EMISSION TESTING REPORT
ETB TEST NUMBER 71-MM-13

Emissions From
Wet Process Cement Kiln
at

O R E G O N P O R T L A N D C E M E N T
LAKE OSWEGO, OREGON

Project Officer
Clyde E. Riley

ENVIRONMENTAL PROTECTION AGENCY
Office of Air Programs
Research Triangle Park, North Carolina 27711

PREFACE

The work reported herein was conducted by the Environmental Protection Agency (EPA), Office of Air Programs, Emission Testing Branch (ETB), Metallurgical and Mechanical Section. Mr. Clyde Riley served as the Project Officer and directed the ETB field team consisting of Mr. Ray Mobley and Mr. James Harris. Mr. Philip K. York served as Project Engineer and Mr. Howard Crist and Mr. Allan Riley performed the particulate analyses at the EPA laboratories.

Approved:

Environmental Protection Agency

Gene W. Smith

Gene W. Smith
Chief, Metallurgical & Mechanical Section

March 29, 1972

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II. INTRODUCTION

Under the Clean Air Act, as amended, 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.

The development of realistic performance standards requires accurate data on pollutant emissions within the various source categories. In the cement industry, the Oregon Portland Cement plant located in Lake Oswego, Oregon was designated by EPA as representative of a well controlled operation, and was thereby selected for emission testing. This report presents the results of tests conducted at that plant.

The Oregon Portland Cement plant operates at a production rate of approximately 4000 barrels per day. The plant recently (July, 1967), installed a 135,000 ACFM baghouse.

The gases from the rotating kiln are directed through the 10 compartment baghouse prior to emission to the atmosphere.

Three particulate runs were conducted at the baghouse stack. Also two cumulative gas samples were collected during two of the particulate runs.

The following sections of this report treat (1) a summary of results, (2) a description of the process, (3) the location of sampling points, (4) process operating conditions, and (5) sampling and analytical procedures.

III. SUMMARY OF RESULTS

Tables I and II present a summary of results from the particulate and gas emission testing.

The kiln baghouse emissions collected in the front-half catch (probe and filter) ranged from 0.501 to 0.676 pounds per ton of kiln feed. The total catch (includes impinger portion) ranged from 0.773 to 1.298 pounds per ton of kiln feed.

It should be noted that during periods of the particulate and gaseous sampling the kiln was not operating properly, and several upset conditions occurring during testing may have altered the measured emission levels significantly.

TABLE I

SUMMARY OF PARTICULATE TESTING

Run Number	1	2	3
Date	8-26-71	8-27-71	8-27-71
Percent Excess Air	74.2	29.7	29.7
Percent Isokinetic	107.2	106.8	105.5
Stack Flow Rate - SCFM* dry	53,941	53,782	52,162
Stack Flow Rate - ACFM wet	146,147	141,376	137,566
Volume of Dry Gas Sampled - SCF*	82.18	81.62	78.22
Feed Rate - tons/hr	59.55	56.46	53.75
Particulates			
Probe, Cyclone, & Filter Catch			
mg	344.8	439.5	379.8
gr/SCF* dry	0.0646	0.0829	0.0748
gr/CF @ Stack Conditions	0.0238	0.0315	0.0283
lbs/hr.	29.83	38.19	33.38
lbs/ton feed	0.501	0.676	0.621
Total Catch			
mg	531.6	843.3	616.2
gr/SCF* dry	0.0996	0.159	0.121
gr/CF @ Stack Conditions	0.0367	0.0605	0.0460
lbs/hr	46.01	73.30	54.20
lbs/ton feed	0.773	1.298	1.008
% Impinger Catch	35.1	47.9	38.4

* 70°F, 29.92" Hg

TABLE II

SUMMARY OF GASEOUS TESTING

Run	Gas Composition (Vol. % Dry)			
	CO_2	O_2	CO	N_2
1	14.9	8.6	<1	76.5
2	21.0	4.5	<1	74.5

IV. PROCESS DESCRIPTION

Limestone (81 percent) and sand (12 percent) are brought to the plant by barge from British Columbia, Canada and clay (6 percent) is trucked from a quarry about 15 miles from the plant. These materials are ground and blended with (1) percent iron oxide in a rotating ball mill to form a slurry of about 32 percent water.

The blended slurry is fed into the upper end of a sloping, slowly revolving (one revolution per minute) kiln. This gas-fired kiln (No. 4) is 450 feet long, 13 1/2 feet in diameter at the feedend and 12 feet at the front end. Fuel consumption is approximately 1,000,000 BTU per barrel of cement produced. During passage through the kiln, the raw materials are heated to about 2500°F to produce calcium and aluminum silicate known in the trade as "clinker". This marble-sized clinker material is discharged from the lower end of the kiln at temperatures exceeding 2000°F and fed immediately into an air-quenching cooler unit which reduces the clinker temperature to about 150°F. The newly-formed clinker material is conveyed to a storage silo from the cooler.

A small amount of gypsum (4.45 percent by weight) is added to the clinker material and this mixture is fed to the finish grinding mill. The dust-laden

air leaving the mill (air sweep) is fed to an air-separator or classifier where the coarse material is returned to the mill and the finished cement (90 percent through 325 mesh screen) is conveyed to storage silos. Kiln No. 4 can produce about 4000 barrels of cement in a day.

The control equipment of interest in this report consists of a Wheelabrator baghouse collector which was installed in 1967 at an approximate cost of $705,000.00. The flow of dust-laden gases is downward to a manifold between the collector hoppers. From the manifold the gases move upward through the collector, then downward through a duct to a fan and are exhausted into an 87 feet high stack with a velocity cone at the top.

The basic unit of the baghouse collector is a compartment which contains 96 graphite impregnated glass-fiber bags with a surface area of 90 ft^2 per bag. There are ten (10) compartments in the baghouse, and each compartment is cleaned sequentially by reverse air flow. The particulate matter is collected on the inside of the glass-fiber bags and falls by gravity to the hopper below where the material is removed by a screw conveyor and returned to the kiln by scoop feeders located in front of the chain system. Approximately 60 to 80 percent of the dust collected is normally returned to the kiln.

The Wheelabrator baghouse collector is designed to handle an air volume of 135,000 ACFM @ 410°F. The equipment manufacturer would not guarantee the efficiency of this baghouse, since this unit was the first one they had installed on a wet process plant. The effective collecting surface area of the baghouse is 86,400 ft^2 which gives an air-to-cloth ratio of 1.62:1 or 1.8:1 ft per minute when one compartment is being cleaned. The pressure drop across a bag filter is 3 to 4 inches of water. The expected life of the bags is from 2 1/2 to 3 years and each bag costs about $25.00. The expected life of the collector is 20 years and the annual operating cost averages about $22,500.00.

V. LOCATION OF SAMPLING POINTS

The sampling ports located on the effluent stack were positioned approximately 32 feet (4.6 stack diameters) above the breeching inlet and 18 feet (2.6 stack diameters) below the section of the cone-shaped cap. The number and locations of the sampling points within the stack cross-section used for the three particulate runs were determined from the Federal Register, "Standards of Performance for New Stationary Sources", (23 December, 1971).

For the gaseous sampling the probe was positioned at one of the two existing particulate sampling ports and extended approximately two feet into the stack.

VI. PROCESS OPERATION

Process operation was frequently interrupted by major upsets occurring within the kiln during the particulate and gaseous testing. Several conditions contributing to this were: (1) burning zone temperatures too high, (2) feed material not sintering properly, and (3) change in kiln feed composition. It was esimated by the Project Officer that the kiln stack opacity ranged from 10 to 30 percent during the testing periods.

VII. SAMPLING AND ANALYTICAL PROCEDURES

Particulate samples were collected with the train specified in Method 5 of the Federal Register, "Standards of Performance For New Stationary Sources" (3 December, 1971) including impingers as described.

The procedures for sampling and analyzing the particulate and gaseous samples are described in Methods 1 through 5 of the December 23, 1971 Federal Register. In addition, the impinger catch was analyzed for particulate residue.

APPENDIX A

PARTICULATE RESULTS

Table A - I lists the complete results for the particulate and gaseous runs. Table A - II lists the equations used for the calculations. Also shown in Table A - II are example calculations from Run No. 1.

Standard conditions are taken as 70°F and 29.92 in. Hg.

TABLE A - I

PARTICULATE AND GASEOUS EMISSION DATA

Run No.		1	2	3
Test Date		8-26-71	8-27-71	8-27-71
D_n	Sampling nozzle diameter, in.	0.250	0.250	0.250
T_t	Net time of test, min.	160	160	160
P_b	Barometric pressure, in. Hg absolute	30.02	29.98	29.98
P_m	Average Orifice pressure drop, in. H_2O	0.980	0.939	0.880
V_m	Volume of dry gas sampled, ft^3 at meter conditions	86.095	83.333	81.780
T_m	Average gas meter temperature, °F	98.	83	96
$V_{m_{std}}$	Volume of dry gas sampled at standard conditions*, SCF	82.18	81.62	78.22
V_w	Total H_2O collected in impingers and silica gel, ml	1218.3	1206.1	1093.8
$V_{w_{gas}}$	Volume of water vapor collected at standard conditions*, SCF	57.75	57.17	51.85
% M	% Moisture in the stack gas by volume	41.27	41.19	39.86
M_d	Mole fraction of dry gas	0.587	0.588	0.601
% CO_2		14.9	21.0	21.0
% O_2		8.6	4.5	4.5
% CO		<1	<1	<1
% N_2		76.5	74.5	74.5
% EA	Excess Air Percent	74.2	29.7	29.7
MW_d	Molecular weight of stack gas, dry basis	30.73	31.54	31.54
MW	Molecular weight of stack gas, wet basis	25.48	25.96	26.14
C_p	Pitot tube coefficient	0.85	0.85	0.85
ΔP_s	Average velocity head of stack gas, in. H_2O	0.69	0.68	0.63
T_s	Average stack temperature, °F	390	365	386
N_p	Net sampling points	32	32	32
P_{st}	Static pressure of stack gas, in. Hg	0.15	0.15	0.15
P_s	Stack gas pressure, in. Hg absolute	30.17	30.13	30.13
V_s	Stack gas velocity at stack conditions, fpm	3798	3674	3575
A_s	Stack area, $in.^2$	5542	5542	5542
Q_s	Dry stack gas volumetric flow rate at standard conditions*, SCFM	53,941	53,782	52,162
Q_a	Stack gas volumetric flow rate at stack conditions, ACFM	146,147	141,376	137,566
% I	Percent isokinetic	107.2	106.8	105.5

* 70°F, 29.92 in. Hg

TABLE A - I (Concluded

Run No.		1	2	3
T_c	Unit Feed Rate-Tons/hr	59.55	56.46	53.75
m_f	Particulate - probe, cyclone and filter, mg	344.8	439.5	379.8
m_t	Particulate - total, mg	531.6	843.3	616.2
I_c	% impinger catch	35.1	47.9	38.4
C_{an}	Particulate - probe, cyclone, and filter, gr/SCF*	0.0646	0.0829	0.0748
C_{ao}	Particulate - total, gr/SCF*	0.0996	0.159	0.121
C_{at}	Particulate - probe, cyclone, and filter, gr/cf at stack conditions	0.0238	0.0315	0.0283
C_{au}	Particulate - total, gr/cf at stack conditions	0.0367	0.0605	0.0460
C_{aw}	Particulate - probe, cyclone, and filter, lb/hr.	29.83	38.19	33.38
C_{ax}	Particulate - total, lb/hr.	46.01	73.30	54.20
P_{tf}	Particulate - probe, cyclone, and filter, lb/ton feed	0.501	0.676	0.621
P_{tt}	Particulate - total, lb/ton feed	0.773	1.298	1.008

*70°F, 29.92 in. Hg, dry basis

TABLE A - II

PARTICULATE CALCULATIONS

1. Volume of dry gas sampled at standard conditions: 70°F, 29.92 in. Hg, SCF

$$V_{m_{std}} = \frac{17.7 \times V_m \left(P_b + \frac{P_m}{13.6}\right)}{(T_m + 460)} = \frac{17.7 \times 86.095 \left(30.02 + \frac{.98}{13.6}\right)}{(98 + 460)} = 82.18 \text{ SCF}$$

2. Volume of water vapor at 70°F and 29.92 in. Hg, SCF

$$V_{w_{gas}} = 0.0474 \times V_w = 0.0474 \times 1218.3 = 57.75 \text{ SCF}$$

3. Percent moisture in stack gas

$$\% M = \frac{100 \times V_{w_{gas}}}{V_{m_{std}} + V_{w_{gas}}} = \frac{100 \times 57.75}{82.18 + 57.75} = 41.27$$

4. Mole fraction of dry gas

$$M_d = \frac{100 - \%M}{100} = \frac{100 - 41.27}{100} = 0.587$$

5. Average molecular weight of dry stack gas

$$MW_d = (\%CO_2 \times \frac{44}{100}) + (\%O_2 \times \frac{32}{100}) + \left[(\%CO + \%N_2) \times \frac{28}{100}\right] =$$

$$(14.9 \times \frac{44}{100}) + (8.6 \times \frac{32}{100}) + (76.5 \times \frac{28}{100}) = 30.73$$

6. Molecular weight of stack gas

$$MW = MW_d \times M_d + 18 (1 - M_d) = 30.73 \times .587 + 18 (1 - .587) = 25.48$$

7. Stack gas velocity at stack conditions, fpm

$$V_s = 4,360 \times \sqrt{\Delta P_s \times (T_s + 460)} \left[\frac{1}{P_s \times MW}\right]^{1/2} =$$

$$4,360 \times 24.15 \left[\frac{1}{30.17 \times 25.48}\right]^{1/2} = 3,798 \text{ fpm}$$

TABLE A - II (Concluded)

8. Stack gas volumetric flow rate at standard conditions*, SCFM

$$Q_s = \frac{0.123 \times V_s \times A_n \times M_d \times P_s}{(T_s + 460)} = \frac{0.123 \times 3798 \times 5542 \times .587 \times 30.17}{(390 + 460)} = 53,941 \text{ SCFM}$$

9. Stack gas volumetric flow rate at stack conditions, ACFM

$$Q_a = \frac{.05645 \times Q_s \times (T_s + 460)}{P_s \times M_d} = \frac{.05645 \times 53,941 \times (390 + 460)}{30.17 \times .587} = 146,147 \text{ ACFM}$$

10. Percent isokinetic

$$\%I = \frac{1,032 \times (T_s + 460) \times V_{m_{std}}}{V_s \times T_t \times P_s \times M_d \times (D_n)^2} = \frac{1,032 \times (390 + 460) \times 82.18}{3798 \times 160 \times 30.17 \times .587 \times (.250)^2} = 107.2\%$$

11. Particulate: probe, cyclone and filter, gr/SCF* Dry Basis

$$C_{an} = 0.0154 \times \frac{m_f}{V_{m_{std}}} = 0.0154 \times \frac{344.8}{82.18} = 0.0646 \text{ gr/SCF}$$

12. Particulate total, gr/SCF* Dry Basis

$$C_{ao} = 0.0154 \times \frac{m_t}{V_{m_{std}}} = 0.0154 \times \frac{531.6}{82.18} = 0.0996 \text{ gr/SCF}$$

13. Particulate: probe, cyclone and filter, gr/CF at stack conditions

$$C_{at} = \frac{17.7 \times C_{an} \times P_s \times M_d}{(T_s + 460)} = \frac{17.7 \times .0646 \times 30.17 \times .587}{(390 + 460)} = 0.0238$$

14. Particulate: total, gr/CF at stack conditions

$$C_{au} = \frac{17.7 \times C_{ao} \times P_s \times M_d}{(T_s + 460)} = \frac{17.7 \times .0996 \times 30.17 \times .587}{(390 + 460)} = 0.0367 \text{ gr/CF}$$

15. Particulate: probe, cyclone, and filter, lb/hr

$$C_{aw} = 0.00857 \times C_{an} \times Q_s = 0.00857 \times .0646 \times 53,941 = 29.83 \text{ lb/hr}$$

16. Particulate: total, lb/hr

$$C_{ax} = 0.00857 \times C_{ao} \times Q_s = 0.00857 \times .0996 \times 53,941 = 46.01 \text{ lb/hr}$$

17. Particulate: probe, cyclone, and filter, lb/ton feed

$$P_{tf} = \frac{C_{aw}}{T_c} = \frac{29.83}{59.55} = 0.501 \text{ lb/ton feed}$$

18. Particulate: total, lb/ton feed

$$P_{tt} = \frac{C_{ax}}{T_c} = \frac{46.01}{59.55} = 0.773 \text{ lb/ton feed}$$

* 70°F, 29.92 in. Hg

APPENDIX B

OPERATION RESULTS

Presented in this section is a summary prepared from the process log located in the plant control room and the particulate field data sheets.

On Thursday morning (8-26-71), operator was having trouble with kiln (burning zone temperature too high). Back to normal at 1100. Feed to kiln averaged 59.55 tons per hour (dry basis) during sampling period 1123 to 1430. (Run No. 1)

On Friday morning (8-27-71) operator was again having trouble with kiln (feed material not sintering properly). Run No. 2 obtained over a period from 0737 to 1238 and sampling had to be stopped three (3) times. Feed rate to kiln averaged 56.46 tons per hour.

On Friday afternoon, kiln operating smoothly with average feed rate of 53.75 tons per hour during sampling period of 1335 to 1622 for Run No. 3. Plant personnel had forgotten to tell the kiln operator of a change in feed to kiln (omitted iron oxide). During these three runs, all of the dust collected in the baghouse was returned to the kiln.

APPENDIX C

FIELD DATA

This section presents the actual field data recorded during the testing.

PRESURVEY - PROCESS INDUSTRY & POWER PLANTS

NAME OF COMPANY Oregon Portland Cement Co. DATE OF PRESURVEY 8-12-71

ADDRESS State St. CITY Lake Oswego STATE Oregon

NAME OF CONTACT Melvin Munch TITLE Plant Mgr. PHONE 503-636-8113
FTS- 503 /226-3361

PROVIDE FLOW DIAGRAM OF EACH PROCESS TO BE SAMPLED, INCLUDING FEED COMPOSITIONS AND RATES, OPERATING TEMPERATURES AND PRESSURES, PRODUCT RATES, AND PROPOSED SAMPLING SITES:

No. of Kilns - 4, 3 kilns on ESPsunite 1 kiln on baghouse (Wheelabrator)
Fuel - Gas Oil used in emergency
Process - Wet
Baghouse constructed July 4, 1967
Baghouse - 10 compartments 96 bags per compartment = 960
200 new bags installed in June 1971
Bag life - 2½-3 yrs. Bag material - glass fiber w/graphite
Air to cloth ratio - less than 2:1 Cleaning cycle 5 min/compartment
Maintance - Usually shut off bags with holes. Compartments are usually vacuumed once per week.
Test - Wheelabrator tested unit for flows only.
Return dust - Returns ~~most~~ 800 #/hr
Plant Production - 4800 barrels/day
Clinker cooler - Unit also has a wire baghouse, hot stack only extends 6 ft beyond fan. (less than 1 dia.)

COMMENTS: Mr. Melvin Munch - General Superintendent
Mr. Erik Voldlach - Vice President of Operations
Mr. Edmond Miller - Asst Vice President of Operations
Mr. William Sweet - Chief Chemist

National Car Rental - Portland - 503-288-7354

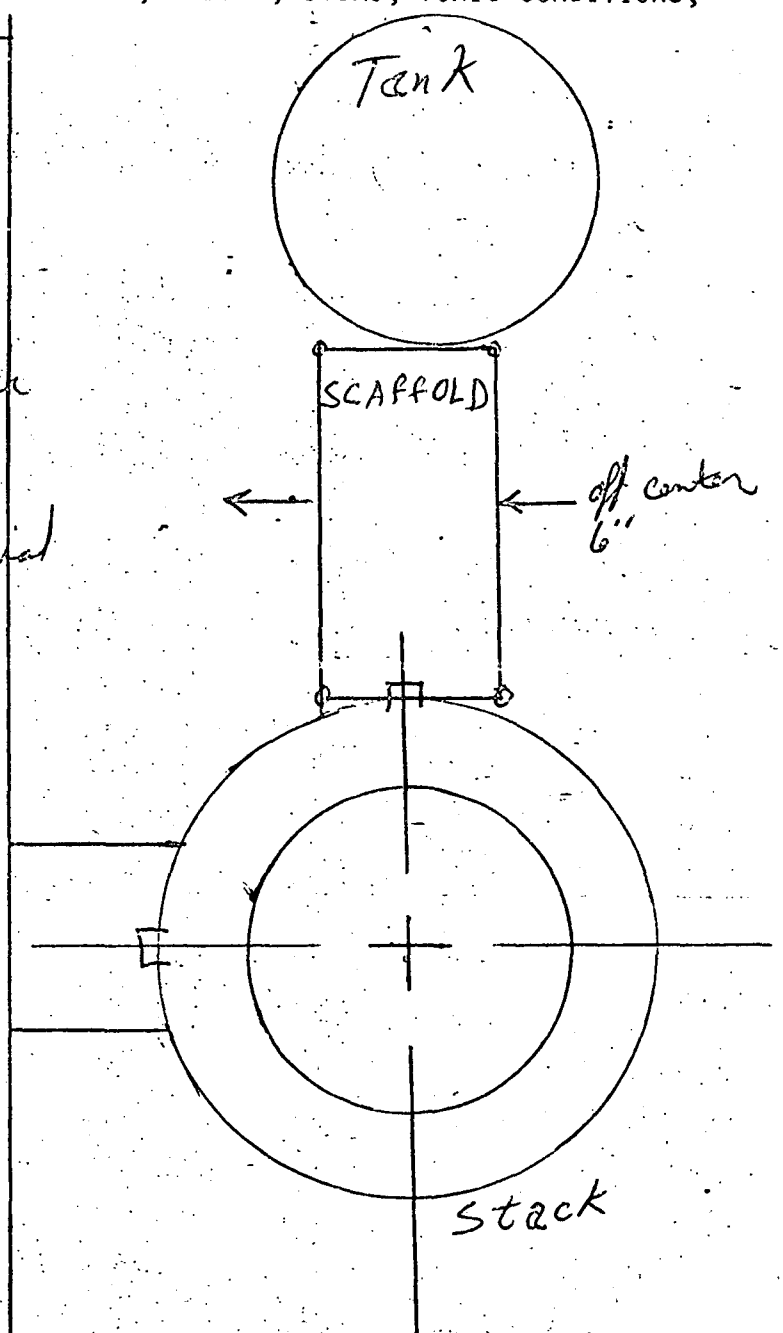
PROVIDE DIAGRAM OF EACH SAMPLING SITE. INCLUDE THE FOLLOWING INFORMATION:

DIMENSIONS TO NEAREST OBSTRUCTION IN ALL DIRECTIONS FROM SAMPLING PORT.

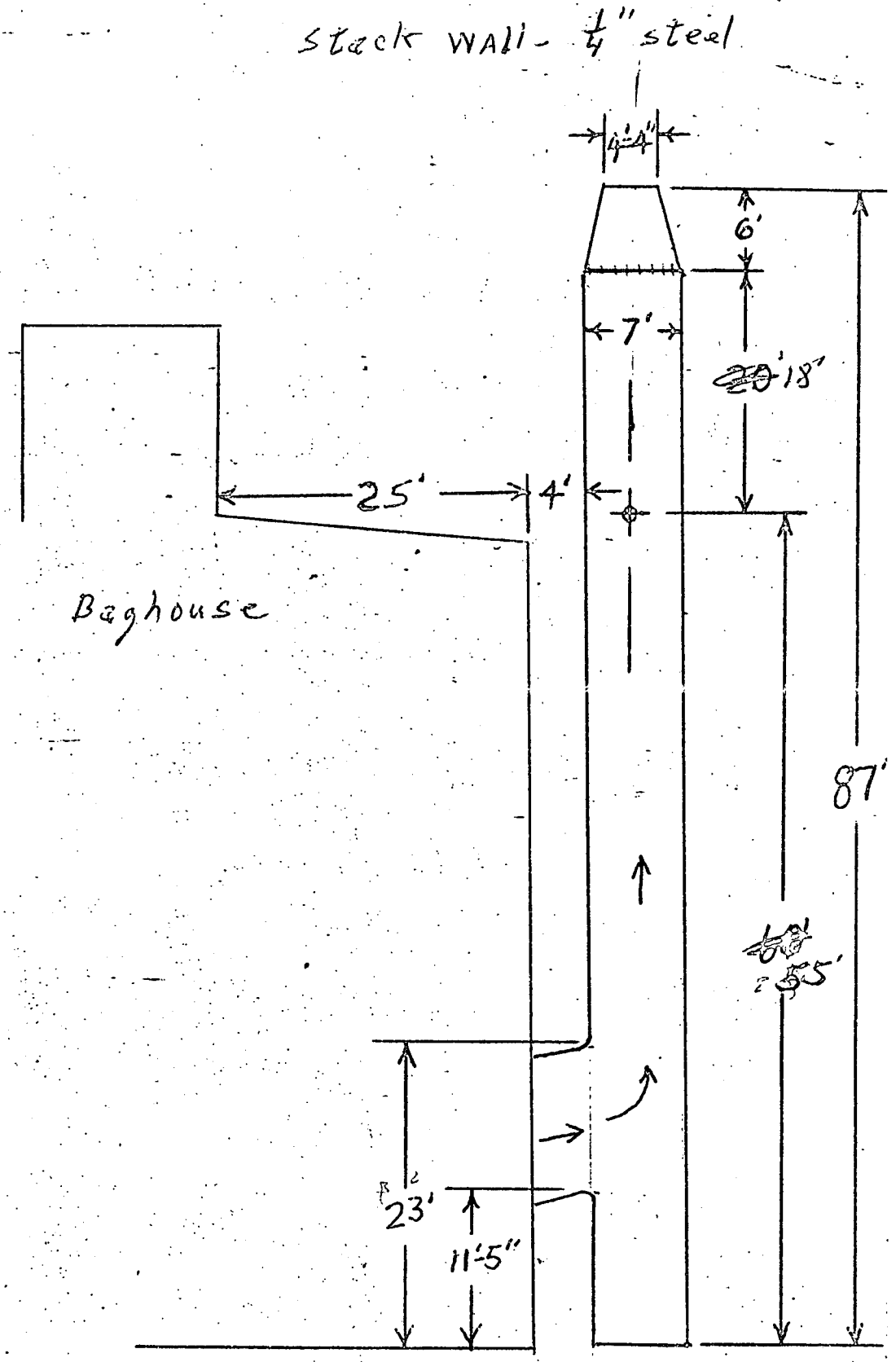
COMPLETE DESCRIPTION OF ALL PORTS INCLUDING ALL DIMENSIONS. DESCRIPTION OF ANY UNUSUAL FEATURES ABOUT ENVIRONMENT; HEIGHT, ODORS, TOXIC CONDITIONS, TEMPERATURE, DUST, ETC.

Baghouse Top view

Baghouse temp't – 400-450°F
Slurry moisture – 35-37%
Volume & flow – 150,000 CFM
Baghouse moisture – 35-40% water
Environment – outside
Working area – high up, roof area
Plant will furnish labor and material for cutting ports. 3 to 4" I.D.
Clean-up area – office or garage
Plant will purchase acetone and will furnish dist. H_2O and a weighing balance for our use.



Main Baghouse and Fan Stack



4.5
7 | 32
28
4

4.5
Clear Downstream - 8 dia
" Upstream - 2.5 dia

ING HOURS OF PLANT PERSONNEL 24 hrs

ING SCHEDULE FOR EACH PROCESS TO BE SAMPLED same

ROCESSES BATCH OR CONTINUOUS? Continuous

FEED RATES AND COMPOSITION FOR EACH PROCESS Slurry

ANY CONTROL EQUIPMENT, INCLUDING SIZE Wheelabrator Baghouse

EXPECTED CONSTITUENTS OF STACK GAS FOR EACH SAMPLING SITE Particulate, SO_2 NO_x

K DATA: HEIGHT 87' WIDTH 7' DIAMETER 7½" I.D. 7"

O.D. AMOUNT OF INSULATION [illegible] THICKNESS ¼"

RIAL OF CONSTRUCTION steel GAS TEMPERATURE 400-450

SURE — WET BULB TEMPERATURE —

AGE PITOT TUBE READING .8 - 1.0 in H_2O

ANCE TO NEAREST UPSTREAM RESTRICTION 5 dia TYPE OF RESTRICTION inlet duct

ANCE TO NEAREST DOWNSTREAM RESTRICTION 2 ½ dia TYPE OF RESTRICTION top cone

PORTS EXISTING? ☐ YES, SIZE _____

☑ NO, WHO WILL PROVIDE THEM? plant

SCAFFOLDING OR OTHER MEANS OF SUPPORT PRESENT?

☐ YES

☑ NO, WHO WILL PROVIDE IT? EPA OAP

SOURCE OF ELECTRICITY AVAILABLE? ☑ YES, MAXIMUM AMPERAGE PER CIRCUIT 20

☐ NO

DISTANCE 50-100 ft WHO WILL PROVIDE EXTENSION CORDS? plant

LOCATION OF FUSE BOX in baghouse area

PARKING FACILITIES AVAILABLE FOR TRAILER OR VAN? yes

SIGNATURE REQUIRED ON PASSES? yes WAIVERS? ✓

NEARBY RESTAURANTS AND MOTELS Breakfast - Denbo's (8 blocks from motel) Riviera Motor Hotel Phone 503 636-9679 (across street from plant) also restaurant in front of motel

LIST ANY SPECIAL SAFETY EQUIPMENT OR RULES glasses + Hard hats

SURVEY BY C.E. Riley

COMMENTS: Scaffold needed to reach desired sampling ports.

Art / Joe
Safway Scaffold Co.
902 S.E. Mill St.
Portland, Oregon
Phone 503 233-4816
Mr. Joe Bill Nelson

Frames - 6'5" - 22
Cross bars - 22
Leveling shoes - 4
boards 2"x10" - 14
delivery, erection, dismantling, & pickup
$ 400.00

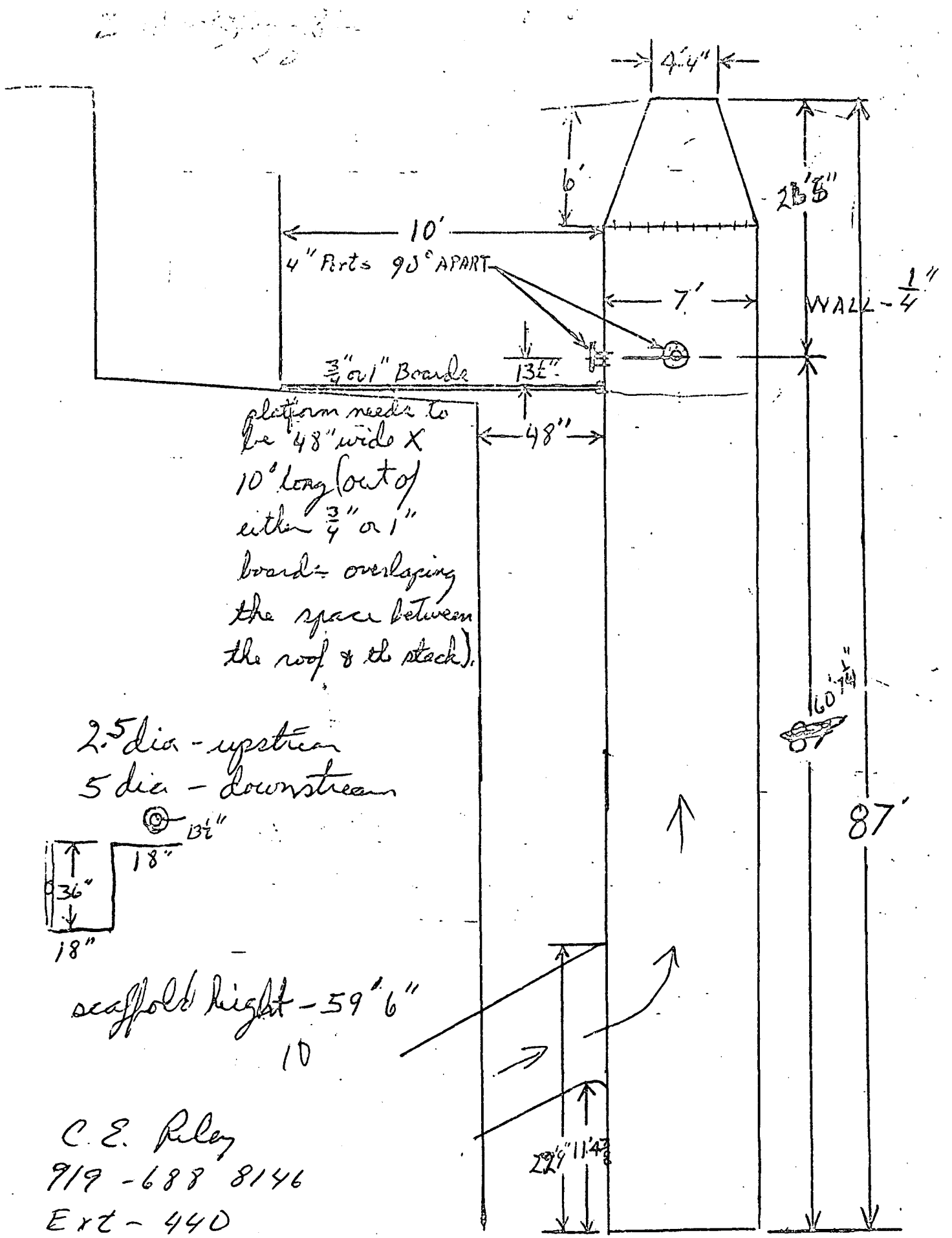
Ice - can be purchased at a small store 4 blocks from motel (store opens 7:00 a.m.)

Lunch - Plant is right in heart of Lake Oswego; Cafes plentiful.

Rest room - located in baghouse area

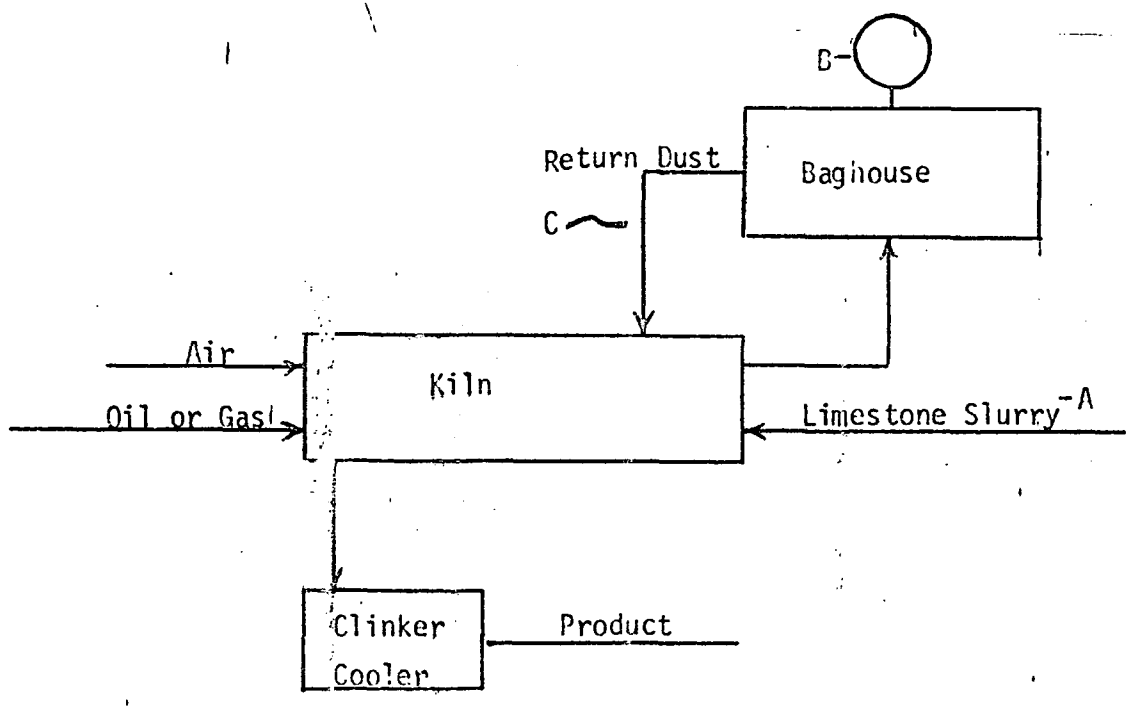
Vending machines - near office

Chemicals - Van Waters & Rogers Portland - 222-1721



C. E. Riley
919 - 688 8146
Ext - 440

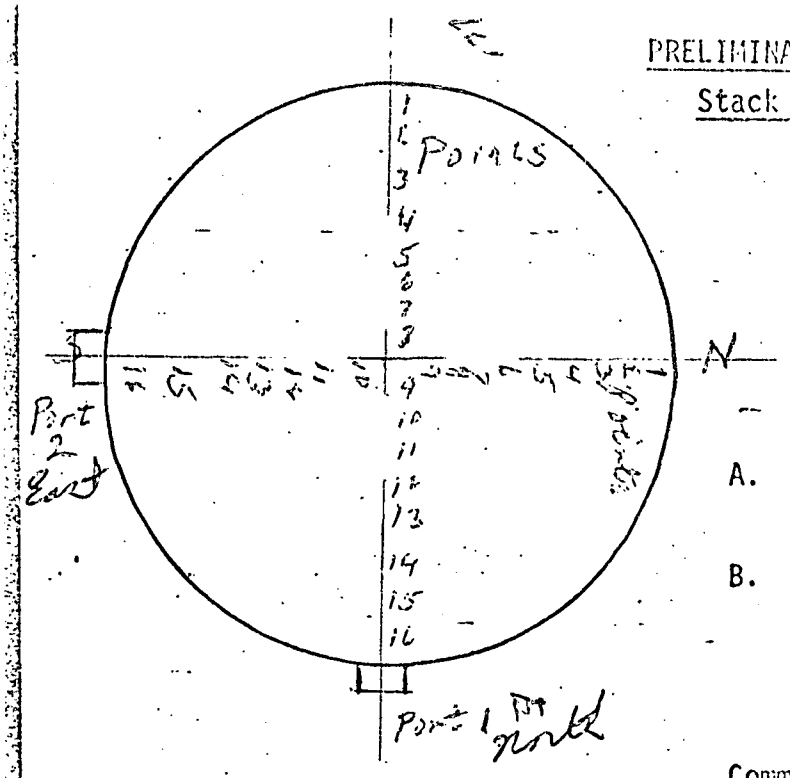
OREGON PORTLAND CEMENT COMPANY



Sampling Point	Type of Sample	Initial Analysis: No. of Samples	Analysis	Organization
A	Slurry	1		
B	Part.	3	Mass	Howard Crist
C	Return Dust	1		
B	Excess Air	2-3	CO_2, O_2, CO	Ray Mobley

PRELIMINARY FIELD DATA

Stack Geometry



Plant Oregon Portland Cement

Test No. 1

Location Kiln Stack

Date 8-25-71

A. Dist. from inside of far wall to outside of near wall, in., = 87 1/4"

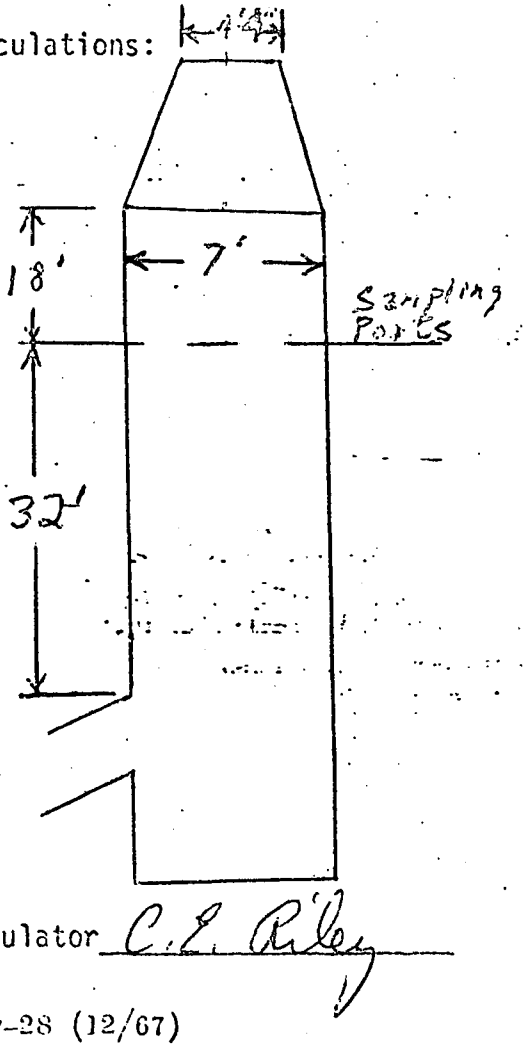
B. Wall thickness, in., = 3 1/4"

Inside diameter of stack = A-B 84"

Stack Area = 5539

Comments: 4.5 dia up
2.5 dia down

Sketch of stack cross-section showing sampling holes



Calculations:

Calculator C.E. Riley

Point	% Dia. for circular stack	Dist. from outside of sample port, in.
16	1.6	1.34+3.25=4 5/8
15	4.9	4.11 = 7 3/8
14	8.5	7.13 = 10 3/8
13	12.5	10.5 = 13 1/2
12	16.9	14.2 = 17 1/2
11	22.0	18.5 = 21 3/4
10	28.3	23.8 = 27 1/8
9	37.5	31.4 = 34 3/8
8	62.5	52.5 = 55 3/4
7	71.7	60.1 = 63 3/8
6	78.0	65.5 = 68 3/4
5	83.1	69.7 = 73
4	87.5	73.5 = 76 3/4
3	91.5	76.7 = 80
2	95.1	79.9 = 83 1/4
1	98.4	82.5 = 85 3/4

NCAP-28 (12/67)

VELOCITY TRAVERSE FIELD DATA

Plant Oregon Portland Cement

Test 1

Location Kiln Stack

Date 8-26-71

Operator [illegible]

Meter ΔH 1.93

Clock Time	Point	(1) ΔP, in. H_2O	(1) $\sqrt{\Delta P}$, in. H_2O	(2) ΔP, in. H_2O	(2) $\sqrt{\Delta P}$, in. H_2O	Stack Temp °F (1)	Stack Temp °F (2)
	#1	.74		.56		390	390
	2	.74		.57			
	3	.73		.58			
	4	.73		.59			
	5	.73		.62			
	6	.69		.62			
	7	.67		.69			
	8	.72		.72			
	9	.79		.75			
	10	.79		.71			
	11	.7		.70			
	12	.74		.75			
	13	.75		.72			
	14	.76		.76			
	15	.46		.66			
	16	.58		.58			

(1) ΔP, in. H_2O Average .688

(2) ΔP, in. H_2O Average .688

Comments: Static Press. 2.1 | 2.0 | 1.9 | 2.0 = +2.0 "H_2O

Moisture Run Only

PARTICULATE FIELD DATA

Plant Oregon Portland Cement

Run No. Moisture

Location Kiln Stack

Date 8-26-71

Operator Ray Molby

Sample Box No. bucket

Meter Box No. 11

Meter Δ H 1.93

C Factor ——

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

water collected + 222
+ 154
376
− 20
176

176
15.5 Silica Gel
191.5

Ambient Temp °F 80°

Bar. Press. "Hg 30.00

Assumed Moisture % ——

Heater Box Setting, °F ——

Probe Tip Dia., In. 3/8"

Probe Length 3'

Probe Heater Setting ——

Avg. Δ P —— Avg. ΔH ——

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press. in. Hg	Stack Temp °F
4:18	0	471.735		2.0	2.0	70	70	7				[illegible]
4:28	10	478.95		2.0	2.0	75	75	7				320
4:38	20	486.495				80	80					[illegible]
	~~20~~	14.760			2.0	75						320

"Moisture Run Only"

Comments:

= 39%

NCAP-37 (12/67)

Oregon Portland Cement Date 8-26-71

Sampling location 2nd stack

STACK DATA FOR NOMOGRAPH:

1. Meter ΔH 1.93 in H_2O

2. Avg. meter tempt (ambient + 20° 85) 105 °F

3. Moisture (volume) 39 %

4. Avg. static press. ⊖ 2.0 in. H_2O X.073 = ⊖ .146 in. Hg.

5. Bar. press sampling point 30.02 in.Hg ⊖ .146 (static press in.Hg) = 30.17 in. Hg.

6. Bar press of meter 30.02 in. Hg.

7. P_s/P_m = 5. 30.17 in. Hg / 6. 30.02 in. Hg = 1.0

8. Avg. stack temperature 400 °F.

9. Avg. stack velocity (ΔP) .69 in H_2O. MAX. VELOCITY .80

C factor (1) .55 (2) .52

10. Probe Tip size .250

1.0 = 1.43

PARTICULATE FIELD DATA

Plant Oregon Portland Cement

Run No. 1

Location Kiln Stack

Date 8-26-71

Operator Ray Mobley

Sample Box No. 124

Meter Box No. 11

Meter ΔH 1.93

C Factor .55

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS - read and record every 5 minutes.

Readings every 5 MIN
16 points / axis
Total points 32
Time — 160 MIN

Ambient Temp °F 80°

Bar. Press. "Hg 30.02

Assumed Moisture % 39

Heater Box Setting, °F 250

Probe Tip Dia., In. .250

Probe Length 8 ft

Probe Heater Setting 70

Avg. ΔP .69 Avg. ΔH 1.0

Port 1

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O Required	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp °F	Stack Press in. Hg	Stack Temp °F
0	0 1133	487.000	—	—	—	—	—	—	—	—		—
1	5	489.48	.65	2.92	.92	84	80	4	250	90		407
2	10	492.10	.74	1.1	1.1	87	82	5	11	93		410
3	15	494.97	.7	1.0	1.0	90	84	5	11	93		415
4	20	497.55	.7	1.0	1.0	92	86	5	11	83		410
5	25	500.23	.8	1.1	1.1	94	88	5	11	83		414
6	30	502.95	.85	1.2	1.2	96	88	5.5	11	80		416
7	35	505.92	.7	1.0	1.0	97	90	5	11	78		414
8	40	507.68	.75	1.1	1.1	99	92	5	11	77		407
9	45	511.50	.75	1.1	1.1	100	93	5.5	11	75		407
10	50	514.35	.8	1.1	1.1	101	94	5.5	11	72		400
11	55	517.17	.85	1.2	1.2	102	95	6	11	73		360
12	60	520.05	.8	1.1	1.1	102	95	6	11	73		350
13	65	522.91	.7	1.0	1.0	103	96	5	11	74		380
14	70	525.66	.65	.92	.92	104	97	5	11	77		380
15	75	528.29	.55	.8	.8	104	98	4.5	11	79		380
16	80 1258	530.74	.55	.8	.8	103	100	2	11	79		350

Comments:

NCAP-37 (12/67)

Comments	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp. °F	Stack Press in. Hg	Stack Temp °F
1:07	0											
Port 2	1 5 ~~10~~	533.20	.6	.85	.85	104	100	2	250	100		370
	2 10	535.61	.55	.8	.8	102	99	2	"	100		"
	3 15	538.08	.6	.95	.85	102	99	2	"	96		380
	4 20	540.63	.55	.8	.8	103	99	2	"	83		350
	5 25	543.13	.5	.71	.71	103	99	2	"	83		390
	6 30	545.56	.4	.85	.85	103	99	2	"	75		390
87	5	548.03	.61	.85	.85	103	99	2	"	76		390
	4 40	550.53	.7	1.	1.	103	99	3	"	75		390
	9 45	553.25	.7	1.	1.	103	99	3	"	78		390
	10 50	556.07	.85	1.2	1.2	103	99	4	"	79		390
	11 55	559.05	.85	1.2	1.2	105	100	4	"	80		380
	12 60	562.03	.8	1.1	1.1	105	100	4	"	84		380
	13 65	564.95	.75	1.1	1.1	105	100	4	"	92		390
	14 70	567.63	.65	.92	.92	106	101	3.5	"	79		350
	15 75	570.61	.6	.85	.85	105	101	3.5	"	78		370
4:17	16 ~~80~~	573.095	.6	.85	.85	105	101	3.5	"	78		370
	~~25~~											
	~~70~~											
	160	86.095	.689		.480	100.6	95.4					390
							98.0					
			✓									
			24.15									

27

1:30 pitot

PARTICULATE FIELD DATA

Plant Oregon Portland Cement

Run No. 2

Location outlet - Kl. Stack

Date 8-27-71

Operator Ray

Sample Box No. 23

Meter Box No. 11

Meter ΔH 1.93

C Factor .52

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL INCINERATORS- read and record every 5 minutes.

16 point/axis
2 axis
32 total points
Test time - 160 MIN

Ambient Temp °F 60

Bar. Press. "Hg 27.98

Assumed Moisture % 6 %

Heater Box Setting, °F 250

Probe Tip Dia., In. .250

Probe Length 8'

Probe Heater Setting 70

Avg. ΔP .69 Avg. ΔH .95

Port 1

Point	Clock Time	574.00 Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg (comp.)	Box Temp. °F	Impinger Temp °F	Stack Press.	Stack Temp °F
0	0 7:37	~~575.872~~	—	—	—	—	—	—	—	—		
1	5	578.37	.7	1.0	1.0	61	60	5	250	84		370
2	10	580.94	.75	1.0	1.0	64	60	5.5	11	76		370
3	15	583.51	.65	.9	.9	66	62	5	11	70		370
4	20	586.0	.75	1.	1.	68	63	5.5	11	69		370
5	25	588.62	.77	1.1	1.1	71	64	6	11	68		370
6	30	591.34	.87	1.2	1.2	74	68	6.5	11	64		370
7	35	594.15	.8	1.0	1.0	75	69	6.5	11	67		370
8	40	596.94	.85	1.2	1.2	77	70	7	11	66		380
9	45	599.78	.8	1.1	1.1	78	72	7	11	64		380
10	50	602.55	.7	1.0	1.0	80	73	6	11	62		380
11	55	605.22	.65	.9	.9	80	74	5.5	11	60		385
12	60	607.89	.6	.83	.83	77	75	5	11	58		390
13	65	610.24	.55	.74	.76	78	75	5	11	55		390
14	70	612.62	.5	.7	.7	80	76	5	11	58		390
15	(75) 12:45	614.90	.4	.56	.56	81	77	4	11	60		390
16	80 12:55	617.18	.51	.72	.72	88	87	4	11	70		360

Comments:

08:50 - Discontinued sampling
11:08 - Started sampling at point 15, port 1.
11:33 - Stopped sampling for 10 min point 7, port 2
11:48 - Started again

CAP-37 (12/67)

Comments	Clock Time	Dry Gas Meter, CF	Press. in. H_2O ΔP	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp. °F	Stack Press in. Hg	Stack Temp °F
2 Part 2	11:08											
1	5	619.50	.5	.7	.7	88	86	4	250	100		340
2	10	621.79	.55	.76	.76	89	84	4.5	"	100		350
3	15	624.16	.6	.83	.83	91	87	5	"	100		350
4	20	626.65	.6	.83	.83	92	88	5	"	94		350
5	25	629.18	.65	.9	.9	94	89	5	"	91		350
6	30	631.78	.7	1.0	1.0	95	90	5.5	"	86		350
0 → 7	5	634.49	.7	1.0	1.0	96	91	5.5	"	84		350
IN. STOP 8	10	637.25	.8	1.1	1.1	98	92	6	"	81		350
9	15	640.05	.85	1.2	1.2	99	93	6	"	76		350
10	20	642.83	.75	1.0	1.0	99	94	6	"	74		350
11	25	645.77	.75	1.0	1.0	99	94	6.5	"	73		355
12	30	648.62	.8	1.1	1.1	100	95	6.5	"	74		355
13	5	651.47	.75	1.0	1.0	100	95	6.5	"	75		355
14	10	654.24	.65	.9	.9	101	96	5.5	"	76		355
15	15	656.85	.6	.83	.83	102	97	5.5	"	78		355
16	20 12:38	659.333	.6	.83	.83	102	97	5.5	"	80		355
						85.7	81.1					
	160	33.333	.678		.939	83.4						365
			✓									
			23.57									

659.333
574
53.333

PARTICULATE FIELD DATA

Plant Oregon Portland Cement

Run No. 3

Location outlet

Date 8-27-71

Operator Ray

Sample Box No. 24

Meter Box No. 11

Meter ΔH 1.93

C Factor .52

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

PATHOLOGICAL EXCLAMATIONS-
read and record every 5 minutes

16 points / axis
2 axis
32 points total
160 min test time

Ambient Temp °F 80

Bar. Press. "Hg 29.93

Assumed Moisture % 41

Heater Box Setting, °F 250

Probe Tip Dia., In .250

Probe Length 8'

Probe Heater Setting 70

Avg. ΔP .69 Avg. √ΔP .95

Part I

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Pump Vacuum In. Hg gauge	Box Temp. °F	Impinger Temp °F	Stack press. in. Hg	Stack Temp °F
~~1~~	0 13.35	659.44	—	—	—	—	—	—	—	—	—	—
1	5	661.82	.55	.76	.76	92	90	2	250	72		350
2	10	664.17	.6	.83	.83	94	90	2	"	72		350
3	15	666.63	.6	.83	.83	96	92	2	"	94		350
4	20	669.10	.55	.76	.76	97	93	2	"	82		350
5	25	671.51	.4	.6	.6	98	94	2	"	83		350
6	30	673.92	.43	.6	.6	100	96	2	"	87		350
7	35	675.98	.5	.7	.7	100	96	2	"	82		350
8	40	678.30	.55	.76	.76	99	96	2	"	90		350
9	45	680.74	.55	.76	.76	99	96	2	"	75		350
10	50	683.09	.65	.9	.9	99	96	3	"	72		350
11	55	685.67	.85	1.2	1.2	99	96	4	"	73		390
12	60	688.56	.8	1.1	1.1	99	96	4	"	72		390
13	65	691.37	.65	.9	.9	99	96	4	"	73		390
14	70	694.00	.65	.9	.9	99	96	4	"	72		370
15	75	696.60	.4	.6	.6	99	96	3	"	73		350
16	80 455	698.92	.5	.7	.7	96	95	4	"	95		390

Comments: No shut downs during testing!

30

XCAP-37 (12/67)

Comments		Clock Time	Dry Gas Meter, CF	Pitot in. H2O ΔP	Orifice ΔH in. H2O		Dry Gas Temp. °F		Vacuum In. Hg Gauge	Box Temp. °F	Impinger Temp. °F	Stack Press in. Hg	Stack T °F
					Desired	Actual	Inlet	Outlet					
		3:02											
3	1	5	701.17	.65	.9	.9	96	94	5	250	100		374
Port 2	2	10	703.72	.65	.9	.9	96	94	5	11	100		395
	3	15	706.31	.8	1.1	1.1	96	94	6	11	92		375
	4	20	709.10	.8	1.1	1.1	97	94	6	11	92		370
	5	25	711.90	.75	1.0	1.0	97	94	6	11	92		350
	6	30	714.69	.7	1.0	1.0	97	94	6	11	84		340
	7	5	717.45	.75	1.0	1.0	97	94	6	11	87		340
	8	10	720.19	.9	1.3	1.3	98	94	7	11	95		340
	9	15	723.22	.75	1.0	1.0	98	94	6	11	81		350
	10	20	726.01	.7	1.0	1.0	96	93	6	11	77		350
	11	25	728.77	.7	1.0	1.0	94	93	6	11	73		370
	12	30	731.44	.65	.9	.9	96	93	6	11	70		390
	13	5	734.04	.6	.83	.83	94	93	5	11	70		350
	14	10	736.50	.6	.83	.83	95	92	5	11	70		380
	15	15	738.95	.5	.7	.7	94	91	5	11	70		390
1622	16	20	741.22	.5	.7	.7	94	91	5	11	70		390
							97.0	93.1					
		160	81.780	.632		.830	95.5						380
				✓									
				23.02									

ORSAT FIELD DATA

1

Location Oregon Portland

Comments: Filter leak

Date 8-26-71

Time 11:00 - 14:00

Operator Ray

Test	(CO_2) Reading 1	(O_2) Reading 2	(CO) Reading 3
1	15.4	23.4-15.4 = 8.0	0 less than 1
2	14.8	23.6-14.8 = 8.8	0 less than 1
3	14.6	23.6-14.6 = 9.0	0 less than 1
	Avg.		
	14.9	8.6	0

14.9
8.6
23.5

10°
23.5
76.5

2

ORSAT FIELD DATA

Location Oregon Portland Comments: Kiln Stack

Date 8-27-71

Time 0730 - 1100

Operator C. E. Rly

Test	(CO_2) Reading 1	(O_2) Reading 2	(CO) Reading 3
1	20.6	25.2-20.6=4.6	less than 1.
2	21.2	25.7-21.2=4.5	less than 1.
3	21.1	25.6-21.1=4.5	less than 1.
Avg.	21.0	4.5	21

PARTICULATE CLEANUP SHEET

Date: 2-24-71 Plant: Oregon Portland Cement

Run number: 1 Location of sample port: Exh. Stack

Operator: Ron Motley Barometric pressure: 30.02

Sample box number: 24 Ambient temperature: 80°

Impinger H_2O

Volume after sampling 1380ml Container No. 1A Ether-chloroform extraction of impinger water ____ mg

Impinger prefilled with 200 ml Extra No. 1A-1

Volume collected 1180ml Impinger water residue 169.1 mg

Impingers and back half of filter, acetone wash: Container No. 1 impgr was broken before being washed with water! Extra No. ____ Weight results 17.7 mg

Dry probe and cyclone catch: Container No. X Extra No. X Weight results ____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. 1C Extra No. 1C-1 Weight results 223.2 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
012203	1D		

Filter particulate weight 116.6 mg

Total particulate weight 531.6 mg

Silica Gel

	1	2	3	4
Weight after test:	217.6	220.7	____	____
Weight before test:	200	200	____	____
Moisture weight collected:	____	____	____	____
Container number:	1. 17.6	2. 20.7	3. ____	4. ____

1180
38.3
1218.3

Moisture total 1218.3 gm

Sample number: 1 Analyze for: Mass part.

Method determination: Standard

Comments: Impgr. was smashed after pouring out sample. No water rinse or acetone rinse was done on this.

PARTICULATE CLEANUP SHEET

Date: 8-27-71 Plant: Oregon Portland Cement

Run number: 2 Location of sample port: Rite Stack

Operator: C E Riley Barometric pressure: 29.98

Sample box number: 25 Ambient temperature: 65

Impinger H_2O

Volume after sampling 1368 ml Container No. 2A Ether-chloroform extraction of impinger water ____ mg

Impinger prefilled with 200 ml Extra No. 2A-1

Volume collected 1168 ml Impinger water residue 381.4 mg

Impingers and back half of filter, acetone wash:

Container No. 2B

Extra No. ____ Weight results 22.4 mg

Dry probe and cyclone catch:

Container No. X

Extra No. X Weight results ____ mg

Probe, cyclone, flask, and front half of filter, acetone wash:

Container No. 2C

Extra No. 2C-1 Weight results 524.5 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
012202	2D		

Filter particulate weight 115.0 mg

Total particulate weight 843.3 mg

Silica Gel

Weight after test:	438.1			
Weight before test:	400.0			
Moisture weight collected:	38.1			
Container number:	1.	2.	3.	4.

1168.0
38.1
1206.1

Moisture total 1206.1 gm

Sample number: 2 Analyze for: Mass Part.

Method determination: Standard

Comments: 1st impg was broken before run started! Changed 1st & 2nd impg & refilled with water. Emptied water out and also changed silica gel after completing half of run.

PARTICULATE CLEANUP SHEET

Date: 8-27-71 Plant: Oregon Portland Cement

Run number: 3 Location of sample port: Kiln Stack

Operator: C E Riley Barometric pressure: 29.58

Sample box number: 241 Ambient temperature: 75°

Impinger H_2O

Volume after sampling 1260 ml Container No. 3A Ether-chloroform extraction of impinger water ____ mg

Impinger prefilled with 200 ml Extra No. 3A-1

Volume collected 1060 ml Impinger water residue 223.4 mg

Impingers and back half of filter, acetone wash: Container No. 3B

Extra No. ____ Weight results 13.0 mg

Dry probe and cyclone catch: Container No. X

Extra No. X Weight results ____ mg

Probe, cyclone, flask, and front half of filter, acetone wash: Container No. 3C

Extra No. 3C-1 Weight results 300.3 mg

Filter Papers and Dry Filter Particulate

Filter number	Container no.	Filter number	Container no.
12205	3D		

Filter particulate weight 79.5 mg

Total particulate weight 616.2 mg

Silica Gel

Weight after test:	4338			
Weight before test:	4000			
Moisture weight collected:	338			
Container number:	1.	2.	3.	4.

1060
338
1093.8

Moisture total 1093.8 gm

Sample number: 3 Analyze for: Mass Conc.

Method determination: Standard

Comments: Probe and filter connector was broken before run started, replaced and started run.

SAMPLING SUMMARY SHEETS

PLANT Oregon Steel Mill Co. LOCATION Lake Oswego, Oregon

SAMPLED SOURCE Wet Scrubber Stack

Train Data

Run No.	Date	Nozzle dia. in.	Net time min.	Bar. pres. "Hg.	Orifice diff. ΔH "H_2O	Volume sampled meter cond. cu. ft.	Meter temp. °F	Volume sampled standard cond. cu. ft.
1	8-24-71	.250	160	30.02	.480	86.095	98.0	82.180
2	8-25-71	.250	160	29.98	.439	83.333	83.4	81.564
3	8-26-71	.250	160	29.88	.830	81.780	95.5	78.290

Moisture and Gas Data

Run No.	Total moisture ml.	Moisture std. cond. cu. ft.	% Moisture by volume	Mole fraction dry gas	Molecular wt. of dry stack gas	Molecular wt. of moist. stack gas
1	1218.3	57.68	41.24	.588	30.73	25.49
2	1206.1	57.17	41.21	.588	31.54	25.96
3	1093.8	51.85	39.84	.602	31.54	26.15

Stack Data

Run No.	Stack area in^2	Velocity head "H_2O	Static press. "Hg.	Stack press. "Hg. Abs.	Stack temp. °F
1	5542	.689	.15	30.17	390
2	5542	.678	.14	30.12	365
3	5542	.632	.13	30.11	386

Velocity and Calculation Data

Run No.	Average $\sqrt{\text{Velocity} \times \text{temperature } ^\circ R}$	Stack velocity fpm stack cond.	Stack gas volume scfm	Percent isokinetic
1	24.15	3788	53,890	107.3
2	23.57	3667	53,661	106.9
3	23.02	3569	52,126	105.7

production TONS/hr. Run 1 – 59.55
Run 2 – 56.46
Run 3 – 53.75

6.10 = 3.50 #/min

$\frac{40}{57} \cdot 3.54 = 249$

$\frac{670}{692} = 3.45$

$\frac{40}{57} \cdot 3.45 = 242$

7-8 6.10 = 3.54 #/min
8-9 6.10 = 3.54
9-10
10-11
11-12 692 3.68
12-13
13-14
14-15
15-16 692 3.45
16-17

[305] = 6.10 / 2000

30 min 45
35 min 40

27

7-8	60	X	3.54	X 6.10 #/661
8-9	60	X	3.54	
9-11	120	X	2.49	
11-12	60	X	3.45	
12-14.30	150	X	2.42	
14.30-1600	90	X	3.45	
16 1620	20	X	2.42	
1620-1700	40	X	3.45	

661

KILN FEED (T/HR)
64.6
64.6
45.6
63.1
44.4
63.1
44.4
63.1

KILN FEED (T/HR) — 26

65.0	11-12	60	3.56 X 6.10
51.6	12-13	30	2.82
65.0		30	3.56
45.7	13-14	25	2.70
6.50		85	3.56
65.0	14-15	60	3.56

27TH

TIME	T/HR
7-8	64.6
8-9	64.6
9-10	45.6
10-11	45.6
11-12	63.1
12-1	44.4
1-2	44.4
2-2:30	44.4
2:30-3	63.1
3-4	63.1
4-4:20	44.4
4:20-5	63.1

26TH

TIME	T/HR
11-12	65.0
12-12:30	51.6
12:30-1	65.0
1-1:35	45.7
1:35-2	65.0
2-3	65.0

SAMPLING PERIODS:

8/24/71 @ 11:23 - 2:30

8/27/71

1:35
1:20
2:55

② 7:37 - 10:55 11:08 - 12:20

③ 1335 - 16??

APPENDIX D

STANDARD SAMPLING PROCEDURES

The sampling procedures used are identical to those outlined in the Federal Register, "Standards of Performance for New Stationary Sources" (23 December, 1971).

APPENDIX E

LABORATORY REPORT

Table E - I presents the particulate analysis results which were reported by the EPA laboratory.

TABLE E - I

PARTICULATE MASS DETERMINATION

Subject: Oregon Portland Cement Company

To:
Mr. Gene Riley, DAT, ETB
Mechanical & Metallurgical Section

The results of particulate mass determination for the sampling trip to Oregon Portland Cement Company appear below:

Sampling Trip No. 1 (August 1971)

Run No.	Fraction	Particulate, mg
1	Impinger water residue	169.1
	Back half rinse	17.7
	Front half rinse	228.2
	Filter	116.6
		531.6
2	Impinger Water residue	381.4
	Back Half Rinse	22.4
	Front Half rinse	324.5
	Filter	115.0
		843.3
3	Impinger water residue	223.4
	Back Half rinse	13.0
	Front half rinse	300.3
	Filter	79.5
		616.2
	Water blank	0.75 mg/500 ml
	Acetone blank	0.75 mg/500 ml

The above results reflect subtraction of the blanks.

Howard Crist
Howard Crist
Chief, Source Sample
Analysis Section, SSFAB, DAS

cc: Mr. Gene Smith

APPENDIX F

TEST LOG

Table F - I presents the actual time during which sampling was conducted.

Table F - I

Sampling Log

Run	Date	Sampling Port	Began	Ended	Elapsed Time(min)
1	8-26-71	1	11:33	12:53	80
		2	13:07	14:27	80
2	8-27-71	1	07:37	08:50	73
		1	10:48	10:55	7
		2	11:08	11:38	30
		2	11:48	12:38	50
3	8-27-71	1	13:35	14:55	80
		2	15:02	16:22	80

APPENDIX G

PROJECT PARTICIPANTS AND TITLES

Name	Title
Howard Crist	Analytical Chemist, ETB
James Harris	Engineering Aid, ETB
Raymond Mobley	Technician, ETB
Allan Riley	Technician, ETB
Clyde Riley	Technician, ETB
Gene Smith	Chemical Engineer, ETB
Philip York	Chemical Engineer, SDID