVG STACK TEMPERATURE	DEG.C	15.0	
NET SAMPLING POINTS		1	
STACK PRESSURE, ABSOLUTE	MM.HG	755.40	
AVG STACK GAS VELOCITY	M/S	8.982	8.982
STK FLOWRATE, DRY,STD CN	DNM3/M	108.	108.
ACTUAL STACK FLOWRATE	AM3/M	109.	109.
PERCENT ISOKINETIC		96.5	96.5
PARTICULATE WT-PARTIAL	MG	10.90	10.90
PARTICULATE WT-TOTAL	MG	15.60	15.60
PERC IMPINGER CATCH		30.1	30.1
PART. LOAD-PTL,STD CN	MG/NM3	6.34	6.34
PART. LOAD-TTL,STD CN	MG/NM3	9.08	9.08
PART. LOAD-PTL,STK CN	MG/AM3	6.29	6.29
PART. LOAD-TTL,STK CN	MG/AM3	9.00	9.00
PARTIC EMIS-PARTIAL	KG/HR	0.04	0.04
PARTIC EMIS-TOTAL	KG/HR	0.06	0.06
PART EMIS/WT PRD FD PTL	KG/MTON	0.00162	0.00162
PART EMIS/WT PRD FD TTL	KG/MTON	0.00232	0.00232

Consultations with MRI personnel and Gene Riley of EMB produced the conclusion that acceptable test results could be obtained from the initial tests. This was achieved by calculating the average level of particulate residue in the acetone blanks (0.001 grams/100 milliliters) and estimating the volume of acetone from past experience to determine the sample residue values.

PROCESS DESCRIPTION

The Kansas City Terminal Elevator Company purchases corn, soybeans, wheat and milo from nearby farms and elevators. They are subsequently sold to a variety of users and shipped primarily by railcar to the desired destination.

When an order of soybeans or corn is received, several grades with different percentages of foreign material are blended to obtain the grade desired for shipping. Before corn is shipped, it may be necessary to clean a portion of it to reduce the percentage of foreign material to the desired level.

The grains are transported from their unloading points to scales in the headhouse where they are weighed. They drop from the scale into a surge bin which continuously feeds one of two parallel loading chutes. The grain then falls about 50 feet down the loading chute into a railcar. The loading area is covered by an overhead shed which is open at both ends.

Railcar Loading

Boxcars and hopper cars are loaded on the same track through separate loading chutes. The last 10 feet of the hopper car loading chute is a round flexible hose enabling the flow of grain to be directed into the car. Filling is started at one end of the car and continued while the car is moved forward until it is full (190,000 pounds of grain).

A dust aspiration hood is located next to the loading spout. Fugitive dust which boils out of the openings at the top of the car is aspirated to a fabric filter baghouse. A "grain door" of wood or reinforced paper is installed over the bottom half of the side openings in the boxcars. The loading chute protrudes into the top portion of the door opening and has a deflector on the end to direct the grain to both ends of the car.

An aspirator hood is located next to the track to collect any fugitive dust that escapes from the car door. This dust stream is then directed to the same baghouse that is used for the top-loading railcars.

Baghouse for Railcar Loading: "Mikro Pul"
Model 4858-20
4,000 cfm
ΔP across filter 3.5" water gauge
16 ounce polypropylene bags
A/C ratio 12:1

Grain Cleaning

Foreign materials are separated from the corn as they are routed by three inclined cleaning screens. The maximum operating capacity of the grain cleaner is 1000 bushels of corn per hour. The top of the cleaner is enclosed thus allowing the air to be aspirated through a fabric filter baghouse.

Baghouse for Grain Cleaning: "Mikro Pul"
Model 130S8-30
12,000 cfm
ΔP across filter 3.5" water gauge
16 ounce polypropylene bags
A/C ratio 12:1

PROCESS OPERATION

Emission tests at the car loading filter exhaust were conducted October 16-19, 1973. The process cycle was timed before testing began. While filling hopper cars, grain flowed for five minutes, flow discontinued for about two minutes while the scales weighed a second draught, then grain flowed for another five minutes. Boxcars required only one draught of grain from the scales, therefore, grain flowed into each car for about five minutes. No boxcars were loaded during the first two test runs, but five were loaded during the third run.

The hopper car dust collection hood is most effective when loading center-hatch cars. The hood cannot be clamped to the car, however, since the car is moved during the loading process. While the last three feet of the hopper car are being filled, the hood is not over the car, therefore, it is ineffective. When loading round hatch type hopper cars all of the hatches are opened before the car enters the loading shed. Dust boils out of the openings that grain is not flowing into. This hood is also not very effective since it is in the center of the car and not directly over any openings. Currently, few round hatch-type cars are used for transporting grains.

Railcar Loading

During the first test 10 hopper cars were loaded. One car was filled with 200,000 pounds of wheat, three cars were filled with 554,000 pounds of corn and six cars were filled with 1,110,000 pounds of milo. Sampling was discontinued during the lull between cars.

After each car was filled, readings of the amount of dust weighed by the automatic weigher were recorded to determine the amount of dust collected.

Visible emissions of fugitive dust from the loading shed were read continuously between 9:45 a.m. and 12:00 noon and between 12:53 p.m. and 1:43 p.m. Visible emissions exceeded 20 percent opacity for approximately 15 minutes between 12:53 p.m. and 1:43 p.m. This was due to an increase in wind velocity and the fact that several round hatch type cars were being loaded.

During the second test run, nine hopper cars were loaded with 1,650,000 pounds of milo. Visible emissions of fugitive dust from the loading shed were read continuously between 11:00 a.m. and 12:00 noon. Visible emissions did not exceed 20 percent opacity for more than three minutes during the hour. The filter outlet was observed continuously from 10:14 a.m. to 10:43 a.m., from 12:45 p.m. to 1:44 p.m., and from 2:15 p.m. to 3:14 p.m. No visible emissions were seen throughout this time.

During the third test run, seven hopper cars were filled with 1,300,000 pounds of milo, seven boxcars and two hopper cars were filled with 1,000,000 pounds of wheat and one hopper car was filled with 180,000 pounds of soybeans. The filter outlet was observed continuously for one hour during the test and no visible emissions were seen. Visible emissions of fugitive dust from the loading shed were read continuously between 1:28 p.m. and 2:34 p.m. on October 18 and between 9:32 a.m. and 10:19 a.m. on October 19, 1973.

Visible emissions exceeded ten percent opacity for less than three minutes during each of the two periods. The following table summarizes the railcar loading data for the individual test runs.

TABLE III. RAILCAR LOADING PROCESS DATA

Test Run	Grain	Avg. Test Weight lb/bu	Average % Moisture	Average % FM[1]	Amount Shipped (lb.)
#1-B	Wheat	61.0	13.4	0.5	200,000
	2Y Corn	57.0	13.6	3.2	554,000
	2Y Milo	55.4	14.2	6.0	1,110,000
				TOTAL	1,864,000
#2-B	2Y Milo	55.9	13.5	7.0	1,650,000
#3-B	2Y Milo	55.7	14.0	6.0	1,300,000
	Wheat	61.0	13.4	0.5	1,000,000
	Soybeans	56.5	14.0	2.4	180,000
				TOTAL	2,480,000

(1) Foreign matter

Grain Cleaning

The grain cleaner was operated for about one hour between 9:30 a.m. and 10:30 a.m. on October 16, 1973. Sampling was conducted during this period. The cleaner was not operated again until October 23, 1973. At that time, MRI sampled at the filter outlet for about 45 minutes. Both sample periods were added together and considered as one test run. The following table presents the operating process data for the individual test runs.

TABLE IV. PROCESS FEED RATES DURING TESTS

Date	Test	Feed Rate
10-16-73	Grain loading	349.5 tons per hour
10-17-73	Grain loading	309.4 tons per hour
10-18-73	Grain loading	465 tons per hour
10-19-73	Grain loading	465 tons per hour
10-16-73	Grain cleaning	28 tons per hour
10-23-73	Grain cleaning	28 tons per hour

LOCATION OF SAMPLE PORTS

Grain Loading Baghouse

In order to meet the requirements of Method 1, Federal Register, Vol. 36, No. 247, it was necessary to install a duct extension on the exhaust outlet of the grain loading baghouse as shown in Figure 1. This located the port approximately 11 feet (9 stack diameters) downstream from the nearest disturbance and approximately 30 inches (2 stack diameters) from the exit end of the extension.

The sample port location for conducting the particle size measurements was two stack diameters upstream from the particulate sampling port on the grain loading baghouse outlet duct.

Grain Cleaning Baghouse

Sample location requirements for this control device were satisfied by the installation of a duct extension on the exhaust outlet. The resulting sample port was located approximately 15 feet (9 stack diameters) downstream of the nearest disturbance and approximately 40 inches (2 stack diameters) upstream from the extension exit end as shown in Figure 2.

Traverse point locations and duct cross sections are shown in Figure 3.

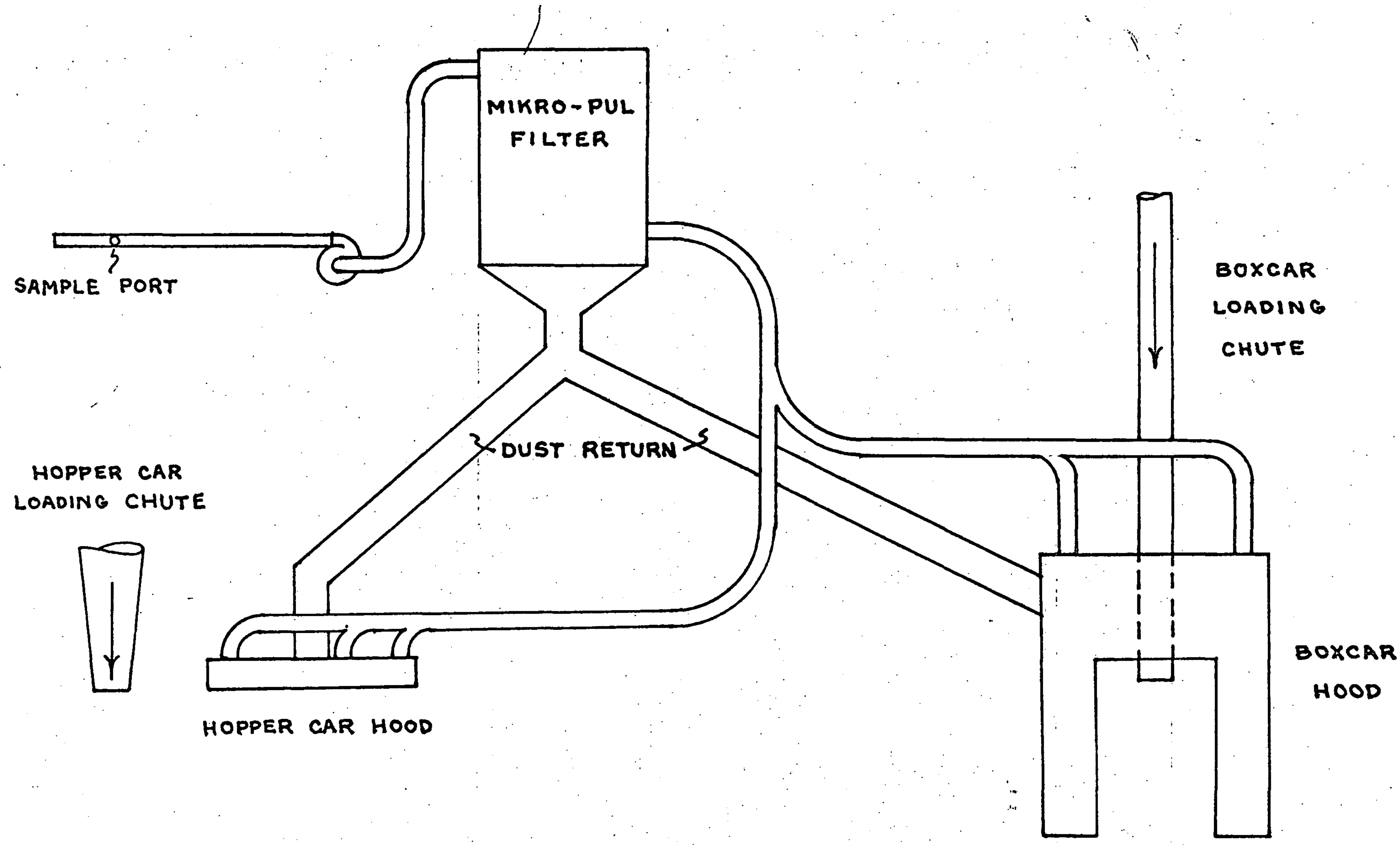


FIG. 1_ CAR LOADING - KANSAS CITY TERMINAL ELEVATOR

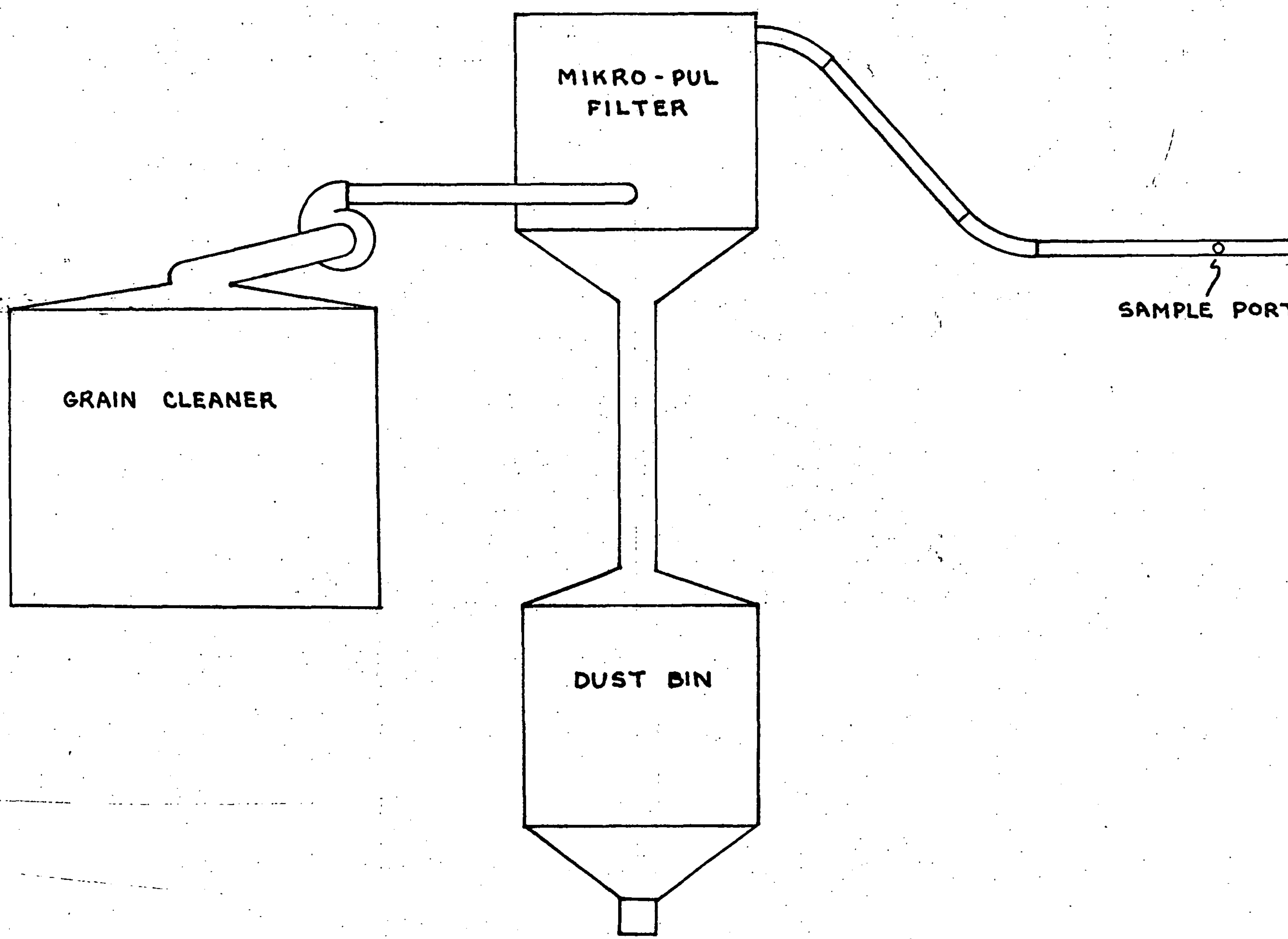
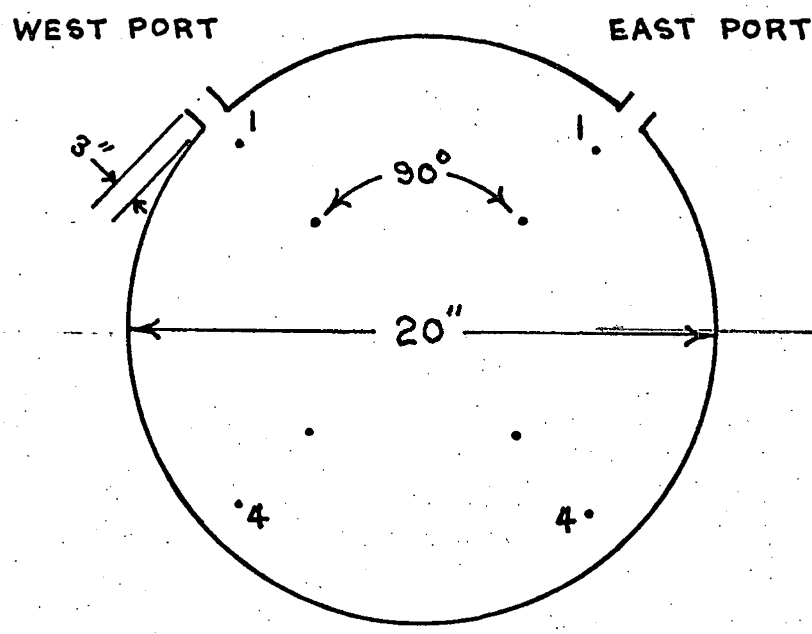
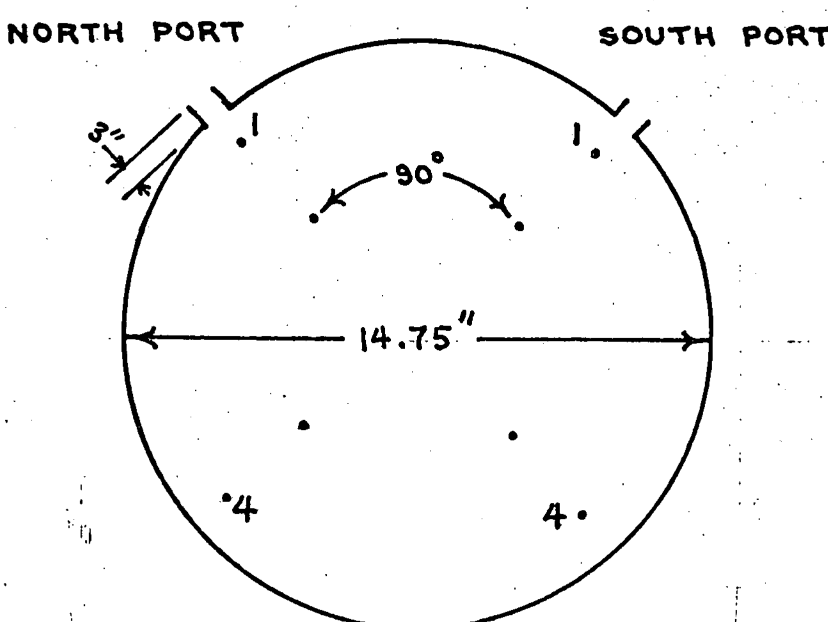


FIG. 2_ GRAIN CLEANING-KANSAS CITY TERMINAL ELEVATOR

FIG. 3_ SAMPLE TRAVERSE POINTS



GRAIN CLEANING DUCT



GRAIN LOADING DUCT

SAMPLING AND ANALYTICAL PROCEDURES

The procedures for measuring particulate emissions were in accordance with Method 5 of the Federal Register, Vol. 36, No. 247. Contractor personnel conducted all testing, sample recovery and sample analysis. The sampling crew consisted of two meter and two probe operators, one Brinks sample operator and a field laboratory technician.

Preliminary Testing Procedures

Preliminary velocity traverses at sampling locations determined approximate nozzle sizes and isokinetic sampling conditions. A 0.125 inch I.D. nozzle was used for the grain loading testing and a 0.25 inch I.D. nozzle was used for the grain cleaning testing. Velocities were measured at each sample port for determination of flow rates as prescribed in the Federal Register. The moisture content and molecular weight of the gas stream were assumed to be the same as ambient air.

Particulate Sampling

Particulate matter was sampled isokinetically during the grain loading and cleaning operations with a sample train as described in Method 5 of the Federal Register. The loading baghouse sampling was conducted for 20 minutes at each point with data being recorded at 5 minute intervals. The cleaning baghouse sampling was conducted for 15 minutes at each point with data being recorded every 5 minutes. In all cases sampling was conducted isokinetically during the test periods.

Sample Train Description

The sample train consisted of a stainless steel nozzle, a heated glass probe, a heated glass fiber filter, and four impingers connected in series with glass ball joint fittings. The first two impingers were charged with 100 milliliters of water each, the third was left empty and the fourth charged with approximately 200 grams of preweighed silica gel. (See Figure 4.)

Sample Cleanup and Analysis

Sample train cleanup consisted of measuring the water collected and transferring this to a glass container. The silica gel was removed and weighed to determine the moisture content. The particulate filter was placed in a marked container. The probe and front half of the train were rinsed with analytical grade acetone and all washings collected in a glass container. The rear half of the train was first rinsed with distilled water which was added to the impinger contents and then was rinsed with acetone which was collected in a separate container. Sufficient portions of the acetone and water were prepared for subsequent use as analysis blanks. Volumetric measurements of the acetone sample washes and acetone blanks were not recorded prior to evaporation, hence the quantity of acetone used for the washes had to be estimated. Acceptable test results were achieved by using this estimate based on past experience to calculate the volume contained in the washes. An average blank value was obtained by averaging ten (10) acetone blank values which yielded 0.001 grams/100 milliliters.

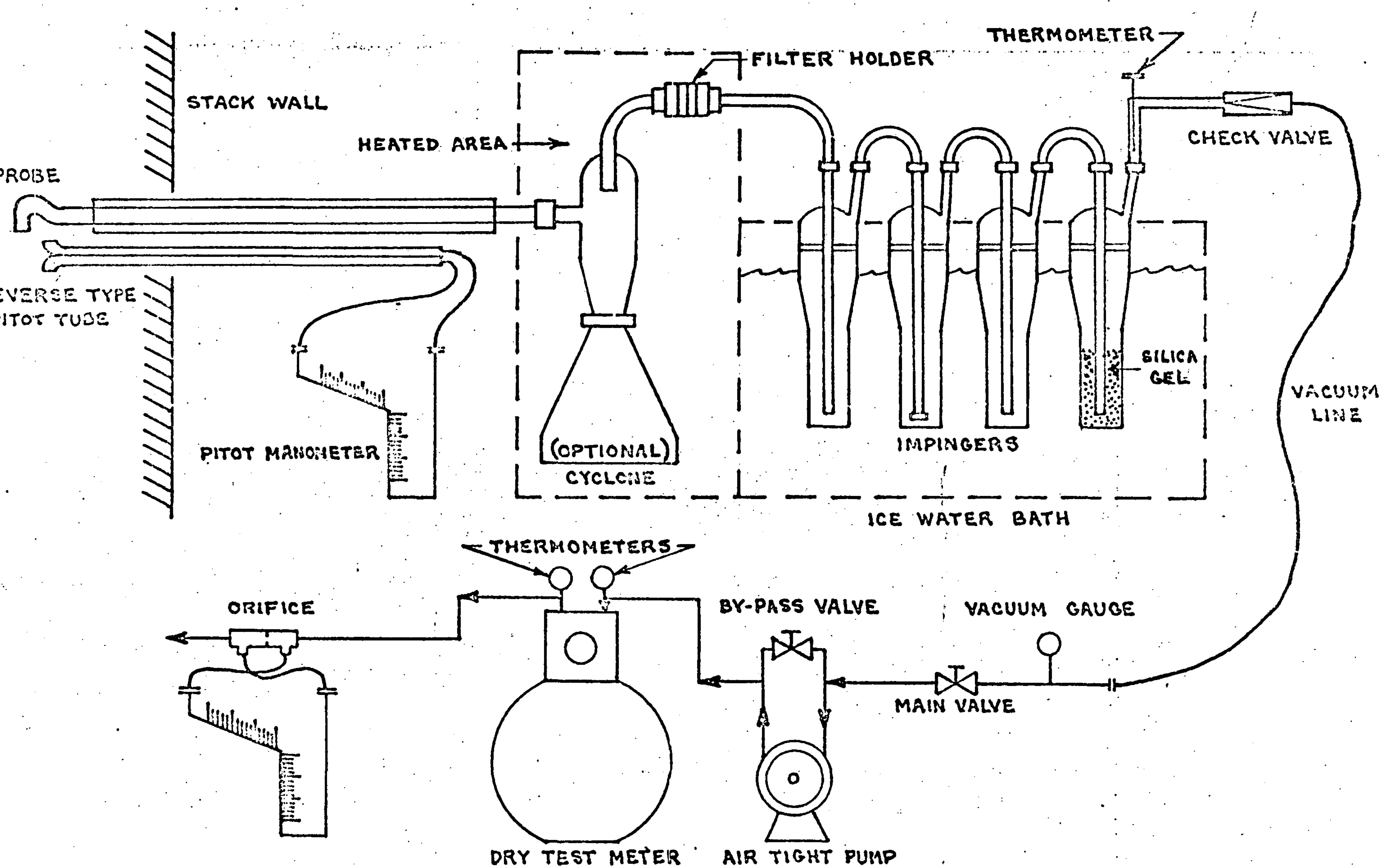


FIG. 4_ PARTICULATE SAMPLING TRAIN

This method was felt to be representative because the mass weighing error in this case is at least ± 0.005 grams/100 milliliters, and all washes were estimated to within ± 100 milliliters of the actual volume. Further information pertaining to these procedures may be found in Appendix F.

All sample containers were sealed and marked with EPA identification labels as listed in Appendix F. Analyses were conducted by MRI personnel who later shipped the samples to EPA for subsequent storage.

Particle Size Measurement Procedures

A description of the procedure used and field data obtained is located in Emission Measurement Branch's file under No. 74-GRN-6.