Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP42 Section:	11.19.1
Background Chapter	4
Reference:	15
Title:	*Emission Test Reports for U.S. Silica, Oceanside, CA, August 1989, September 1990, January 1991, and June 1987*, Air Pollution Control District, San Diego, CA.

SAND & GRAVEL
REF 15 (B2)
not used in
AP-42

SAND & GRAVEL - REFERENCE 15

U.S. SILICA, OCEANSIDE, CA

CONSISTS OF RESULTS OF 4 TESTS ON SAND DRYER

DATA NOT USED FOR FOLLOWING REASONS:

- ALL TESTS CONSISTED OF ONE RUN ONLY
- USED MODIFIED METHOD 5 WITH FILTER PLACED AFTER THE IMPINGERS, INSTEAD OF BEFORE
- PRODUCTION DATA NOT PROVIDED FOR ALL TESTS

SDC - 40
SAND & GRAVEL
REF. 15 (BR)

apcd

County of San Diego

R. J. Sommerville
Air Pollution Control Officer

May 8, 1990 [redacted]

Mark Lough
U.S. Silica
3231 Oceanside Blvd.
Oceanside, CA 92056

SUBJECT: **RENEWAL TEST REPORT**

The enclosed test report is the result of testing done at your facility.

If you have any questions, please call me at (619) 694-3359.

C. W. Ridenour
Senior Air Pollution Chemist

Enclosures

AIR POLLUTION CONTROL DISTRICT
9150 Chesapeake Drive. San Diego, California 92123-1095
(619) 565-5901

SAN DIEGO AIR POLLUTION CONTROL DISTRICT
9150 CHESAPEAKE DRIVE
SAN DIEGO, CA. 92123

SUMMARY:
SOURCE TEST OF PARTICULATE EMISSIONS TO THE ATMOSPHERE

TEST SITE: U.S. Silica
3231 Oceanside Blvd.
Oceanside Ca. 92056

TEST #: 89234 P/O # : 000236 TEST DATE: 22 AUG. 89

EQUIPMENT: Fluid bed dryer on a glass sand process line: crushing, drying, & screening systems with dust laden air from bagging & lower bin areas vented to an antipol wet type air scrubber, 24000 dscfm, w/ 250 gpm of water. (appl. #10658)
(appl. #860749 gea)
UNIT TESTED: Venturi-type scrubber

SITE PERSONNEL: Mark Lough
APCD PERSONNEL: T. Wood, J. Jackson,and G. Mazis
REPORT BY: J.Jackson DATE: 18 DEC. 89
APPROVED BY: C.W. Ridenour DATE: 5/8/90
C.W. RIDENOUR
SENIOR AIR POLLUTION CHEMIST

PARAMETERS:	MEASURED:
STACK GAS FLOW RATE (DSCFM):	19,617
STACK GAS TEMPERATURE °F (AVG):	137
PRODUCTION RATE (AVG):	70.8 tons/hr.

RESULTS:

TEST	PERMIT LIMIT	MEASURED	PERFORMANCE
RULE 54 DUST AND FUME	40.00 lb/hr	1.71 lbs/hr	PASSED
RULE 50: General	20 %	10 %	PASSED

TEST REFERENCE:
San Diego Air Pollution Control District Quality Assurance Manual Method 5 for Particulate Emissions from Stationary Sources.

TEST DESCRIPTION

Introduction: This report presents the results of particulate loading and gas volume tests at U.S. Silica The test was performed on a Venturi-type scrubber serving the fluidized bed dryer.

System Description:

Glass sand is dried in a fluid bed dryer which is fired by natural gas. The exhaust from this dryer is pulled through a venturi-type scrubber, the emissions to the atmosphere from this scrubber are the subject of this report.

Procedures:
The procedures and equipment utilized in performing these tests are based on EPA New Source Performance Standards Method 5. The sampling train was modified to exclude the front-end filter and include a back-end filter, per the San Diego Air Pollution Control District Method 5 testing guidelines. The calculations were designed to include the impinger catch so that the test results can be compared to Rule 54 of SDAPCD.

Velocity Traverse:
Prior information regarding the stack velocity profile eliminated the need for a separate exploratory traverse. Temperature and pitot tube data collected during actual sampling were used to calculate stack volume.

Particulate Sampling:
This sample consisted of 28 traverse points, 7 from each of 4 sample ports as shown in Figure 1&2. Two of the ports were inaccessible due to probe interference with railing. The sample was collected 114 inches below the top of the stack. Field data associated with samp collection has been transferred to computer printout and is shown in the report. Calculations were done by computer and are also shown within the report.

Gas Analysis:
An integrated bag sample was collected on site and measured. The oxygen and carbon dioxide content of the stack gas was measured using a Teledyne model # 320P-4 serial # 66676, and an Anarad gas analyzer model # AR-400, serial # 305, respectively, as per Method 3 in SDAPCD test guidelines.

Comments:
This report provides sufficient information to determine that the site is in compliance despite equipment problems which prevented sampling in the standard configuration.

SITE: U.S. Silica

OPERATOR: J.Jackson

TEST DATE: 22 AUG. 89

TEST: 89234

DATA SUMMARY: #

TRAVERSE POINT NUMBER	GAS METER READING (Vm), ft3	PRESS. DIFF. ACROSS PITOT TUBES	PRESS. DIFF. ACROSS ORIF. ACTUAL	DRY GAS METER TEMPERATURE		STACK TEMP	IMP. TEMP	STACK FLOW (velocity)
				INLET	OUTLET			
	9.865							
1		.10	0.10	94	102	174	67	19.88
2		.10	0.10	93	113	174	65	19.88
3		.20	0.12	92	116	174	63	28.12
4		.50	0.27	92	119	174	57	44.46
5		.80	0.48	92	122	161	53	55.66
6		.70	0.42	92	122	153	53	51.73
7		.40	0.24	92	122	147	55	38.91
8		.15	0.18	92	117	140	67	23.69
9		.35	0.21	92	122	160	61	36.79
10		.60	0.36	93	126	152	54	47.85
11		1.15	0.70	93	128	145	52	65.87
12		1.60	0.95	94	130	138	51	77.25
13		1.60	0.95	94	131	136	50	77.12
14		1.00	0.60	94	130	135	52	60.92
15		.50	0.30	99	109	119	64	42.49
16		1.00	0.60	98	126	118	53	60.04
17		1.60	0.95	97	129	121	53	76.14
18		2.10	1.25	96	130	119	51	87.08
19		2.70	1.61	96	129	122	52	99.00
20		2.70	1.61	95	125	118	52	98.66
21		1.50	0.90	94	121	122	53	73.79
22		1.40	0.84	96	114	118	57	71.04
23		2.25	1.34	98	127	119	51	90.14
24		2.95	1.76	95	128	119	51	103.21
25		3.75	2.25	95	133	120	52	116.47
26		4.50	2.69	95	136	121	52	127.69
27		4.10	2.45	95	135	121	53	121.89
28	50.959	2.80	1.70	95	135	113	46	100.03
29								
30								
31								
32								

Pressures are in inches of water, temperatures are in degrees Fahrenheit, velocities are in ft/sec. All measurements are actual - uncorrected - values.

Average:	Vm	ΔP	ΔH	t1	t2	ts	ti	vs
	41.094	1.54	0.93	94	124	137	55	68.42

DATA SUMMARY:

PRESSURES

P bar	29.9	in Hg
P static	3.50	in H2O
Ps	30.2	in Hg

AVERAGE TEMPERATURES

ts	= 137	F
tm = 1/2(ave.t1+ave.t2)	= 109	F
ti	= 55	F

VOLUMES

Vm, meter	41.094	ft^3
Vlc, impingers	109.4	ml

VAPOR PRESSURES

Vpw @ Imp = 0.436 inHg

METER BOX PARAMETERS

ΔH@ =	2.72	inH2O
ΔP =	1.54	inH2O
ΔH =	.93	inH2O
METER BOX I.D.#	D-337	

NOZZLE AND PROBE

Dn =	0.146	In
An = Dn^2*π/4 =	.0167	in^2
Cp =	0.840	
Y =	.9898	

STACK MEASUREMENTS

%CO2	1.40	
%CO	.00	
%O2	19.50	
%N2	79.10	
Ø = sampling time	98	minutes
mn=particulate collect'd	.0249	grams

STACK PARAMETERS

Stack Diameter =	2.50	ft
Ao=Area stack =	6.25	ft^2

CALCULATIONS:

				EQUATION NUMBER
corr Vwm = ((Vm*Vpw@imp/Ps)*Pm*Tstd)/(Tm*Pstd) = water volume correction at meter w/o silica gel	=	0.5518	ft^3	1
Vm std = (Vm*Y*Tstd*Pm/(Pstd*Tm))-corr Vwm = meter volume corrected to STP	=	37.23	ft^3	2
Pm= Pbar+(ΔH/13.6)= corrected pressure of meter	=	29.97	in Hg	3
Tm= (t1+t2)/2 + 460 = meter temperature	=	569.3	°R	4
Ts = ts+460 = corrected stack temperature	=	596.9	°R	5
Ps= Pbar + (P static/13.6)= corrected stack pressure	=	30.16	in Hg	6
Vw std = Vlc*∂*R*Tstd/(Pstd*Md)+corr Vwm = water volume at STP	=	5.72	ft^3	7
Bws = (Vw std+corr Vwm)/(Vw std+corr Vwm+Vm std) = moisture	=	0.1441		8
mn= grams of particulate (from laboratory sheet)	=	0.0249	grams	9
Cs = 15.43*mn/Vm std = grain loading (dry)	=	0.0103	grains/dscf	10

GAS ANALYSIS

component	gas comp.	Bws	Mw g/g*mole	Mw wet
H2O	.14	0.1441	18	2.59
		1 - Bws		
Oxygen	.20	0.8559	32	5.34
Carbon monoxide	.00	0.8559	28	0.00
Carbon dioxide	.01	0.8559	44	0.53
N2 + inerts	.79	0.8559	28	19.09

Md = 0.32*%O2+0.44*%CO2+0.28*(100-%O2-%CO2) = average molecular weight, dry	(g/g*mol)=	27.55
vs= 85.49*Cp*((Ts*ΔP)/(Ps*Ms))^.5 = stack velocity	(ft/s)=	68.42
Qs = (vs)*Ao*60 = stack flow rate	(acfm)=	25,658
Qstd =17.68*Qs*(1-Bws)*Ps/Ts =flow rate at STP	(dscfm)=	19,617
I = 144*100*Ts*(.002669*Vlc+(Vm/Tm)*Pm)/(60*Ø*vs*Ps*An) =isokinetic	(%) =	95.33
E = (0.00847)*(Qstd)*Cs = particulate emission rate	(lbs/hr) =	1.71

SUMMARY OF CALCULATIONS:

I = % isokinetics = 95.3 %

Cs = grain loading (dry) = 0.010 grains/dscf

E = particulate emission rate = 1.71 lbs/hr

% CO2 = 1.40 %

NOMENCLATURE:

* = multiplication
/ = division
^ = exponentiation
Vm = sample gas volume, uncorrected = (ft^3)
ΔP = root mean pitot tube differential pressure
= (summation(press.diff. across pitot tubes^.5)/number entries)^2 = (in H2O)
ΔH = average differential pressure across the orifice = (in H2O)
t1 = dry gas meter inlet temperature = (°F)
t2 = dry gas meter outlet temperature = (°F)
ts = stack temperature = (°F)
ti = impinger out temperature = (°F)
vs = stack gas velocity = 85.49*Cp*(Ts*ΔP/(Ps*Ms))^.5 = (ft/s)
Pbar = barometric pressure = (in Hg)
Pstatic = stack static pressure = (in Hg)
Ps = Absolute stack pressure = Pbar +(Pstatic/13.6) = (in Hg)
tm = dry gas meter temperature =(t1+t2)/2 = (°F)
Vlc = collected water,impingers = (ml)
Vpw = Vapor pressure of water = (in Hg)
ΔH @ = orifice pressure differential that equates to 0.75 cfm of air @ 68°F and 29.92 in Hg
Dn = nozzle diameter = (in)
An = nozzle area = π*Dn^2/4 = (in^2)
π = the ratio of circumference of a circle to its diameter = 22/7 (dimensionless)
Cp = pitot tube coefficient = (dimensionless)
Y = meter box coefficient = (dimensionless)
CO2 = carbon dioxide = (%)
CO = carbon monoxide = (%)
O2 = oxygen = (%)
N2 = nitrogen = (%)
Ø = sampling time = (minutes)
mn = particulate found in sample train = (grams)
Ao = stack area = stack diameter^2*π/4 if round; length *width if rectangiar = (ft^2)
Corr Vwm = ((Vm*Vpw@imp/Ps)*Pm*Tstd)/(Tm*Pstd) = (ft^3)
Pm = absolute meter pressure = Pbar+(ΔH/13.6) = (in Hg)
Tstd = temperature at standard conditions = (528°R)
Tm = dry gas meter temperature =(t1+t2)/2+460 = (°R)
Pstd = pressure at standard condition = (29.92 in. Hg)
Vm std = corrected volume of meter = Vm*Y*T std*Pm/(Pstd*Tm)-corr Vwm = (ft^3)
Ts = stack temperature = (°R)
Vw std = water volume at STP = Vlc*∂*R*Tstd/(Pstd*Md) = (ft^3)

NOMENCLATURE: cont.

∂ = density of water at STP = 0.002201 = (lb/ml)
R = ideal gas constant = 21.85 in. Hg*ft^3/°R*lb*mole
Md = dry stack gas molecular weight = 0.32*%O2+0.44*%CO2+0.28(100-%O2-%CO2)
= (g/g*mole)
Bws = fractional stack gas moisture content = (Vw std+Corr Vwm)/(Vwstd+Corr Vwm+Vm std
= (%/100)
Cs = grain loading = 15.430*mn/Vm std = (grains/dscf)
Mw = molecular weight = (g/g*mole)
Ms = wet stack gas molecular weight = Md*(1-Bws)+Bws*18 = (g/g*mole)
Qs = flow rate = vs*Ao*60 = (acfm)
Qstd = flow rate at standard conditions = 17.68*Qs*(1-Bws)*Ps/Ts = (dscfm)
I = isokinetics = 144*100*Ts*(.002669*Vlc+Vm/Tm)*Pm/(60*Ø*vs*Ps*An) = (%)
E = particulate emissions rate = 0.00847*Cs*Qstd = (lbs/hr)

CONSTANTS:

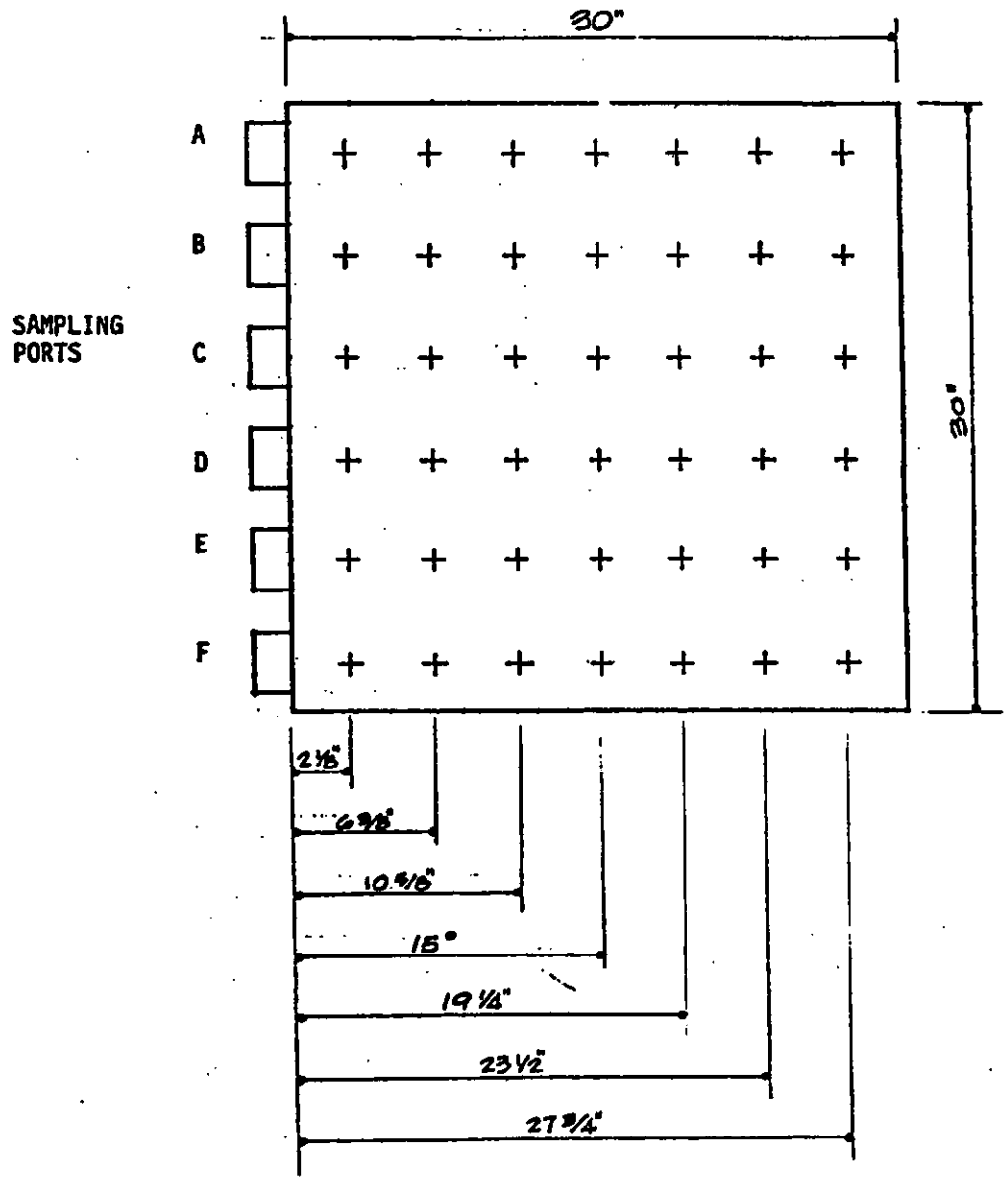
0.00847 lb/(gr*min/hr) = 1 lb/7000grains*60 min/hr
13.6 in H2O/in Hg
17.68 °R/in Hg
60 sec/min
32 g/g*mole = O2 molecular weight
44 g/g*mole = CO2 molecular weight
28 g/g*mole = N2 molecular weight
18 g/g*mole = H2O molecular weight
85.49 (ft/sec)*(lb*in Hg/(lb*mole**R*in H2O))^.5
0.04707 = ft^3/ml
460 (demensionless) = conversion °F to °R
144 in^2/ft^2
15.43 gr/g
0.002669 in Hg*ft^3/(°R*ml)

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

TRAVERSE POINTS

CRYSTAL SILICA

EXHAUST FROM FLUID BED DRYER



* Ports E&F were not unaccessible, thus not traversed.

Figure 1

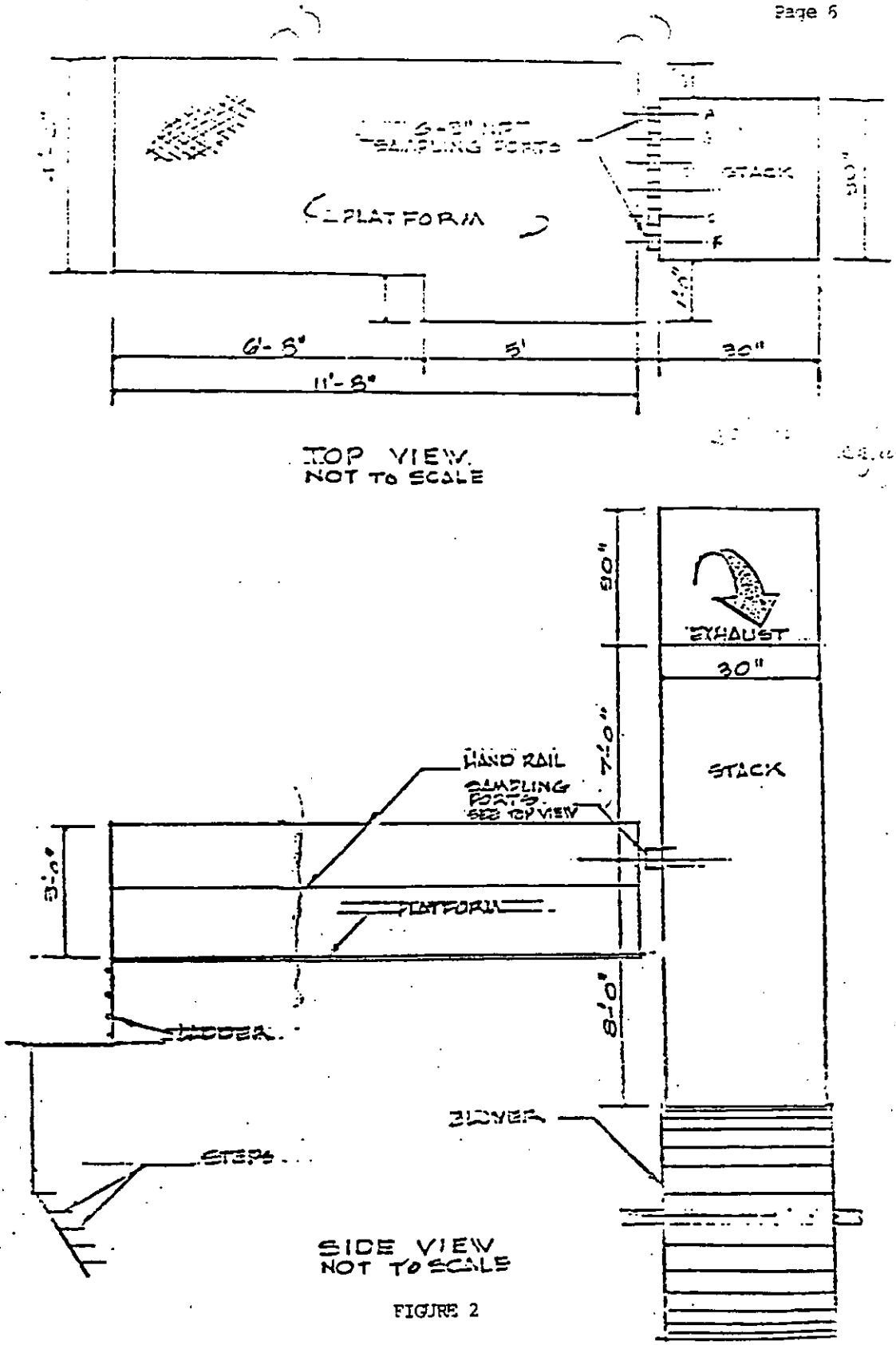

SAMPLING PORTS
STACK
PLATFORM
6'-5"
5'
30"
11'-8"
TOP VIEW
NOT TO SCALE
90"
EXHAUST
30"
7'-0"
STACK
HAND RAIL
SAMPLING PORTS SEE TOP VIEW
3'-0"
PLATFORM
8'-0"
LADDER
BLOWER
STEPS
SIDE VIEW
NOT TO SCALE

FIGURE 2

US SILICA COMPANY
3231 OCEANSIDE BLVD.
OCEANSIDE, CA

22 AUG 89

EQUIPMENT DESCRIPTION:

SAND FLUID BED DRYER WITH ANTIPOL WET TYPE AIR SCRUBBER AND PROCESS LINE (P/O 0236 & 237)

I. PRODUCTION DATA

TIME	TONNAGE	TONS/HR	
11:53	103442.20	76	PORT B DATA*
12:04	103454.96	76	
12:07	103458.71	78	
12:10	103461.92	76	
12:33	103489.75	75	PORT C DATA
12:36	103492.77	79	
12:39	103496.12	78	
12:42	103499.60	75	
12:45	103503.46	74	
12:48	103507.51	79	
12:51	103510.50	70	
12:54	103514.50	75	PORT D DATA
12:57	103517.77	80	
1:00	103520.85	75	
1:03	103524.24	76	
1:06	103528.11	72	
1:09	103532.11	78	
Δ: 1.27 HRS	89.91 TONS	MEAN: 76 ± 2.6	PRODUCTION RATE (CALCULATED) 70.8 TONS/H

* NOTE: PORT 'A' AND PARTIALLY PORT 'B' DATA NOT AVAILABLE DUE TO INSTRUCTION REQUIREMENTS OF NEW STAFF.

II. OPERATING TEMPERATURES (°F)

	BROWN	RED	GREEN	PURPLE	MV (EXHAUST)
	550	130	540	190	-.3 (AVG)
	550	120	550	190	-.3
	560	125	540	190	-.3
	540	125	540	190	-.3
	580	130	580	190	-.3
	580	130	570	190	-.3
	575	130	570	190	-.3
	575	130	595	190	-.3
	585	130	590	185	-.3
	565	130	555	190	↓
	570	130	560	190	↓
	570	130	555	185	↓
	570	130	560	190	↓
	565	130	565	190	↓
	580	130	590	185	↓
	570	130	580	190	↓
	575	130	585	185	
MEAN:	569	130	565	190	

* BURNER TEMP STEADY AT 180 – 200 °F
* NAT. GAS SUPPLIED DIRECTLY FROM SDGE (NO METER)

BROWN = UNDERGRID FRONT $T_{1,2,3}$
RED = ABOVE GRID $T_{4,5,6}$
GREEN = UNDERGRID BACK $T_{7,8,9}$
PURPLE = IN BED $T_{10,11,12}$

U.S. SILICA 23 AUG 89

① A TOTAL OF 4 OF THE POSSIBLE 6 PORTS WERE SAMPLED. A PORT CONSISTED OF 7 POINTS. THEREFORE, 28 POINTS INSTEAD OF 42 POINTS WERE SAMPLED. THE REASONS FOR THIS ARE:

(a) THE ONLY FUNCTIONAL PROBE WE HAVE IS 6 FOOT LONG (IDEAL).

(b) DUE TO THE LENGTH OF THE PROBE, ~~AND~~ THE HEIGHT OF THE PORTS, AND THE DESIGN OF THE RAILING, ACCESS TO THE RIGHT (TWO) PORTS WAS NOT POSSIBLE.

* FOR A DRAWING OF THIS SET UP SEE REPORT.

② SAMPLING TIME WAS 3.5 MINUTES PER POINT

③ SETTING UP FOR THIS TEST WAS DIFFICULT. THE "NEW" PORTS ARE 2.25" IN DIAMETER. NOTE THAT A 3 FOOT PROBE IS A MUST FOR THIS SITE. IT IS ALSO SUGGESTED THAT A PLANK (WOOD) OF APPROXIMATELY 60" BE USED FOR FUTURE TESTS. SEE SITE PHOTOS!

④ VISIBLE EMISSIONS RANGED FROM 0–10%

⑤ PROCESS WAS UTILIZING NATURAL GAS SUPPLY FROM SIDE (i.e. NO GAUGES FOR GAS FLOW).

(6) SITE HAS MASSIVE AMOUNTS OF FUGITIVE "EMISSIONS". THE SOURCES FOR THESE EMISSIONS ARE MAINLY FROM CONVAIR BELT TRAFFIC AND MISCELLANEOUS TRANSFER PROCESSES.

GEORGE MAZIS
ASSISTANT AIR POLLUTION CHEMIST

SDC APCD METHOD 5 LAB SHEET

SITE = U. S. Silica Test Date = 8-22-89

TEST # = 89234

VOLUMES

(1) IMPINGER VOLUMES

	final			Initial			Δ
# 1	644.7	ml	-	539.4	ml	=	105.3
# 2	542.6	ml	-	540.0	ml	=	2.6
# 3	457.3	ml	-	456.2	ml	=	1.1
# 4	441.7	ml	-	441.3	ml	=	0.4

TOTAL VOLUME LIQUID COLLECTED = 109.4

comments: Impingers were weighed in gms. Used 1 gm/ml to convert to mls.
Rinses for front half and back half were combined.
Particulate was white and chalky.

(2) SOLVENTS ADDED DURING RECOVERY

ACETONE		WATER	
BKR ID =	69	BKR ID =	76
FRONT HALF WASH =	400 ml	FRONT HALF WASH =	410 ml
BACK HALF WASH =	ml	BACK HALF WASH =	ml
TRANSFER RINSE =	30 ml	TRANSFER RINSE =	32 ml
		IMPINGERS =	200 ml
total acetone =	430.0 ml	total water =	642.0 ml

* All data and calculations may be found on file at the San Diego County Air Pollution Control District.

SDC APCD METHOD 5 LAB SHEET

TEST # = 89234

STANDARD CONCENTRATIONS

volume Ac = 515 ml volume water = 1010 ml

ACETONE		WATER	
BKR ID =	70	BKR ID =	71
f:	50.9329 g	f:	49.4106 g
i:	50.9326 g	i:	49.4100 g
Δ:	0.0003 g	Δ:	0.0006 g

Limits:

limit for acetone is 7.9 µg/ml (7.9 * 10^-6 g/ml)
limit for water is 4 µg/ml (4 * 10^-6 g/ml)

The Acetone **PASSED** The Water **PASSED**

5.83E-07 g/ml 5.94E-07 g/ml

---

(3) CORRECTIONS- (volume used)*(std wt)

ACETONE		WATER	
FRONT HALF =	0.0002 g	FRONT HALF =	0.0002 g
BACK HALF =	0.0000 g	BACK HALF =	0.0000 g
BKR RINSES =	1.7476E-05 g	BKR RINSES =	1.901E-05 g

total grams from solvents = 0.0005 g

SDC 42

SDC APCD METHOD 5 LAB SHEET

TEST # = 89234

SAMPLE WEIGHTS

	FRONT HALF	BACK HALF
ACETONE		
BKR ID =	69	
f:	49.9289 g	g
i:	49.9118 g	g
Δ:	0.0171 g	0.0000 g
WATER		
BKR ID =	76	
f:	48.2255 g	g
i:	48.2173 g	g
Δ:	0.0082 g	0.0000 g
ORGANIC		
BKR ID =		
f:	g	g
i:	g	g
Δ:	0.0000 g	0.0000 g
FILTERS		
ID =	89016	
f:	0.1208 g	g
i:	0.1207 g	g
Δ:	0.0001 g	0.0000 g

SDC APCD METHOD 5 LAB SHEET

TEST # = 89234

(4) FINAL WEIGHTS

(total weight gained)

FRONT HALF= 0.0253 BACK HALF= 0.0000 ORGANIC= 0.0000 (front and back)

WEIGHT GAINED = 0.0253 g

correction for solvents (acetone and water)

WEIGHT GAINED FROM SOLVENTS = 0.0005 g

(5) CORRECTED WEIGHTS

WEIGHT GAINED (CORRECTED) = 0.0248 g

(6) FILTERS

FRONT HALF= 0.0001 BACK HALF= 0.0000

TOTAL WEIGHT GAINED = 0.0249 g

Comments - Filter - light loading of light grey particulates noted.

SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT

TEST # 89 234 DATE: 8-22-89

SITE US SILICA

		AFTER TRAVERSE
Pm, absolute	30	NOTE: T stack HAVE CHANGED ΔP's HAVE CHANGED
Ps, absolute	30	
Tm, absolute	99	100
∂H@ across meter	2.7	
% moisture of stack	~~10%~~ 12%	12%
correction factor	✓ ~~1.44~~ 1.39	1.4
Ts, absolute	121	147 (MEAN)
∂P stack	2.1	2.3 (MEAN)
ideal nozzle diameter	✓ ~~.158~~ .159	.157
nozzle used	.146	
test differential pressure	$K = \frac{1.85}{2.95} = .63$	

$\frac{1.85}{3.1} = K = .6$

GO BACK UP USING "REAL WORLD" NOZZLE AND RE-ADJUST NOMAGRAPH TO CORRECT ΔH/ΔP RATIO.

$\Delta H = K \Delta P$

$K = \Delta H / \Delta P$

$\frac{1.85}{2.95} = .63$

old ΔH = 1.0 rate = .47

ΔH = 2.0 rate = .63

$\bar{x} = .55 ft^3/min$

$50 ft^3 \left(\frac{min}{.55 ft^3} \right) = \frac{90.9 min}{42 pts} = 2.2 min/pt$ go with 3'/pt

$= \frac{90.91}{28} = 3.3$

go with 3.5 min/pt

2 ducts short = no access.

PORTS L → R A – B

CO_2 = 1.4 %
O_2 = 19.5 %

SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT

SITE US SILICA

DATE 22 AUG 89

OPERATOR MAZIS, HAGERTY, WOOD, JACKSON

PRE LEAK Ø cfm @ 15 in. Hg — PASS / NOT PASS

POST LEAK Ø cfm @ 8 in. Hg — PASS / NOT PASS

PITOT CHECK PRE + POST — PASS / NOT PASS

	TRAVERSE POINT NUMBER	SAMPLING TIME, min ~11:20 AM	GAS METER READING (Vm), ft3 9.865	VELOCITY HEAD (dP), inHg	ORIFICE METER (dH), in Hg ACTUAL	DRY GAS METER TEMPERATURE INLET (T1)	DRY GAS METER TEMPERATURE OUTLET (T2)	PUMP VACUUM in Hg	STACK TEMPERATURE (Ts), F	IMPINGER TEMPERATURE
PORT 1	A 7	3.5		.1	.1	94	102	Ø	119	67
	A 6	7	10.440	.1	.1	93	113	Ø	119	65
	A 5	10.5	11.315	.2	.12	92	116	Ø	115	63
	A 4	14.0	12.175	.5	.27	92	119	Ø	115/174	57
	A 3	17.5	13.260	.8	.48	92	122	Ø	161°	53
	A 2	21	14.390	.7	.42	92	122	Ø	153°	53°
	A 1	24.5	15.280	.4	.24	92	122	Ø	147°	55°
Port 2	B 1	3.5	15.790	.15	.18	92	117	Ø	140°	67°
	B 2	7.0	16.380	.35	.21	92	122	Ø	160°	61°
	B 3	10.5	17.530	.60	.36 ~~.60~~	93	126	Ø	152°	54°
	B 4	14.0	18.960	1.65	.70 ~~.60~~	93	128	Ø	145	52°
	B 5	17.5	20.630	1.60	.95	94	130	Ø	138°	51°
	B 6	21.0	22.240	1.6	.95	94	131	Ø	136°	50°
	B 7	24.5	23.648	1.0	.60	94	130	Ø	135	52°

negligible ΔP

#3 stack
#4 impingers

P. static +3.5

METER BOX # D337

METER dH@ 2.72

NOZZLE I.D. # .146

PROBE LENGTH 6'

should use 3'

* CALIBRATE DRY GAS OUTLET THERMOMETER.

P/O	Site	Test Date	Run	
000236	US Silica	89234	5-1	23 Aug 89

1030	DI Sample	DI # Blank	Ace Sample	Ace Blank	Comments
Sample #					Particulate was white & Chuckyn
Amt	410 Rinse 200 Charge 109.4 Condens 729.4 g	1000 ml	400 ml	500 ml Lot # 8301 Omnisol Glass Distilled EMAX0116-1	Rinse Ace Rinse 200 + 200 ml
Comments:	in Vac Oven @0707 8/24/89	in Vac oven at 1390 8/23/89		added 30 ml wash to Beaker #69	DI Rinse 410 ml +
25 Aug 89 13:00		Transfer to BKR # 71		Transfer to BKR # 70	Filter # 8901 Light Loading of light grey Particulate Desiccator 1100 23 Aug 89
Chaser		+10 ml		+15 ml	

* NOTE: H_2O PRIME RECOVERY SHOWS SOME BLACK FLOATING DEBRIS. THESE ARE SUSPECTED TO BE FROM THE PRIME [illegible].

Imp	#1	#2	#3	#4	Total
Final	644.7 g	542.6 g	457.3	441.7	Condensate
Init.	539.4	540.0 g	456.2	441.3	
	105.3 g	2.6 g	1.1 g	0.4 g	109.4 g

0010

30 AUG 89

US SILICA

DI SAMPLE INTO BEAKER #70

ml H_2O ADDED = 32 ml

PYROPOWER — Trudy's lab book — 29AUG89

BEAKER #	wt 1 8100 HRS	wt 2 2130 HRS	30 AUG89 wt 3 1100 HRS	FINAL WT
63	49.8795	49.8791		49.8792
64	49.2215	49.2215		49.2215
65	50.1773	50.1775		50.1774
66	49.6957	49.6955		49.6956
67	49.9093	49.9092		49.9093
* 68	49.3224	49.3264	49.3210	(see p. 34)
* FILTER #8314 (F.B.)	0.5230	0.5230		0.5230
FILTER #8316	0.4402	0.4400		0.4401
US SILICA				
71	49.4105	49.4106		49.4106
69	[illegible]	49.9286	49.9290	49.9289
FILTER 89016		0.1208	0.1207	0.1208
910 HRS 31AUG89 70	50.9329	31AUG89 3:00 HRS 50.9324		50.9329
76	31AUG89 310 HRS 48.2255	9689 0811 48.2256		48.2255

PYROPOWER NOTES:

* THIS SAMPLE SHOWS A OIL-LIKE RESIDUE ON BOTTOM OF BEAKER; [illegible]
* FILTER SHOWS HEAVY PART LOADING; INCLUDES [illegible] (WATER OIL) → LOOSE FROM FILTER.

8-2-89

U.S. Silica

Called Mark Low 7572630

Replaced piece - not sure of ports & holders
Did extend stack.
Low is being transferred ~ 8/18

Tues 8/22 0600 Ted Glennon (foreman) - contact after 8/18/89

Production is 80 tons
Best run is ~ 100 tons. only if dry.

P Dest done 8/8/90 5/2/90 send transltr. + mail to. 5:00 pm. (because of electricity) -4:00 pm is critical costs

U.S. Silica David Rubio
Kr. P.O. Box 1280
Oceanside 92054
He w. CA
wer

o if had too.

sen port caps.

firm if ports & support rings

(8-15) Checked w/ Mark Low. Road will be graded to the dryer.
Eye hooks above ports have been installed.
Can easily run until 1:00 pm (1-4 pm is extremely high elec. costs).
(8-15) Left message for T. Glennon, may have to test until 1:00 pm.

22 AUG 89 SRCTST

(1) 5' PROBE NON-OP, USING 6'

(2) 6' DOES NOT ALLOW FOR SAMPLING IN PORTS 5 & 6 (LTOR) DUE TO CONSTRAINTS OF PLATFORM AND RAILING, AND NEW 2" (2 1/4") PORTS DO NOT ALLOW ANGLED PENETRATION BY PROBE.

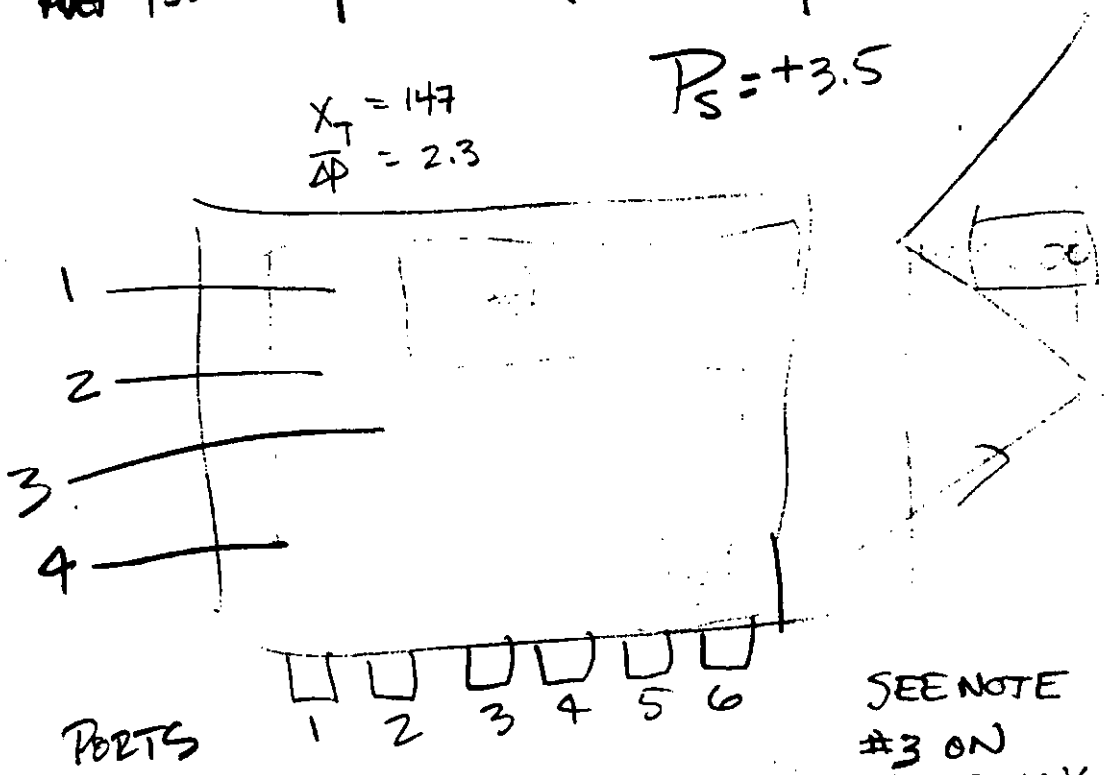
(3) NOT CYCLONIC FLOW, BUT, PORTS ARE APPX 12' FROM EXIT OF FORCED DRAFT FAN IMPACTING ON A RECTANGULAR DUCT, FORCING FLOW TO BE LOW ON PORTS 1-2, HIGH 3-5 (SEE DRAWING ON PREVIOUS PG.

VELOCITY CHECK
U.S. SILICA 22 AUG 89
T WOOD, J JACKSON, G MAZIS, M HAGERTY

PRT	1 T	1 ΔP	2 T	2 ΔP	3 T	3 ΔP	4 T	4 ΔP	FROM BK. WALL
PT 1	142	.4	144	.8	132	1.8	125	2.8	~4"
2	144	.6	140	1.4	132	2.0	155	3.4	-8"
3	169	1.0	144	1.8	133	3.0	146	4.2	-12"
4	167	1.2	160	2.0	168	3.4	148	4.8	16"
5 @ 4"			152	2.0	151	3.3	136	4.2	
FROM PORT AVG	155	.8	147	1.6	143	2.7	142	3.9	

$X_T = 147$
$\overline{\Delta P} = 2.3$

$P_S = +3.5$



SEE NOTE #3 ON FOLLOWING PAGE

8DC-45

apcd

County of San Diego

R. J. Sommerville
Air Pollution Control Officer

May 13, 1991

U S Silica Co.
Attention: PLant Engineer
3231 Oceanside Blvd.

Oceanside, CA 92056

SUBJECT: **RENEWAL TEST REPORT**

The enclosed test report is the result of testing done at your facility.

If you have any questions, please call me at (619) 694-3359.

C. W. Ridenour
Senior Air Pollution Chemist

CWR:jo

Enclosures

AIR POLLUTION CONTROL DISTRICT
9150 Chesapeake Drive, San Diego, California 92123-1095
(619) 694-3307 FAX (619) 694-2730

SAN DIEGO AIR POLLUTION CONTROL DISTRICT
9150 CHESAPEAKE DRIVE
SAN DIEGO, CA. 92123

SUMMARY:
SOURCE TEST OF PARTICULATE EMISSIONS TO THE ATMOSPHERE

TEST SITE: U. S. Silica
3231 Oceanside Blvd.
PO BOX 1280
Oceanside, CA 92054-0243

TEST #: 90257 P.O.# 236 TEST DATE 9/14/90

EQUIPMENT:
Fluid bed dryer on a glass sand process line: crushing, drying, & screening systems with dust laden air from bagging & lower bin areas vented to an antipol wet type air scrubber, 24000 dscfm, w/ 250 gpm of water. (appl. #10658) (appl. #860749 gea)

UNIT TESTED:
Venturi-type scrubber

SITE PERSONNEL:	TED GLENNON		
APCD PERSONNEL:	J. CAWYER, T. PREVO		
REPORT BY:	J. CAWYER	DATE	1/2/91
APPROVED BY:	C.W. Ridenour	DATE:	

C.W. RIDENOUR
SENIOR AIR POLLUTION CHEMIST

PARAMETERS:	MEASURED:
STACK GAS FLOW RATE (DSCFM):	22640
STACK GAS TEMPERATURE °F (AVG):	131
PRODUCTION RATE (AVG): tons/hr	74

RESULTS: Based upon APCD Method 5 Standards relating to the entire impinger catch.

TEST	PERMIT LIMIT	MEASURED	PERFORMANCE
RULE 54 DUST AND FUME	40.00 lb/hr	< 2.00 lbs/hr	PASSED

TEST REFERENCE:
San Diego Air Pollution Control District Quality Assurance Manual Method 5 for Particulate Emissions from Stationary Sources.

TEST DESCRIPTION

Introduction: This report presents the results of particulate loading and gas volume tests at U. S. Silica . The test was performed on a Venturi-type scrubber serving the the fluidized bed dryer.

System Description:
Glass sand is dried in a fluid bed dryer which is fired by natural gas. The exhaust from this dryer is pulled through a venturi-type scrubber, the emissions to the atmosphere from this scrubber are the subject of this report.

Procedures:
The procedures and equipment utilized in performing these tests are based on EPA New Source Performance Standards Method 5. The sampling train was modified to exclude the front-end filter and include a back-end filter, per the San Diego Air Pollution Control District Method 5 testing guidelines. The calculations were designed to include the impinger catch so that the test results can be compared to Rule 54 of SDAPCD.

Velocity Traverse:
Preliminary calculations were based upon data from previous tests. Temperature and pitot tube data collected during actual sampling were used to calculate stack volume.

Particulate Sampling:
This sample consisted of 42 traverse points, 7 from each of 6 sample ports as shown in Figure 1. The sample was collected 114 inches below the top of the stack. Field data associated with sample collection has been transferred to computer printout and is shown in the report. Calculations were done by computer and are also shown within the report.

Gas Analysis:
An integrated bag sample was collected on site and measured. The oxygen and carbon dioxide content of the stack gas was measured using electronic instrumentation.

SITE: U. S. Silica Report version #1

OPERATOF J. CAWYER

TEST DATE: 9/14/90

TEST: 90257

DATA SUMMARY: #

TRAVERSE POINT NUMBER	GAS METER READING (Vm), ft3	PRESS. DIFF. ACROSS PITOT TUBES	PRESS. DIFF. ACROSS ORIF.	DRY GAS METER TEMPERATURE		STACK TEMP	IMP. TEMP	STACK FLOW (velocity)
				INLET	OUTLET			
	579.583		ACTUAL					
* 1		5.00	5.00	89	108	121	57	128.32
* 2		5.00	5.00	88	112	136	53	129.96
* 3		5.00	5.00	88	114	134	52	129.74
* 4		5.00	5.00	88	114	137	51	130.07
* 5		5.00	5.00	88	114	120	51	128.20
6		5.00	5.00	88	114	115	51	127.65
7		4.10	4.50	89	119	110	52	115.09
8		3.60	4.00	90	118	135	53	110.18
9		3.70	4.10	90	125	137	52	111.89
10		3.82	4.25	90	127	133	51	113.31
11		3.80	4.25	91	128	139	51	113.58
12		4.20	4.65	91	128	139	50	119.41
13		4.50	5.00	92	126	136	51	123.29
14		2.80	3.10	92	126	120	52	95.94
15		2.90	3.20	93	123	134	56	98.81
16		2.20	2.40	94	129	138	53	86.35
17		1.65	1.80	92	129	137	53	74.72
18		1.75	1.90	91	129	135	55	76.82
19		2.00	2.20	90	130	134	55	82.06
20		2.65	3.00	90	131	135	56	94.53
21		2.00	2.20	90	130	123	57	81.29
22		1.95	2.20	90	122	134	60	81.02
23		1.50	1.70	91	128	131	59	70.88
24		1.00	1.10	91	128	138	60	58.22
25		0.80	0.90	91	126	140	57	52.16
26		1.00	1.10	91	127	130	57	57.83
27		1.35	1.50	91	129	134	57	67.42
28		1.20	1.30	91	129	120	58	62.81
29		0.85	0.90	92	120	131	60	53.36
30		0.70	0.80	91	125	130	59	48.38
31		0.30	0.30	90	124	134	62	31.78
32		0.10	0.10	90	122	131	67	18.30
33		0.15	0.20	90	122	134	67	22.47
34		0.60	0.70	90	123	133	62	44.91
35		0.65	0.70	90	123	113	59	45.95
36		0.15	0.20	90	119	128	62	22.36
37		0.25	0.30	90	120	132	63	28.96
38		0.05	0.10	90	120	133	62	12.96

39		0.05	0.10	89	120	132	64	12.95
40		0.10	0.10	88	120	131	68	18.30
41		0.15	0.20	89	120	131	63	22.42
42	660.365	0.05	0.10	90	124	115	62	12.77

* : SEE COMMENTS ON PAGE THIRTEEN

Pressures are in inches of water, temperatures are in degrees Fahrenheit, velocities are in ft/sec. All measurements are actual - uncorrected - values.

Average:	Vm	ΔP	ΔH	t1	t2	ts	ti	vs
	80.782	2.11	2.27	90	123	131	57	74.22

DATA SUMMARY:

PRESSURES

P bar 29.86 in Hg

P static 3.00 in H2O

Ps 30.08 in Hg

AVERAGE TEMPERATURES

ts = 131 F

tm = 1/2(avg.t1+avg.t2) = 107 F

ti = 57 F

VOLUMES

Vm, meter 80.782 ft^3

Vlc, impingers 137.7 ml

VAPOR PRESSURES

Vpw @ imp = 0.459 inHg

METER BOX PARAMETERS

ΔH@ = 2.61 inH2O

ΔP = 2.11 inH2O

ΔH = 2.27 inH2O

METER BOX I.D.# D337

NOZZLE AND PROBE

Dn = 0.173 in

An = Dn^2*π/4 = .0235 in^2

Cp = 0.807

Y = .9796

STACK MEASUREMENTS

%CO2 1.20

%CO 0.00

%O2 19.10

%N2 79.70

Ø = sampling time 126 minutes

mn=particulate collect'd 0.0338 grams

STACK PARAMETERS

Stack Diameter = 2.50 ft

Ao=Area stack = 6.25 ft^2

CALCULATIONS:

		UNITS		EQUATION NUMBER
corr Vwm = ((Vm'*Vpw@imp/Ps)*Pm*Tstd)/(Tm*Pstd) = water volume correction at meter w/o silica gel	=	1.13	ft^3	1
Vm std = (Vm'*Tstd*Pm/(Pstd*Tm))-corr Vwm = dry meter volume corrected to STP	=	72.88	ft^3	2
Pm= Pbar+(ΔH/13.6)= corrected pressure of meter	=	30.03	in Hg	3
Tm= (t1+t2)/2 + 460 = meter temperature	=	566.6	°R	4
Ts = ts+460 = corrected stack temperature	=	590.5	°R	5
Ps= Pbar + (P static/13.6)= corrected stack pressure	=	30.08	in Hg	6
Vw std = Vlc*∂*R*Tstd/(Pstd*MwH2O)+corr Vwm = water volume at STP	=	7.63	ft^3	7
Bws = (Vw std)/(Vw std+Vm std)*100 = percent moisture	=	9.48	%	8
mn= grams of particulate (from laboratory sheet)	=	0.0338	grams	9
Cs = 15.43*mn/Vm std = grain loading (dry)	=	0.007	grains/d dscf	10
Vm'= Vm*Y = Corrected dry gas meter volume	=	79.13	ft^3	11
Md=0.440(%CO2)+0.320*(%O2)+0.280(N2+Inerts+CO) Dry gas molecular weight	=	28.96	g/g*mole	12
Ms=Md*(1-Bws)+18.0*(Bws) Stack gas molecular weight-wet basis	=	27.92	g/g*mole	13

		UNITS	EQUATION NUMBER
vs= 85.49*Cp*((Ts*ΔP)/(Ps*Ms))^.5 = stack velocity	74.22	(ft/s)	14
Qs = (vs)*Ao*60 = stack flow rate	27834	(acfm)	15
Qstd =17.64*Qs*(1-Bws)*Ps/Ts =flow rate at STP	22640	(dscfm)	16
I = 144*100*Ts*(.002669*Vlc+(Vm'/Tm)*Pm)/ (60*Ø*vs*Ps*An) =isokinetic	97.76	(%)	17
E = (0.00857)*(Qstd)*Cs = particulate emission rate	1.39	(lbs/hr)	18

SUMMARY OF CALCULATIONS:

I = % isokinetics = 97.8 %

Cs = grain loading (dry) = 0.007 grains/dscf

E = particulate emission rate = 1.39 lbs/hr

% CO2 = 1.20 %

SITE: U. S. Silica Report version #2 OPERATOF J. CAWYER

31668 1/2/04 TEST: 90257

DATA SUMMARY: #

TRAVERSE POINT NUMBER	GAS METER READING (Vm), ft3	PRESS. DIFF. ACROSS PITOT TUBES	PRESS. DIFF. ACROSS ORIF. ACTUAL	DRY GAS METER TEMPERATURE		STACK TEMP	IMP. TEMP	STACK FLOW (velocity)
	579.583			INLET	OUTLET			
* 1		20.00	5.00	89	108	121	57	256.63
* 2		20.00	5.00	88	112	136	53	259.92
* 3		20.00	5.00	88	114	134	52	259.49
* 4		20.00	5.00	88	114	137	51	260.14
* 5		20.00	5.00	88	114	120	51	256.41
6		5.00	5.00	88	114	115	51	127.65
7		4.10	4.50	89	119	110	52	115.09
8		3.60	4.00	90	118	135	53	110.18
9		3.70	4.10	90	125	137	52	111.89
10		3.82	4.25	90	127	133	51	113.31
11		3.80	4.25	91	128	139	51	113.58
12		4.20	4.65	91	128	139	50	119.41
13		4.50	5.00	92	126	136	51	123.29
14		2.80	3.10	92	126	120	52	95.94
15		2.90	3.20	93	123	134	56	98.81
16		2.20	2.40	94	129	138	53	86.35
17		1.65	1.80	92	129	137	53	74.72
18		1.75	1.90	91	129	135	55	76.82
19		2.00	2.20	90	130	134	55	82.06
20		2.65	3.00	90	131	135	56	94.53
21		2.00	2.20	90	130	123	57	81.29
22		1.95	2.20	90	122	134	60	81.02
23		1.50	1.70	91	128	131	59	70.88
24		1.00	1.10	91	128	138	60	58.22
25		0.80	0.90	91	126	140	57	52.16
26		1.00	1.10	91	127	130	57	57.83
27		1.35	1.50	91	129	134	57	67.42
28		1.20	1.30	91	129	120	58	62.81
29		0.85	0.90	92	120	131	60	53.36
30		0.70	0.80	91	125	130	59	48.38
31		0.30	0.30	90	124	134	62	31.78
32		0.10	0.10	90	122	131	67	18.30
33		0.15	0.20	90	122	134	67	22.47
34		0.60	0.70	90	123	133	62	44.91
35		0.65	0.70	90	123	113	59	45.95
36		0.15	0.20	90	119	128	62	22.36
37		0.25	0.30	90	120	132	63	28.96

38		0.05	0.10	90	120	133	62	12.96
39		0.05	0.10	89	120	132	64	12.95
40		0.10	0.10	88	120	131	68	18.30
41		0.15	0.20	89	120	131	63	22.42
42	660.365	0.05	0.10	90	124	115	62	12.77

* : SEE COMMENTS ON PAGE THIRTEEN

Pressures are in inches of water, temperatures are in degrees Fahrenheit, velocities are in ft/sec. All measurements are actual - uncorrected - values.

Average:	Vm	ΔP	ΔH	t1	t2	ts	tl	vs
	80.782	3.90	2.27	90	123	131	57	89.61

DATA SUMMARY:

PRESSURES

P bar 29.86 in Hg

P static 3.00 in H2O

Ps 30.08 in Hg

AVERAGE TEMPERATURES

ts = 131 F

tm = 1/2(avg.t1+avg.t2) = 107 F

tl = 57 F

VOLUMES

Vm, meter 80.782 ft^3

Vlc, impingers 137.7 ml

VAPOR PRESSURES

Vpw @ imp = 0.459 inHg

METER BOX PARAMETERS

ΔH@ = 2.61 inH2O

ΔP = 3.90 inH2O

ΔH = 2.27 inH2O

METER BOX I.D.# D337

NOZZLE AND PROBE

Dn = 0.173 in

An = Dn^2*π/4 = .0235 in^2

Cp = 0.807

Y = .9796

STACK MEASUREMENTS

%CO2 1.20

%CO 0.00

%O2 19.10

%N2 79.70

STACK PARAMETERS

Stack Diameter = 2.50 ft

Ao=Area stack = 6.25 ft^2

Ø = sampling time 126 minutes

mn=particulate collect'd 0.0338 grams

CALCULATIONS:

		UNITS		EQUATION NUMBER
corr Vwm = ((Vm'*Vpw@imp/Ps)*Pm*Tstd)/(Tm*Pstd) = water volume correction at meter w/o silica gel	=	1.13	ft^3	1
Vm std = (Vm'*Tstd*Pm/(Pstd*Tm))-corr Vwm = dry meter volume corrected to STP	=	72.88	ft^3	2
Pm= Pbar+(ΔH/13.6)= corrected pressure of meter	=	30.03	in Hg	3
Tm= (t1+t2)/2 + 460 = meter temperature	=	566.6	°R	4
Ts = ts+460 = corrected stack temperature	=	590.5	°R	5
Ps= Pbar + (P static/13.6)= corrected stack pressure	=	30.08	in Hg	6
Vw std = Vlc*∂*R*Tstd/(Pstd*MwH2O)+corr Vwm = water volume at STP	=	7.63	ft^3	7
Bws = (Vw std)/(Vw std+Vm std)*100 = percent moisture	=	9.48	%	8
mn= grams of particulate (from laboratory sheet)	=	0.0338	grams	9
Cs = 15.43*mn/Vm std = grain loading (dry)	=	0.007	grains/d dscf	10
Vm'= Vm*Y = Corrected dry gas meter volume	=	79.13	ft^3	11
Md=0.440(%CO2)+0.320*(%O2)+0.280(N2+Inerts+CO) Dry gas molecular weight	=	28.96	g/g*mole	12
Ms=Md*(1-Bws)+18.0*(Bws) Stack gas molecular weight-wet basis	=	27.92	g/g*mole	13

		UNITS	EQUATION NUMBER
vs= 85.49*Cp*((Ts*ΔP)/(Ps*Ms))^.5 = stack velocity	89.61	(ft/s)	14
Qs = (vs)*Ao*60 = stack flow rate	33605	(acfm)	15
Qstd =17.64*Qs*(1-Bws)*Ps/Ts =flow rate at STP	27333	(dscfm)	16
I = 144*100*Ts*(.002669*Vlc+(Vm'/Tm)*Pm)/ (60*Ø*vs*Ps*An) =isokinetic	80.97	(%)	17
E = (0.00857)*(Qstd)*Cs = particulate emission rate	1.68	(lbs/hr)	18

SUMMARY OF CALCULATIONS:

I = % isokinetics = 81.0 %

Cs = grain loading (dry) = 0.007 grains/dscf

E = particulate emission rate = 1.68 lbs/hr

% CO2 = 1.20 %

Corrected Cs = CS * (I/100) = 0.006 grains/dscf

Corrected E = 0.00857*Qstd*Cs corr = 1.36 lbs/hr

NOMENCLATURE:

* multiplication
/ division
^ exponentiation
Vm sample gas volume, uncorrected = (ft^3)
Vm sample gas volume, corrected = Vm*Y = ft^3
ΔP root mean pitot tube differential pressure
= (summation(press.diff. across pitot tubes^.5)/number entries)^2 = (in H2O)
ΔH average differential pressure across the orifice = (in H2O)
t1 dry gas meter inlet temperature = (°F)
t2 dry gas meter outlet temperature = (°F)
ts stack temperature = (°F)
ti Impinger out temperature = (°F)
vs stack gas velocity = 85.49*Cp*(Ts*ΔP/(Ps*Ms))^.5 = (ft/s)
Pbar = barometric pressure = (in Hg)
Pstatic = stack static pressure = (in Hg)
Ps = Absolute stack pressure = Pbar +(Pstatic/13.6) = (in Hg)
tm = dry gas meter temperature =(t1+t2)/2 = (°F)
Vlc = collected water,impingers = (ml)
Vpw = Vapor pressure of water = (in Hg)
ΔH @ = orifice pressure differential that equates to 0.75 cfm of air @ 68ºF and 29.92 in Hg
Dn = nozzle diameter = (in)
An = nozzle area = π*Dn^2/4 = (in^2)
π = the ratio of circumference of a circle to its diameter = 22/7 (dimensionless)
Cp = pitot tube coefficient = (dimensionless)
Y = meter box coefficient = (dimensionless)
CO2 = carbon dioxide = (%)
CO = carbon monoxide = (%)
O2 = oxygen = (%)
N2 = nitrogen = (%)
Ø = sampling time = (minutes)
mn = particulate found in sample train = (grams)
Ao = stack area = stack diameter^2*π/4 if round; length *width if rectanglar = (ft^2)
Corr Vwm = ((Vm'*Vpw@imp/Ps)*Pm*Tstd)/(Tm*Pstd) = (ft^3)
Pm = absolute meter pressure = Pbar+(ΔH/13.6) = (in Hg)
Tstd = temperature at standard conditions = (528°R)
Tm = dry gas meter temperature =(t1+t2)/2+460 = (°R)
Pstd = pressure at standard condition = (29.92 in. Hg)
Vm std = dry corrected volume of meter = Vm'*T std*Pm/(Pstd*Tm)-corr Vwm = (ft^3)
Ts = stack temperature = (°R)
Vw std = water volume at STP = Vlc*∂*R*Tstd/(Pstd*MwH2O) = (ft^3)

NOMENCLATURE: cont.

∂ = density of water at STP = 0.002201 = (lb/ml)
R = ideal gas constant = 21.85 in. Hg*ft^3/°R*lb*mole
Md = dry stack gas molecular weight = 0.32*%O2+0.44*%CO2+0.28(100-%O2-%CO2)
= (g/g*mole)
Bws = fractional stack gas moisture content = (Vw std+Corr Vwm)/(Vwstd+Corr Vwm+Vm std)
= (%/100)
Cs = grain loading = 15.430*mn/Vm std = (grains/dscf)
Mw = molecular weight = (g/g*mole)
Ms = wet stack gas molecular weight = Md*(1-Bws)+Bws*18 = (g/g*mole)
Qs = flow rate = vs*Ao*60 = (acfm)
Qstd = flow rate at standard conditions = 17.68*Qs*(1-Bws)*Ps/Ts = (dscfm)
I = isokinetics = 144*100*Ts*(.002669*Vlc+Vm'/Tm)*Pm/(60*Ø*vs*Ps*An) = (%)
E = particulate emissions rate = 0.00847*Cs*Qstd = (lbs/hr)
MwH2O = molecular weight of water = 17.98 (g/g*mole)

CONSTANTS:

0.00847 lb/(gr*min/hr) = 1 lb/7000grains*60 min/hr
13.6 in H2O/in Hg
17.68 °R/in Hg
60 sec/min
32 g/g*mole = O2 molecular weight
44 g/g*mole = CO2 molecular weight
28 g/g*mole = N2 molecular weight
18 g/g*mole = H2O molecular weight
85.49 (ft/sec)*(lb*in Hg/(lb*mole*°R*in H2O))^.5
0.04707 = ft^3/ml
460 (demensionless) = conversion °F to °R
144 in^2/ft^2
15.43 gr/g
0.002669 in Hg*ft^3/(°R*ml)

NOTE:

Note concerning compliance test #90257 for U.S. Silica performed on 9/16/90.

1) Velocity Data:

It was found during the process of this test that the stack flow velocity had a large amount of variation. The delta p readings varied from zero to above five inches of water. The magnahelic that was used during this test measures to only five inches of water. Therefore, for the first five readings of this test the delta p value is unknown. Two calculations have been generated. The first uses a value of 5.00 inches of H2O for the unkown points and the second calculation uses and arbitrary maximum value of 20.0 inches of H2O. Using 20.0 inches of H2O, the %I is 81.0%. Correcting for this low %I the emission rate is 1.36 lb/hr. Using the 5.00 inches of water pressure readings the %I is 97.8% and the emission rate is 1.39 lb/hr. Higher values of delta p would decrease the %I, thus indicating oversampling. Therefore, this test shows compliance for a limit of 40 lb/hr however, this data is not accurate and should not be used to determine emissior inventory data or other data which necessitates precise and accurate data.

2) Production Data:

The production data taken for this test was data that was requested from site personnel. This data, besides not having any corollation with APCD engineers or sourcetesting crew, is based upon estimated monthly tonnage and monthly operating hours. When asked for specific tonnages and hours during the testing, I was informed that that information was not available.

NOTE: con't

3) Site Platform Condition:

Improvements to the site platform are recommended before any further testing be performed. The angle of the platform side guards as they extend from the stack to the walkway are at such an angle that makes it necessary to use only a 3 ft probe. Even with a 3 ft probe it is a tight fit. Also, a 6 ft support board is needed to support the impingers at a proper level. During this particulate test it was noticed by T. Prevo that the platform was decaying in several areas and that he considered it to be unsafe. It is my recomendation that the platform be rebuilt and that the angle extending from the stack to the walkway be reevaluated so as to make it more accessible for the sourcetest team.

Janet E. Cawyer
Acting Assistant Chemist
San Diego Air Pollution Control District

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

TRAVERSE POINTS

U. S. SILICA

EXHAUST FROM FLUID BED DRYER

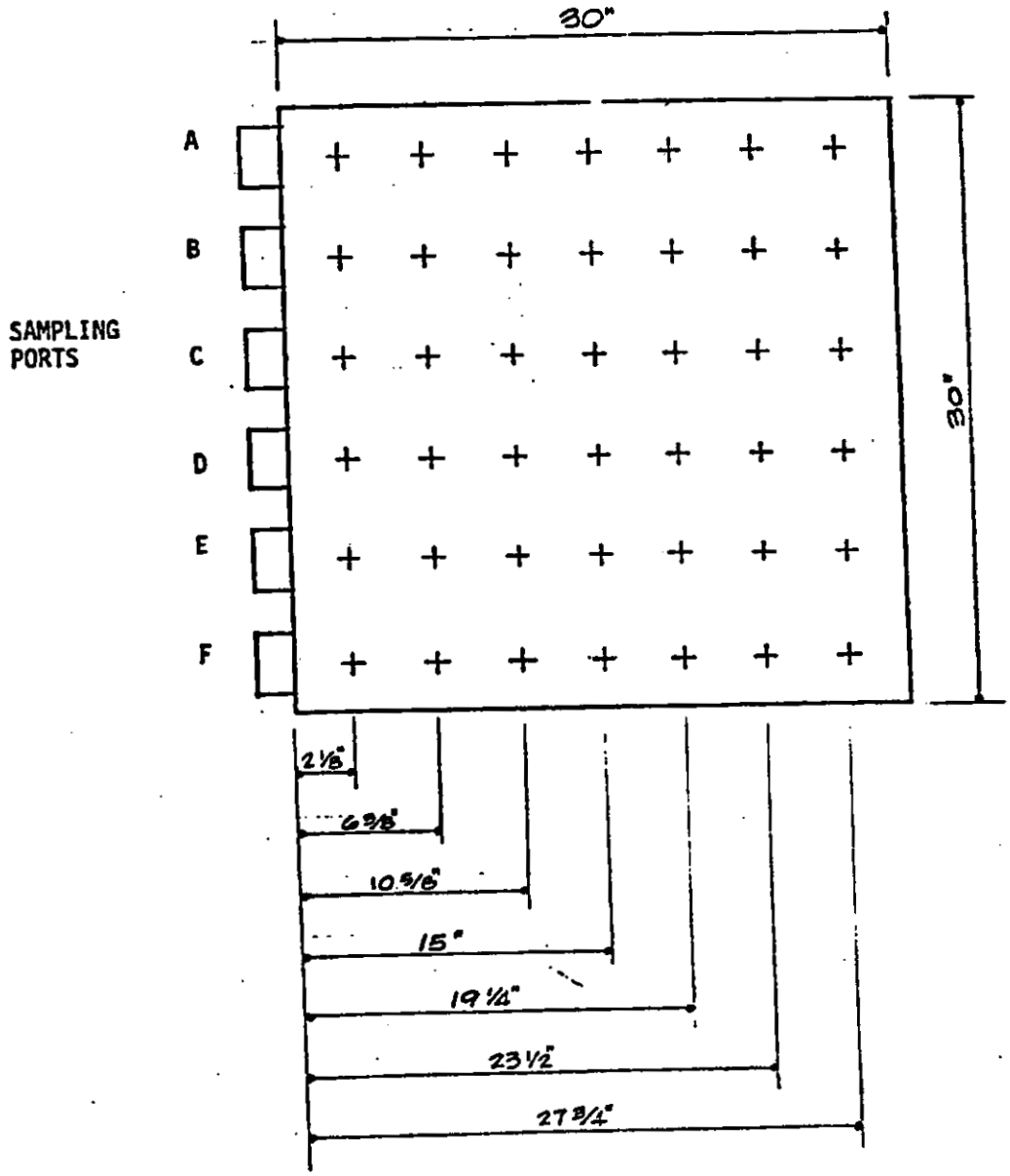


Figure 1

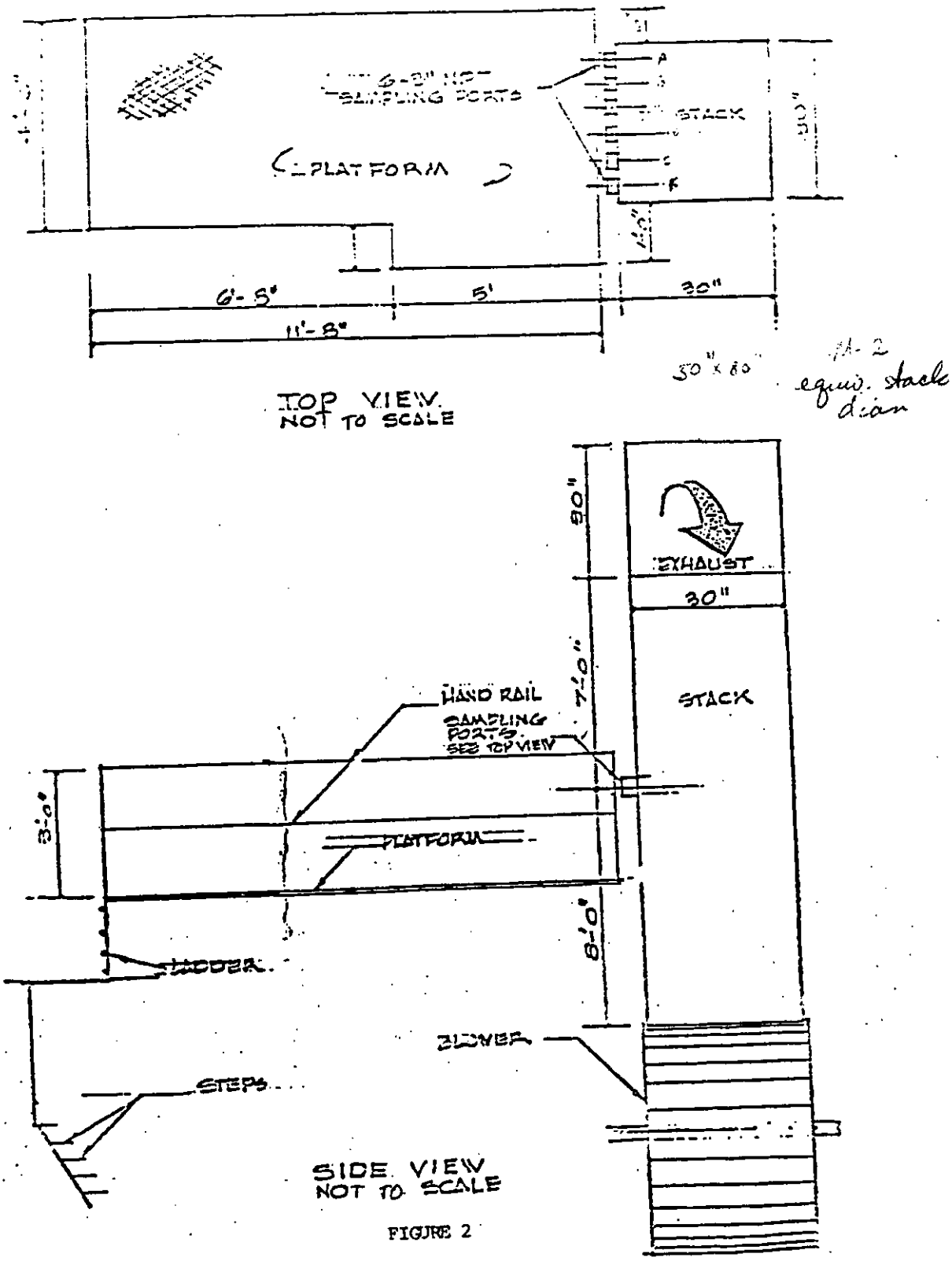

6-2" NOT
SAMPLING PORTS
STACK
PLATFORM
6'-5"
5'
30"
11'-8"
50" x 80"
equiv. stack dian
TOP VIEW
NOT TO SCALE
90"
EXHAUST
30"
7'-0"
STACK
HAND RAIL
SAMPLING PORTS
SEE TOP VIEW
3'-0"
PLATFORM
8'-0"
LADDER
BLOWER
STEPS
SIDE VIEW
NOT TO SCALE

FIGURE 2

San Diego County APCD METHOD 5 LAB SHEET

SITE = U S Silica

TEST # = 90257

VOLUMES

(1) IMPINGER VOLUMES

	final		initial		Δ
#1	739.75 g	-	567.85 g	=	171.90 g
#2	523.05 g	-	562.83 g	=	-39.78 g
#3	491.35 g	-	487.20 g	=	4.15 g
#4	477.40 g	-	475.95 g	=	1.45 g

† TOTAL VOLUME LIQUID COLLECTED = 137.72 ml

comments:

The Acetone and DI Water rinses were kept separated by front and back half.
From the appearance and odor of the front and back half water rinses,
it was determined that an orgainc extraction would not be neccessary for this recovery.

† The density of water is 1 g/ml

San Diego County APCD METHOD 5 LAB SHEET

TEST # = 90257

(2) BEAKER RINSES

ACETONE			WATER			PET ETHER		
BKR ID =	162/159		BKR ID =	184/166		BKR ID =	N/A	
FRONT HALF =	225.00	ml	FRONT HALF =	200.00	ml	FRONT HALF =		ml
F.H. RINSES =	50.00	ml	F.H. RINSES =	40.00	ml	F.H. RINSES =		ml
BACK HALF =	160.00	ml	BACK HALF =	215.00	ml	BACK HALF =		ml
B.H. RINSES =	50.00	ml	B.H. RINSES =	40.00	ml	B.H. RINSES =		ml
SEPARATORY FUNNEL RINSE =	0.00	ml	IMPINGERS =	200.00	ml			
total acetone =	485.00	ml	total water =	695.00	ml	total Pet Ether =	0.00	ml

* All data and calculations may be found on file at the San Diego County Air Pollution Control District.

San Diego County APCD METHOD 5 LAB SHEET

TEST # = 90257

STANDARDS

volume Ac = 560 ml

volume water = 560 ml

volume Pet Ether = 500 ml

ACETONE		WATER		PET ETHER	
BKR ID =	160	BKR ID =	177	Bkr ID =	N/A
f:	49.7013 g	f:	30.3519 g	f:	g
i:	49.6994 g	i:	30.3508 g	i:	g
Δ:	0.0019 g	Δ:	0.0011 g	Δ:	0.0000 g

Limits:

limit for petroleum ether is 6.4 µg/ml (6.4 * 10^-6 g/ml)
limit for acetone is 10.0 µg/ml (10.0 * 10^-6 g/ml)
limit for water is 4 µg/ml (4 * 10^-6 g/ml)

The Acetone **PASSED** 3.3929E-06 g/ml

The Water **PASSED** 1.9643E-06 g/ml

The Pet Ether **PASSED** 0 g/ml

San Diego County APCD METHOD 5 LAB SHEET

TEST # = 90257

(3) CORRECTIONS- (volume used)*(std wt)

ACETONE		WATER		PET ETHER	
FRONT HALF =	0.000933 g	FRONT HALF =	0.000471 g	FRONT HALF =	0.000000 g
BACK HALF =	0.000713 g	BACK HALF =	0.000501 g	BACK HALF =	0.000000 g
SEP. FUNNEL =	0.000000 g	IMPINGERS =	0.000393 g		

tot. front half = 0.001404 g

total back half = 0.001213 g

sep. funnel + impingers = 0.000393 g

total grams from solvents = 0.0030 g

San Diego County APCD METHOD 5 LAB SHEET

TEST # = 90257

WEIGHTS

	FRONT HALF	BACK HALF
ACETONE		
BKR ID =	162	159
f:	48.4595 g	49.2047 g
i:	48.4468 g	49.1966 g
Δ:	0.0127 g	0.0081 g
WATER		
BKR ID =	184	166
f:	49.5676 g	50.0711 g
i:	49.5633 g	50.0596 g
Δ:	0.0043 g	0.0115 g

San Diego County APCD METHOD 5 LAB SHEET

TEST # = 90257

ORGANIC

BKR ID = N/A	BKR ID = N/A
f: _____ g	f: _____ g
i: _____ g	i: _____ g
Δ: 0.0000 g	Δ: 0.0000 g

FILTERS

ID = N/A	ID = 89062
f: _____ g	f: 0.1212 g
i: _____ g	i: 0.1210 g
Δ: 0.0000 g	Δ: 0.0002 g

San Diego County APCD METHOD 5 LAB SHEET

TEST # = 90257

(4) FINAL WEIGHTS

(total weight gained)

FRONT HALF= 0.0170 BACK HALF= 0.0196

TOTAL WEIGHT GAINED = 0.0366 g

correction for solvents (acetone and water)

TOTAL WEIGHT GAINED FROM SOLVENTS = 0.0030 g

(5) CORRECTED WEIGHTS

TOTAL WEIGHT GAINED CORRECTED = 0.0336 g

(6) FILTERS

FRONT HALF= 0.0000 BACK HALF= 0.0002

TOTAL WEIGHT GAINED = 0.0338 g

Comments -

U.S. SILICA

J. Cawyer 11/26/90

U.S. SILICA.

FACSIMILE TELEPHONE NUMBER
(619) 433-9615

FACSIMILE MESSAGE

TO: COMPANY NAME S.D.A.P.C.D.
LOCATION S.D.
ATTENTION J. Cowyer
OF PAGES (INC. COVER) 1

FROM: NAME David Rubio
LOCATION U. S. SILICA - OCEANSIDE, CA
DATE Sept. 14, 1990

Phone (619) 757-2630 if problem with this transmittal

Dryer throughput:

	tons	hrs.
1989		
Aug.	32,701	399.8
Sept. - Dec.	109,023	1,392.8
1990		
Jan. - Aug.	238,269	3,225
Sept. (Est.)	25,000	338

Engineering Data: 11/26/90

Engineering information was supplied by site engineer David Rulis. No APCD engineer was present to verify data. From Mr. Rulis estimates, a monthly average of production rate was obtained.

$$\frac{25{,}000 \text{ tons}}{338 \text{ hrs}} = 73.96 \text{ tons/hr.}$$

$$= \frac{73.96 \text{ tons}}{\text{hr}} \left(\frac{2000 \text{ lb}}{\text{ton}}\right) = 147{,}000 \frac{\text{lb}}{\text{hr.}}$$

Janet E Cangu
Acting Assistant Chemist

K = 1.1

3 min points.

PAGE 1

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SITE U.S. Silica

DATE 9/14/90

RUN # 1

Impinger Box # 4

T ambient ~74°F

P bar —

P static 3.0

Probe I.D. 5872

PROBE LENGTH 35 ft.

NOZZLE I.D.# 21491435

METER BOX # D337

Y= 0.9796

METER dH@ 2.6123

PITOT Cp .84

Nozzle size: .173

DIAM STACK 30" x 30"

FILTER#: 890602

Pitot Leak yes

OPERATOR J. CARVER

POINT NUMBER	TIME min	GAS METER READING (Vm), ft 3	VELOCITY HEAD (dP), In Hg	ORIFICE PRESSURE DIFFERENTIAL (dH), In Hg ACTUAL	ESIRED	STACK TEMP (Ts), F T1	SAMPLE BOX TEMP T2	IMPINGER TEMP ti T3	DRY GAS METER TEMP INLET (t1)	OUTLET (t2)	PUMP VACUUM In Hg
	0:00	579.583									
1	3:00	582.890	>5.0 ?	5.0	5.5	121	426	57	89	108	7.0
2	6:00	586.200	>5.0 ?	5.0	5.5	136	421	53	88	112	7.0
3	9:00	589.500	>5.0 ?	5.0	5.5	134	415	52	88	114	7.0
4	12:00	592.820	>5.0 ?	5.0	5.5	137	413	51	88	114	7.1
5	15:00	596.135	>5.0 ?	5.0	5.5	120	407	51	88	114	7.1
6	18:00	599.453	5.0	5.0	5.5	115	398	51	88	114	7.1
7	21:00	602.448	4.10	4.5	4.51	110	390	52	89	119	6.0
1	0:00 3:00	605.324	3.60	4.0	4.0	135	398	53	90	118	5.0
2	6:00	608.133	3.70	4.1	4.07	137	399	52	90	125	5.1
3	9:00	611.139	3.82	4.25	4.20	133	400	51	90	127	~~5.85~~ 5.5
4	12:00	614.056	3.80	4.25	4.18	139	400	51	91	128	5.5
5	15:00	617	4.20	4.65	4.62	139	397	50	91	128	6.1
6	18:00	620.314	4.50	5.00	4.95	136	399	51	92	126	7.0
7	21:00	622.909	2.80	3.10	3.08	120	400	52	92	126	4.5

FIGURE 5-5 FIELD DATA SHEET #2

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SITE US. Silica

DATE 9/14/90

RUN # 1

Impinger Box # 4

T ambient

P bar

P static

Probe I.D.

PROBE LENGTH

NOZZLE I.D.#

METER BOX # D37

Y= .9796

METER dH@ 2.6123

PITOT Cp .84 Nozzle size: .173

DIAM STACK 30"x30"

FILTER#: 890 62

Pitot Leak —

OPERATOR S. Cawyer

POINT NUMBER	TIME min	GAS METER READING (Vm), ft 3	VELOCITY HEAD (dP), In Hg	ORIFICE PRESSURE DIFFERENTIAL (dH), In Hg ACTUAL	ESIRED	STACK TEMP (Ts), F T1	SAMPLE BOX TEMP T2	IMPINGER TEMP ti T3	DRY GAS METER TEMP INLET (t1)	OUTLET (t2)	PUMP VACUUM In Hg
#4	0:00	622.909									
1	3:00	625.462	2.90	3.20	3.19	131	404	56	93	123	4.5
2	6:00	627.708	2.20	2.40	2.42	138	407	53	94	129	3.5
3	9:00	629.712	1.65	1.80	1.82	137	405	53	92	129	2.5
4	12:00	631.691	1.75	1.90	1.93	135	406	55	91	129	2.5
5	15:00		2.00	2.20	2.20	134	406	55	90	130	3.5
6	18:00	636.390	2.65	3.00	2.92	135	408	56	90	131	4.5
7	21:00	638.532	2.00	2.20	2.20	123	409	57	90	130	3.5
#5 1	0:00 3:00	640.602	1.95	2.20	2.15	134	413	60	90	122	3.5
2	6:00	642.478	1.50	1.70	1.65	131	410	59	91	128	2.5
3	9:00	643.938	1.00	1.10	1.10	138	408	60	91	128	2.0
4	12:00	645.234	0.80	.90	.88	140	406	57	91	126	1.5
5	15:00	646.722	1.00	1.10	1.10	130	403	57	91	127	2.0
6	18:00	648.492	1.35	1.50	1.49	134	402	57	91	129	2.5
7	21:00	650.170	1.20	1.30	1.32	120	403	58	91	129	2.0

FIGURE 5-5 FIELD DATA SHEET #2

PAGE 5

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SITE U.S. Silica
DATE 9/14/90
RUN # 1

Impinger Box # 4
T ambient
P bar —
P static 3.0

Probe I.D.
PROBE LENGTH 3 ft.
NOZZLE I.D.#
METER BOX # D337

Y= .9796
METER dH@ 2.6123
PITOT Cp
Nozzle size: .173
DIAM STACK 30"x30"

Pitot Leak
OPERATOR J CAWYER

FINAL LEAK: SYSTEM ok
TIME: 5 min .038 - .042

Pitot high: 30 in 15 s.
Low: 3.0 15 s.
FILTER#: 89062

POINT NUMBER	TIME min	GAS METER READING (Vm), ft 3	VELOCITY HEAD (dP), In Hg	ORIFICE PRESSURE DIFFERENTIAL (dH), In Hg ACTUAL	ESIRED	STACK TEMP (Ts), F T1	SAMPLE BOX TEMP T2	IMPINGER TEMP ti T3	DRY GAS METER TEMP INLET (t1)	OUTLET (t2)	PUMP VACUUM In Hg
#2 1	0:00	650.170									
1	3:00	651.563	.85	.90	.94	131	402	60	92	120	1.5
2	6:00	652.815	.70	.80	.77	130	398	59	91	125	1.5
3	9:00	653.528	.30	.30	.33	134	396	62	90	124	1.0
4	12:00		.10	.10	.11	131	395	67	90	122	1.0
5	15:00	653.881	.15	.20	.17	134	397	67	90	122	1.0
6	18:00	654.630	.60	.70	.66	133	399	62	90	123	1.5
#1 7	21:00	655.857	.65	.70	.72	113	399	59	90	123	1.5
1	0:00 3:00	657.778	.15	.20	.17	128	398	62	90	119	1.0
2	6:00	658.556	.25	.30	.28	132	397	63	90	120	1.0
3	9:00	659.017	.05	.10	.06	133	395	62	90	120	1.0
4	12:00	659.192	.05	.10	.06	132	397	64	89	120	1.0
5	15:00	659.346	.10	.10	.11	131	399	68	88	120	1.0
6	18:00	659.930	.15	.20	.12	131	401	63	89	120	1.0
7	21:00	660.365	.05	.10	.06	115	404	62	90	121	1.0

FIGURE 5-5 FIELD DATA SHEET #2

SDC-47

851
855
839
145
847

METHOD 5
PRELIMINARY DATA SHEET

ST NO 90257 SITE U.S. SILICA DATE 9/14/90
RUN NO. — TEST DATE 9/14/90 QA/QC —

PRELIMINARY TRAVERSE DATA:
Stack Temperature: ave 596.9 min 113 max 174 previous test report: ✓
Stack velocity ave 68.42 min 19.88 max 127.69 on site traverse: —
Delta P: ave 1.54 min .10 max 4.50 (check off source of data)
% moisture 14.41 Gas MD(Dry) 27.55 Optimum nozzle Dia: .191
Nozzle Diameter used: .173
Traverse Point Layout (attach sketch): ✓
Nomograph ΔH/ΔP ratio: 1.1

OUTSIDE REQUESTS:
APCD engineer None Barometric Request: ✓

EQUIPMENT CHECK:

Nozzle Diameter (actual)	ID# 0.173	Calib ✓	Date 8/23/90
Pitot Tube Assembly	ID# 5872/3' probe	Calib 0.807/0.817	Date 6/5/90
Delta P Sensor Size 5in	ID# D337	Calib ✓	Date 8/13/90
Delta H Sensor Size 5in	ID# D337	Calib ✓	Date 8/13/90
Thermocouple Size —	ID# TC10	Calib ✓	Date 8/24/90
Thermocouple Size —	ID# Box 2	Calib ✓	Date 8/24/90
Thermocouple Size —	ID# ✓	Calib —	Date —
Thermocouple Dry Gas	ID# D3371	Calib ✓	Date 8/24/90
	ID# 2	Calib ✓	Date 8/24/90

D337 Y= 0.9796 Delta H@: 2.6123 Calib 605 Date: 8/20/90
Probe Cleaned and Stoppered: ✓

PRESTEST CHECKS:
Sample Time at Traverse Point: 3:00 min/pt. Traverse Points Marked Yes
Ports Cleaned: — Port Size —
Tedlar Bag Leak Checked ✓
Temperature Sensors (at ambient temperature)
ts 74°F tbox 74°F ti 74°F

SDAPCD FIGURE 5-3A

PRETEST LEAK CHECKS:
Meter Orifice Check ✓
Sample Line .007 cfm 1 min Limit: 0.02 cfm
Pitot Tubes High 4.4 in H2O 15 sec
Low 3.0 in H2O 15 sec

SAMPLING CHECKS:
Hot Box Heater On: ✓ Probe Heater On: ✓ Impingers Iced: —
Static Pressure: 3.00

POSTTEST LEAK CHEKS
Meter Orifice Check ✓
Sample Line .004 cfm 1 min Limit: 0.02 cfm
Pitot Tubes High 3.0 in H2O 15 sec
Low 3.0 in H2O 15 sec

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

US. SILICA
9/14/90.

ORIFICE CHECK

Yc = (Ø*(0.0319*Tm/bar)^0.5)/Vm (run at ∂H@ for Ø minutes)

Pre-test check

	TIME	T1	T2	VM	PBar
start:	0:00	78°F	97°F	533.188	
finish:	5:04	76°F	110°F	537.060	
average:		77°F	103.5°F		
		+460			
net:	5:04	550.3°R		3.872	29.96

Yc= .9964 Ym= .9796 Yc/Ym= 1.02 ok.

(0.97 ≤ Yc/Ym ≤ 1.03)

Post test check

	TIME	T2	T1	VM	PBar
start:	0:00	85°F	78°F	627.738	
finish:	5:00	111°F	81°F	631.618	
average:		98°F	79.5°F		
		+460			
net:	5:00	548.75		3.880	29.96

Yc= .9850 Ym= .9796 Yc/Ym= 1.01 ok

(0.97 ≤ Yc/Ym ≤ 1.03)

~~Fig 5-24~~ FIGURE 5-4.

FIELD DATA SHEET #2: CON'T

TEST #: 90257 DATE: 9/14/90

SITE US Silica

	BEFORE TRAVERSE	AFTER TRAVERSE
Pm, absolute	29.97	—
Ps, absolute	30.16	
Tm, absolute	(109.3°F) 569.3°R	563.°R. (103°F)
∂H@ across meter	2.6123	—
% moisture	.1332	—
correction factor		1.32 (1.317)
Ts, absolute	596.9	→ Ts = 556. (96°F)
∂P stack	1.54	Δp = 2.20
ideal nozzle diam	.191	.160
nozzle used	.173	.173
test differential pressure		~~ΔH = KΔp~~ ~~K = ΔH/Δp~~ .85/1.

K = 1.06

K = 1.04

use K = 1.1.

Box #4 FIELD DATA SHEET #1 US. Silica

Sample No. US. Silica PO# 236.

Impinger No	Soution Used	Amount of Solution (ml)	Imp. Tip Configuration	Weight (grams)
1	H_2O	100 ml	mod	Final 739.75 Initial 567.85 g Wt. Gain 171.90
2	H_2O	100 ml	Std.	Final 523.05 Initial 562.83 g Wt. Gain -39.78
3	—	—	mod	Final 491.35 Initial 487.20 g Wt. Gain 4.15
4	—	—	mod.	Final 477.40 Initial 475.95 g Wt. Gain 1.45
5				Final Initial Wt. Gain
6				Final Initial Wt. Gain
Filter	#89062			Final Initial Wt. Gain

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 137.72

Date 9/14/90

Signature Janet E. Cuyer

GAS ANALYSIS RESULTS

Gas Fractional Part

CO2 Instrument I.D.# ANARAD-400 S/N 305

O2 Instrument I.D.# T/R 320 P-4 S/N: 66676

CO2 1.2%

O2 19.1%

CO 0

N2 79.7%

Date 9/14/90

Time Janet E Cuyer

Signature

Figure 5-4A

BAROMETRIC PRESSURE REQUEST

PO# 236 S.I.# 90257

STREET ADDRESS 3231 Oceanside Blvd
Oceanside CA 92054

120 GRADE LEVEL _____ FT. ABOVE MSL
~~[illegible]~~ _____ FT. ABOVE GRADE

ALTITUDE _____ FT. ABOVE MSL

DATE: 9/14/90

HOUR: 8am. - 12:00 noon.

REQUESTED BY Janet E. Causer

29.98 IN. HG.* CALCULATED BY [illegible]

S.D.A.P.C.D. ST#2 REV. 5/80

*: No elevation correction applied.

From report test # 96155 elevation data:
120 ft above MSL.

11/26/90.

Corrected Pbar:

$$120 \text{ ft} \left(\frac{-0.1 \text{ in Hg}}{100 \text{ ft}} \right) = -0.12 \text{ in Hg}$$

$$P_{bar} = 29.98 - 0.12 = 29.86 \text{ in Hg.}$$

Correction information obtained from San Diego APCD QA manual for method 5, Section 2.1.9.

Janet Causer
Acting Assistant Chemist

US SILICA

FRONT ½ H_2O 184	~~collected:~~ ~~change +200 ml~~ 1° Rinses: 100 ml, +100 ml	2° Rinses. 20 ml 20 ml	
FRONT ½ ACE Bkr # 162	25 ml. +200 ml	50 ml.	
Bkr # 166 BACK ½ H_2O ~~Bkr # 159~~	~~collected~~ +15 +40 change: 200 ml +25 1° Rinses: 100 ml +15 +20	~~50 ml~~ 40 ml	
BACK ~~FRONT~~ ½ ACE Bkr 159	100 ml. + 60 ml.	50 ml	
H_2O STD 177	500 ml	60 ml	
ACE STD. Bkr # 160	500 ml + 30 ml.	30 ml	

US Silica weights (grams)

BOB #	[illegible] wt#1 [illegible]	JEC 11/30 wt#2 10/11/90	JEC 9/17 wt#3 [illegible]	FINAL wt.		in wt MASTER LOG
FRONT ½ H2O # 184	49.5674	49.5678	49.5677	49.5676		49.5633
FRONT ½ ACE # 162	48.4594	48.4597	48.4594	48.4595		48.4468
BACK ½ H2O # 166	50.0709	50.0712	50.0712	50.0711		50.0596
BACK ½ ACE # 159	49.2047	49.2049	49.2046	49.2047		49.1966
H2O STD # 177	30.3518	30.3520	30.3519	30.3519		30.3508
ACE STD # 160	49.7011	49.7014	49.7013	49.7013		49.6994
	8/17 8:19	8/22 2:56	8/23 16:42			
FILTER # 89062	0.1213	0.1212	0.1212	0.1212		0.1210

INITIAL	weights	↓ FROM MASTER weights Log	↑ FILTER #89062 in wt = 0.1210
# 184	49.5633		
162	48.4468		
166	50.0596		
159	49.1966		
177	30.3508		
160	49.6994		

SAN DIEGO AIR POLLUTION CONTROL DISTRICT
9150 CHESAPEAKE DRIVE
SAN DIEGO, CA. 92123

SUMMARY:
SOURCE TEST OF PARTICULATE EMISSIONS TO THE ATMOSPHERE

TEST SITE U.S. SILICA

QC DNS

TEST #: P.O.# TEST DATE:

EQUIPMENT:

UNIT TESTED:

SITE ENGINNER:
SITE PERSONNEL:
APCD ENGINEER:
APCD PERSONNEL:
REPORT BY: DATE:
APPROVED BY: DATE:
C.W. RIDENOUR
SENIOR AIR POLLUTION CHEMIST

PARAMETERS:	MEASURED:
STACK GAS FLOW RATE (DSCFM):	27307
STACK GAS TEMPERATURE °F (AVG):	131
PRODUCTION RATE (AVG): tons/hr	

RESULTS: Based upon APCD Method 5 Standards relating to the entire impinger catch.

TEST	PERMIT LIMIT	MEASURED	PERFORMANCE
RULE 54 DUST AND FUME	40.00 lb/hr	1.68 lbs/hr	PASSED

TEST REFERENCE:
San Diego Air Pollution Control District Quality Assurance Manual Method 5 for Particulate Emissions from Stationary Sources.

TEST DESCRIPTION

Introduction: This report presents the results of particulate loading and gas volume tests at 0 . The test was performed on the baghouse exhaust.

System Description:
The crushed rock, sand, and hot asphalt oil are heated and mixed in the rotary drum.
The rock and sand are dried in a rotary dryer which is heated by natural gas.
The exhaust from this dryer is vented through a baghouse, the emissions to the atmosphere from this rotary dryer are the subject of this report.

Procedures:
The procedures and equipment utilized in performing these tests are based on EPA New Source Performance Standards Method 5. The sampling train was modified to exclude the front-end filter and include a back-end filter, per the San Diego Air Pollution Control District Method 5 testing guidelines. The calculations were designed to include the impinger catch so that the test results can be compared to Rule 54 of SDAPCD.

Velocity Traverse:
Preliminary calculations were based upon data from previous tests. Temperature and pitot tube data collected during actual sampling were used to calculate stack volume.

Particulate Sampling:
This sample consisted of 20 traverse points, 10 from each of 2 sample ports as shown in Figure 1. The sample was collected 24 inches below the top of the stack. Field data associated with sample collection has been transferred to computer printout and is shown in the report. Calculations were done by computer and are also shown within the report.

Gas Analysis:
An integrated bag sample was collected on site and measured. The oxygen and carbon dioxide content of the stack gas was measured using electronic instrumentation.

SITE: 0

OPERATOR:

TEST DATE:

TEST: 0

DATA SUMMARY: #

TRAVERSE POINT NUMBER	GAS METER READING (Vm), ft3	PRESS. DIFF. ACROSS PITOT TUBES	PRESS. DIFF. ACROSS ORIF.	DRY GAS METER TEMPERATURE		STACK TEMP	IMP. TEMP	STACK FLOW (velocity)
				INLET	OUTLET			
	579.583		ACTUAL					
1		20.00	5.00	89	108	121	57	256.65
2		20.00	5.00	88	112	136	53	259.94
3		20.00	5.00	88	114	134	52	259.50
4		20.00	5.00	88	114	137	51	260.16
5		20.00	5.00	88	114	120	51	256.42
6		5.00	5.00	88	114	115	51	127.66
7		4.10	4.50	89	119	110	52	115.10
1		3.60	4.00	90	118	135	53	110.19
2		3.70	4.10	90	125	137	52	111.90
3		3.82	4.25	90	127	133	51	113.32
4		3.80	4.25	91	128	139	51	113.59
5		4.20	4.65	91	128	139	50	119.42
6		4.50	5.00	92	126	136	51	123.30
7		2.80	3.10	92	126	120	52	95.95
1		2.90	3.20	93	123	134	56	98.81
2		2.20	2.40	94	129	138	53	86.36
3		1.65	1.80	92	129	137	53	74.72
4		1.75	1.90	91	129	135	55	76.83
5		2.00	2.20	90	130	134	55	82.06
6		2.65	3.00	90	131	135	56	94.54
7		2.00	2.20	90	130	123	57	81.30
1		1.95	2.20	90	122	134	60	81.03
2		1.50	1.70	91	128	131	59	70.89
3		1.00	1.10	91	128	138	60	58.22
4		0.80	0.90	91	126	140	57	52.16
5		1.00	1.10	91	127	130	57	57.83
6		1.35	1.50	91	129	134	57	67.42
7		1.20	1.30	91	129	120	58	62.81
1		0.85	0.90	92	120	131	60	53.36
2		0.70	0.80	91	125	130	59	48.38
3		0.30	0.30	90	124	134	62	31.78
4		0.10	0.10	90	122	131	67	18.30

5		0.15	0.20	90	122	134	67	22.10
6		0.60	0.70	90	123	133	62	44.91
7		0.65	0.70	90	123	133	59	46.74
1		0.15	0.20	90	119	128	62	22.36
2		0.25	0.30	90	120	132	63	28.96
3		0.05	0.10	90	120	133	62	12.96
4		0.05	0.10	89	120	132	64	12.95
5		0.10	0.10	88	120	131	68	18.30
6		0.15	0.20	89	120	131	63	22.42
7	660.365	0.05	0.10	90	121	115	62	12.77

Pressures are in inches of water, temperatures are in degrees Fahrenheit, velocities are in ft/sec. All measurements are actual - uncorrected - values.

Average:	Vm	ΔP	ΔH	t1	t2	ts	ti	vs
	80.782	3.90	2.27	90	123	131	57	89.63

DATA SUMMARY:

PRESSURES

P bar	29.86	in Hg
P static	3.00	in H2O
Ps	30.08	in Hg

AVERAGE TEMPERATURES

ts	=	131	F
tm = 1/2(avg.t1+avg.t2)	=	107	F
ti	=	57	F

VOLUMES

Vm, meter	80.782	ft^3
Vlc, impingers	137.7	ml

VAPOR PRESSURES

Vpw @ imp	=	0.4686	inHg

METER BOX PARAMETERS

ΔH@ =	2.6123	inH2O
ΔP =	3.90	inH2O
ΔH =	2.27	inH2O
METER BOX I.D.#	D337	

NOZZLE AND PROBE

Dn =		0.173	in
An = Dn^2*π/4	=	.0235	in^2
Cp =		0.8070	
Y =		.9796	

STACK MEASUREMENTS

%CO2	1.20	
%CO	0.00	
%O2	19.10	
%N2	79.70	
Ø = sampling time	126	minutes
mn=particulate collect'd	0.0338	grams

STACK PARAMETERS

Stack Diameter =		2.50	ft
Ao=Area stack =		6.25	ft^2

CALCULATIONS:

		UNITS		EQUATION NUMBER
corr Vwm = ((Vm'*Vpw@Imp/Ps)*Pm*Tstd)/(Tm*Pstd) = water volume correction at meter w/o silica gel	=	1.15	ft^3	1
Vm std = (Vm'*Tstd*Pm/(Pstd*Tm))-corr Vwm = dry meter volume corrected to STP	=	72.86	ft^3	2
Pm= Pbar+(ΔH/13.6)= corrected pressure of meter	=	30.03	in Hg	3
Tm= (t1+t2)/2 + 460 = meter temperature	=	566.6	°R	4
Ts = ts+460 = corrected stack temperature	=	591.0	°R	5
Ps= Pbar + (P static/13.6)= corrected stack pressure	=	30.08	in Hg	6
Vw std = Vlc*∂*R*Tstd/(Pstd*MwH2O)+corr Vwm = water volume at STP	=	7.65	ft^3	7
Bws = (Vw std)/(Vw std+Vm std)*100 = percent moisture	=	9.51	%	8
mn= grams of particulate (from laboratory sheet)	=	0.0338	grams	9
Cs = 15.43*mn/Vm std = grain loading (dry)	=	0.007	grains/dsc	10
Vm'= Vm*Y = Corrected dry gas meter volume	=	79.13	ft^3	11
Md=0.440(%CO2)+0.320*(%O2)+0.280(N2+inerts+CO) Dry gas molecular weight	=	28.96	g/g*mole	12
Ms=Md*(1-Bws)+18.0*(Bws) Stack gas molecular weight-wet basis	=	27.91	g/g*mole	13
vs= 85.49*Cp*((Ts*ΔP)/(Ps*Ms))^.5 = stack velocity		89.63	(ft/s)	14
Qs = (vs)*Ao*60 = stack flow rate		33610	(acfm)	15
Qstd =17.64*Qs*(1-Bws)*Ps/Ts =flow rate at STP		27307	(dscfm)	16
I = 144*100*Ts*(.002669*Vlc+(Vm'/Tm)*Pm)/ (60*Ø*vs*Ps*An) =isokinetic		81.03	(%)	17
E = (0.00857)*(Qstd)*Cs = particulate emission rate		1.68	(lbs/hr)	18

SUMMARY OF CALCULATIONS:

Enter the type of plant. (Asphalt/Combustion) Asphalt

I = % isokinetics =	81.0	%
Cs = grain loading (dry) =	0.007	grains/dscf
E = particulate emission rate =	1.68	lbs/hr
% CO2 =	1.20	%

Corrected Cs= Cs * (I/100)=	0.006	grains/dscf
Corrected E= 0.00857*Qstd*Cs Corr	1.36	lbs/hr

You put in desired instead of actual

SITE: 0

OPERATOR:

TEST DATE:

TEST: 0

DATA SUMMARY: #

TRAVERSE POINT NUMBER	GAS METER READING (Vm), ft3	PRESS. DIFF. ACROSS PITOT TUBES	PRESS. DIFF. ACROSS ORIF. ~~ACTUAL~~	DRY GAS METER TEMPERATURE		STACK TEMP	IMP. TEMP	STACK FLOW (velocity)
				INLET	OUTLET			
	579.583							
1		5.00	5.00	89	108	121	57	128.32
2		5.00	5.00	88	112	136	53	129.97
3		5.00	5.00	88	114	134	52	129.75
4		5.00	5.00	88				30.08
5		5.00	5.00	88				28.21
6		5.00	5.00	88				27.66
7		4.10	4.50	89				15.10
1		3.60	4.00	90				10.19
2		3.70	4.10	90				11.90
3		3.82	4.25	90				13.32
4		3.80	4.25	91				13.59
5		4.20	4.65	91				19.42
6		4.50	5.00	92				23.30
7		2.80	3.10	92				5.95
1		2.90	3.20	93				8.81
2		2.20	2.40	94				6.36
3		1.65	1.80	92				4.72
4		1.75	1.90	91				6.83
5		2.00	2.20	90				2.06
6		2.65	3.00	90	[illegible]	135	56	94.54
7		2.00	2.20	90	130	123	57	81.30
1		1.95	2.20	90	122	134	60	81.03
2		1.50	1.70	91	128	131	59	70.89
3		1.00	1.10	91	128	138	60	58.22
4		0.80	0.90	91	126	140	57	52.16
5		1.00	1.10	91	127	130	57	57.83
6		1.35	1.50	91	129	134	57	67.42
7		1.20	1.30	91	129	120	58	62.81
1		0.85	0.90	92	120	131	60	53.36
2		0.70	0.80	91	125	130	59	48.38
3		0.30	0.30	90	124	134	62	31.78
4		0.10	0.10	90	122	131	67	18.30

Revised. Put in 5.00 values. JC 1/2/91

SDC-49

5		0.15	0.20	90	122	134	67	22.10
6		0.60	0.70	90	123	133	62	44.91
7		0.65	0.70	90	123	133	59	46.74
1		0.15	0.20	90	119	128	62	22.36
2		0.25	0.30	90	120	132	63	28.96
3		0.05	0.10	90	120	133	62	12.96
4		0.05	0.10	89	120	132	64	12.95
5		0.10	0.10	88	120	131	68	18.30
6		0.15	0.20	89	120	131	63	22.42
7	660.365	0.05	0.10	90	121	115	62	12.77

Pressures are in inches of water, temperatures are in degrees Fahrenheit, velocities are in ft/sec. All measurements are actual - uncorrected - values.

Average:	Vm	ΔP	ΔH	t1	t2	ts	ti	vs
	80.782	2.11	2.27	90	123	131	57	74.24

DATA SUMMARY:

PRESSURES

P bar	29.86	in Hg
P static	3.00	in H2O
Ps	30.08	in Hg

AVERAGE TEMPERATURES

ts	=	131	F
tm = 1/2(avg.t1+avg.t2)	=	107	F
ti	=	57	F

VOLUMES

Vm, meter	80.782	ft^3
Vlc, impingers	137.7	ml

VAPOR PRESSURES

Vpw @ imp	=	0.4686	inHg

METER BOX PARAMETERS

ΔH@ =	2.6123	inH2O
ΔP =	2.11	inH2O
ΔH =	2.27	inH2O
METER BOX I.D.#	D337	

NOZZLE AND PROBE

Dn =		0.173	in
An = Dn^2*π/4	=	.0235	in^2
Cp =		0.8070	
Y =		.9796	

STACK MEASUREMENTS

%CO2	1.20	
%CO	0.00	
%O2	19.10	
%N2	79.70	
Ø = sampling time	126	minutes
mn=particulate collect'd	0.0338	grams

STACK PARAMETERS

Stack Diameter	=	2.50	ft
Ao=Area stack	=	6.25	ft^2

CALCULATIONS:

		UNITS		EQUATION NUMBER
corr Vwm = ((Vm'*Vpw@imp/Ps)*Pm*Tstd)/(Tm*Pstd) = water volume correction at meter w/o silica gel	=	1.15	ft^3	1
Vm std = (Vm'*Tstd*Pm/(Pstd*Tm))-corr Vwm = dry meter volume corrected to STP	=	72.86	ft^3	2
Pm= Pbar+(ΔH/13.6)= corrected pressure of meter	=	30.03	in Hg	3
Tm= (t1+t2)/2 + 460 = meter temperature	=	566.6	°R	4
Ts = ts+460 = corrected stack temperature	=	591.0	°R	5
Ps= Pbar + (P static/13.6)= corrected stack pressure	=	30.08	in Hg	6
Vw std = Vlc*∂*R*Tstd/(Pstd*MwH2O)+corr Vwm = water volume at STP	=	7.65	ft^3	7
Bws = (Vw std)/(Vw std+Vm std)*100 = percent moisture	=	9.51	%	8
mn= grams of particulate (from laboratory sheet)	=	0.0338	grams	9
*Cs = 15.43*mn/Vm std = grain loading (dry)*	=	0.007	grains/dsc	10
Vm'= Vm*Y = Corrected dry gas meter volume	=	79.13	ft^3	11
Md=0.440(%CO2)+0.320*(%O2)+0.280(N2+inerts+CO) Dry gas molecular weight	=	28.96	g/g*mole	12
Ms=Md*(1-Bws)+18.0*(Bws) *Stack gas molecular weight-wet basis*	=	27.91	g/g*mole	13
vs= 85.49*Cp*((Ts*ΔP)/(Ps*Ms))^.5 = stack velocity		74.24	(ft/s)	14
Qs = (vs)*Ao*60 = stack flow rate		27840	(acfm)	15
Qstd =17.64*Qs*(1-Bws)*Ps/Ts =flow rate at STP		22618	(dscfm)	16
I = 144*100*Ts*(.002669*Vlc+(Vm'/Tm)*Pm)/ (60*Ø*vs*Ps*An) =isokinetic		97.83	(%)	17
E = (0.00857)*(Qstd)*Cs = particulate emission rate		1.39	(lbs/hr)	18

SUMMARY OF CALCULATIONS:

Enter the type of plant. (Asphalt/Combustion) Asphalt

I = % isokinetics =	97.8	%
Cs = grain loading (dry) =	0.007	grains/dscf
E = particulate emission rate =	1.39	lbs/hr
% CO2 =	1.20	%

San Diego County APCD METHOD 5 LAB SHEET-P.O.# 1207

SITE = _____

TEST # = _____

VOLUMES

(1) IMPINGER VOLUMES

	final		initial		Δ
#1	739.75 g	-	567.85 g	=	171.90 g
#2	523.05 g	-	562.83 g	=	-39.78 g
#3	491.35 g	-	487.20 g	=	4.15 g
#4	477.40 g	-	475.95 g	=	1.45 g

† TOTAL VOLUME LIQUID COLLECTED = 137.72 ml

comments:

The Acetone and DI Water rinses were kept separate by front and back half. An Organic Extraction was performed with Petroleum Ether on the back half DI Rinse. A Petroleum Ether Blank was performed.

† The density of water is 1 g/ml

Revised 10/25/90 J. Cawyer 1/2/91

SOC 50

San Diego County APCD METHOD 5 LAB SHEET-P.O.# 1207

TEST # = 0

(2) BEAKER RINSES

ACETONE			WATER			METHYLENE CHLORIDE		
BKR ID =	162/159		BKR ID =	184/166		BKR ID =		
FRONT HALF =	225.0	ml	FRONT HALF =	200.0	ml	FRONT HALF =		ml
F.H. RINSES =	50.0	ml	F.H. RINSES =	40.0	ml	F.H. RINSES =		ml
BACK HALF =	160.0	ml	BACK HALF =	215.0	ml	BACK HALF =		ml
B.H. RINSES =	50.0	ml	B.H. RINSES =	40.0	ml	B.H. RINSES =		ml
SEPARATORY FUNNEL RINSE =	0.0	ml	IMPINGERS =	200.0	ml			
total acetone =	485.0	ml	total water =	695.0	ml	total Pet Ether =	0.0	ml

* All data and calculations may be found on file at the San Diego County Air Pollution Control District.

Revised 10/25/90 J. Cawyer 1/2/91

San Diego County APCD METHOD 5 LAB SHEET-P.O.# 1207

TEST # = 0

STANDARDS

volume Ac = 560.0 ml volume water = 560.0 ml Pet. volume Ethe = _____ ml

ACETONE		WATER		PETROLEUM ETHER	
BKR ID =	160	BKR ID =	177	Bkr ID =	
f:	49.7013 g	f:	30.3519 g	f:	g
i:	49.6994 g	i:	30.3508 g	i:	g
Δ:	0.0019 g	Δ:	0.0011 g	Δ:	0.0000 g

Limits:

limit for Petroleum ether is 6.4 µg/ml (6.4* 10^-6 g/ml)
limit for acetone is 10.0 µg/ml (10.0 * 10^-6 g/ml)
limit for water is 4 µg/ml (4 * 10^-6 g/ml)

The Acetone **PASSED** 3.3929E-06 g/ml

The Water **PASSED** 1.9643E-06 g/ml

The Petroleum Ether **PASSED** 0 g/ml

Revised 10/25/90 J. Cawyer 1/2/91

San Diego County APCD METHOD 5 LAB SHEET-P.O.# 1207

TEST # = 0

(3) CORRECTIONS- (volume used)*(std wt)

ACETONE		WATER		PETROLEUM ETHER	
FRONT HALF =	0.000933 g	FRONT HALF =	0.000471 g	FRONT HALF =	0.000000 g
BACK HALF =	0.000713 g	BACK HALF =	0.000501 g	BACK HALF =	0.000000 g
SEP. FUNNEL =	0.000000 g	IMPINGERS =	0.000393 g		

tot. front half = 0.001404 g

total back half = 0.001213 g

sep. funnel + impingers = 0.000393 g

total grams from solvents = 0.0030 g

Revised 10/25/90 J. Cawyer 1/2/91

TEST # = 0

ORGANIC

BKR ID = _____	BKR ID = _____
f: _____ g	f: _____ g
i: _____ g	i: _____ g
Δ: 0.0000 g	Δ: 0.0000 g

FILTERS

ID = _____	ID = 89062
f: _____ g	f: 0.1212 g
i: _____ g	i: 0.1210 g
Δ: _____ g	Δ: 0.0002 g

SDC - 57

SAN DIEGO AIR POLLUTION CONTROL DISTRICT
9150 CHESAPEAKE DRIVE
SAN DIEGO, CALIFORNIA

TEST NO.: 87163

P.O. NO.: 0236

TEST DATE: JUNE 12, 1987

SOURCE TESTED: U. S. SILICA CO.
3231 OCEANSIDE BLVD.
OCEANSIDE, CA 92056

UNIT TESTED: FLUID BED DRYER

PERFORMED BY: P. JARMAN
G. CARRIER
C. RIDENOUR
A. SEGAL (ENG)

REPORT PREPARED BY: P. JARMAN

APPROVED BY: C.W. Ridenour
C.W. RIDENOUR
SENIOR AIR POLLUTION CHEMIST

7/9/87
DATE

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SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT

TEST DATE: June 12, 1987

TEST NO. : 87163

P.O. NO. : 0236

SUMMARY: EMISSIONS TO ATMOSPHERE

NAME OF FIRM: U. S. Silica Company

LOCATION OF PLANT: 3231 Oceanside Blvd.

TYPE OF OPERATION: Processing and Bagging Sand

UNIT TESTED: Fluid Bed Dryer

		MEASURED EMISSIONS	ALLOWABLE EMISSIONS
RULE 52	PARTICULATE MATTER, DRY	_____ Grains per SCF	_____ Grains per SCF
RULE 53A	SULFUR COMPDS AS SO-2, DRY	_____ % by VOL.	_____ % by VOL.
RULE 53B	COMBUSTION CONTAMINANTS	_____ Grains per SCF @12% CO2	_____ Grains per SCF @12% CO2
RULE 53C	INCINERATORS	_____ Grains per SCF @12% CO2	_____ Grains per SCF @12% CO2
RULE 54	DUST & FUMES	3.68 Lbs/Hr	40 Lbs/Hr

GAS FLOW RATE, DSCFM 25,742

GAS TEMPERATURE, °F 121.0 (AVE)

PRODUCTION RATE 70.3 Tons/hr

EMISSION RATES

PARTICULATES: 3.68 Lbs/Hr

OXIDES OF NITROGEN: _____ Lbs/Hr

TEST DESCRIPTION

Introduction
This report presents the results of particulate loading and gas volume tests performed at U.S. Silica Co., on June 12, 1987. The tests were performed on the exhaust stack of the water scrubber serving the Fluid Bed Dryer, while production averaged 70.3 tons per hour.

System Description
Glass sand is dried in a natural gas fired Fluid Bed Dryer. The exhaust from the dryer is pulled through a venturi-type scrubber. This report shows the emissions into the atmosphere from this scrubber.

Procedures
The procedures and equipment utilized in performing these tests were based on EPA New Source Performance Standards Method 5. The sampling train was modified as shown on Page 7. The calculations were designed to include the impinger catch so that the test results can be compared to Rule 54 of SDAPCD.

Velocity Traverse
Prior information regarding the stack velocity profile eliminated the need for a separate exploratory traverse. Temperature and pitot tube data collected during actual sampling was used to calculate actual stack volume.

Particulate Sampling
This sample consisted of 42 traverse points, 7 from each sample port as shown in Figure 1, on page 5. The sample was collected at 3 minutes per point for a total test time of 84 minutes. The sample was collected 7 feet from the exhaust outlet of the stack. Field data associated with sample collection has been transferred to computer printout and is shown on Page 8 and 9. Calculations were performed by computer and are shown on Pages 3 and 4. Though the isokinetic sampling rate is outside the usual recommended range, the emission is acceptable in accordance with criterion contained in Appendix A, Part 10, SDAPCD Quality Assurance Guidlines and Operational Procedures. The isokinetic variance was caused by the assumed moisture content being 5% lower than previously measured.

Gas analysis
Carbon dioxide and oxygen content of the stack gas was measured by Orsat, according to EPA NSPS Method 3. The results of this analysis are on Page 4. 4.

Comments
The site is in disrepair compared to last year. There are substantial holes and leaks in the ducting. These were temporarily sealed during the test but should be repaired.

AIR POLLUTION CONTROL DEPARTMENT - COUNTY OF SAN DIEGO

TEST NO. 87163
U.S. SILICA
RUN 1

TEST DATE JUNE 12, 1987

A.	V_m	METER VOLUME, UNCORRECTED*FACTOR	=	58.45 cu ft
B.	P_m	METER PRESSURE, P_{bar} + H/13.6	=	29.95 in Hg
C.	T_m	METER TEMPERATURE, 460+(T_1 +T_2)/2	=	559. DEG. R
D.	T_i	IMPINGER TEMPERATURE	=	45. DEG. F
E.	T_s	AVERAGE STACK TEMPERATURE, 460+DEG. F	=	581. DEG. R
F.	P_s	STACK PRESSURE, P_{bar} + P_g /13.6	=	30.09 in Hg
G.	VP_i	MAX. H_2O VP PERMITTED AT T_i (SEE APPENDIX)	=	.32 in Hg
H.	V_{lc}	VOLUME OF CONDENSED H_2O (SEE LAB SHEET)	=	119. ml
I.	$V_{calc\ 2}$	H_2O VAPOR , METER COND., H*C/B*0.00267	=	5.93 cu ft
J.	V_{wv}	MOISTURE METERED AT METER COND., A*G/B	=	.63 cu ft
K.	V_{dry}	SAMPLE VOLUME AT METER COND., DRY, A-J	=	57.82 cu ft
L.	$\%M_c$	PER CENT MOISTURE CALC.. 100*(I+J)/(A+I)	=	10.19 %
M.	VP_s	MAX. H_2O VP PERMITTED AT T_s (SEE APPENDIX)	=	3.54 in Hg
N.	$\%M_s$	PER CENT MOISTURE PERMITTED, M/F*100	=	11.8 %
	B_{ws}	ENTER LOWER OF L OR N	=	10.2 %
O.	M.C.	MOISTURE CORRECTION FACTOR, (100-L OR N)/100	=	.898
P.	$V_{m(std)}$	SAMPLE VOL., STD COND. (DRY), K*528/29.92*B/C	=	54.615 cu ft
S.	m_n	WEIGHT OF PARTICULATE MATTER COLLECTED	=	.059 g
T.	c_s	GRAIN LOADING (DRY), 15.43*S/P	=	.017 grains/scf

AIR POLLUTION CONTROL DEPARTMENT - COUNTY OF SAN DIEGO

TEST NO. 87163
U.S. SILICA
RUN 1

TEST DATE JUNE 12, 1987

GAS ANALYSIS				
COMPONENT	VOL.%/100	*MOISTURE CORR	*MOL.WT.	=WT./MOLE WET BASIS
WATER, B_{ws}	.1019	1.00000	18.0	1.833
OXYGEN	.1880	.89814	32.0	5.403
CARBON MONOXIDE	.0000	.89814	28.0	.000
CARBON DIOXIDE	.0130	.89814	44.0	.514
NITROGEN & INERTS	.7990	.89814	28.2	20.237

AA. M_s AVERAGE MOLECULAR WEIGHT = 27.987

DD. C_p PITOT TUBE CORRECTION FACTOR = .822

EE. V_s STACK VELOCITY AT STACK COND. (SEE SAMPLE DATA) = 83.71 ft/sec

FF. $V_{s(std)}$ STACK VEL. AT STD COND.(DRY),EE*528/29.92*F/E*O = 68.65 ft/sec

GG. DURATION OF SAMPLING = 126. min

HH. AVERAGE SAMPLING RATE (DRY),P/GG = .433 scfm

II. SELECTED NOZZLE DIAMETER = .147 in

JJ. SAMPLING VELOCITY AT STD COND.,HH/II**2*144/60*4/3. = 61.30 ft/sec

KK. I ISOKINETIC VARIATION, JJ/FF*100 = 89. %

LL. A_s AREA OF STACK = 6.25 sq ft

MM. Q_{sd} FLOW RATE AT STD. COND.(DRY), FF*LL*60 = 25742. scfm

NN. Q_s FLOW RATE AT STACK COND., EE*LL*60 = 31391. acfm

UU. PARTICULATE EMISSION RATE, 0.00847*T*MM = 3.68 lb/hr

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

TRAVERSE POINTS

CRYSTAL SILICA

EXHAUST FROM FLUID BED DRYER

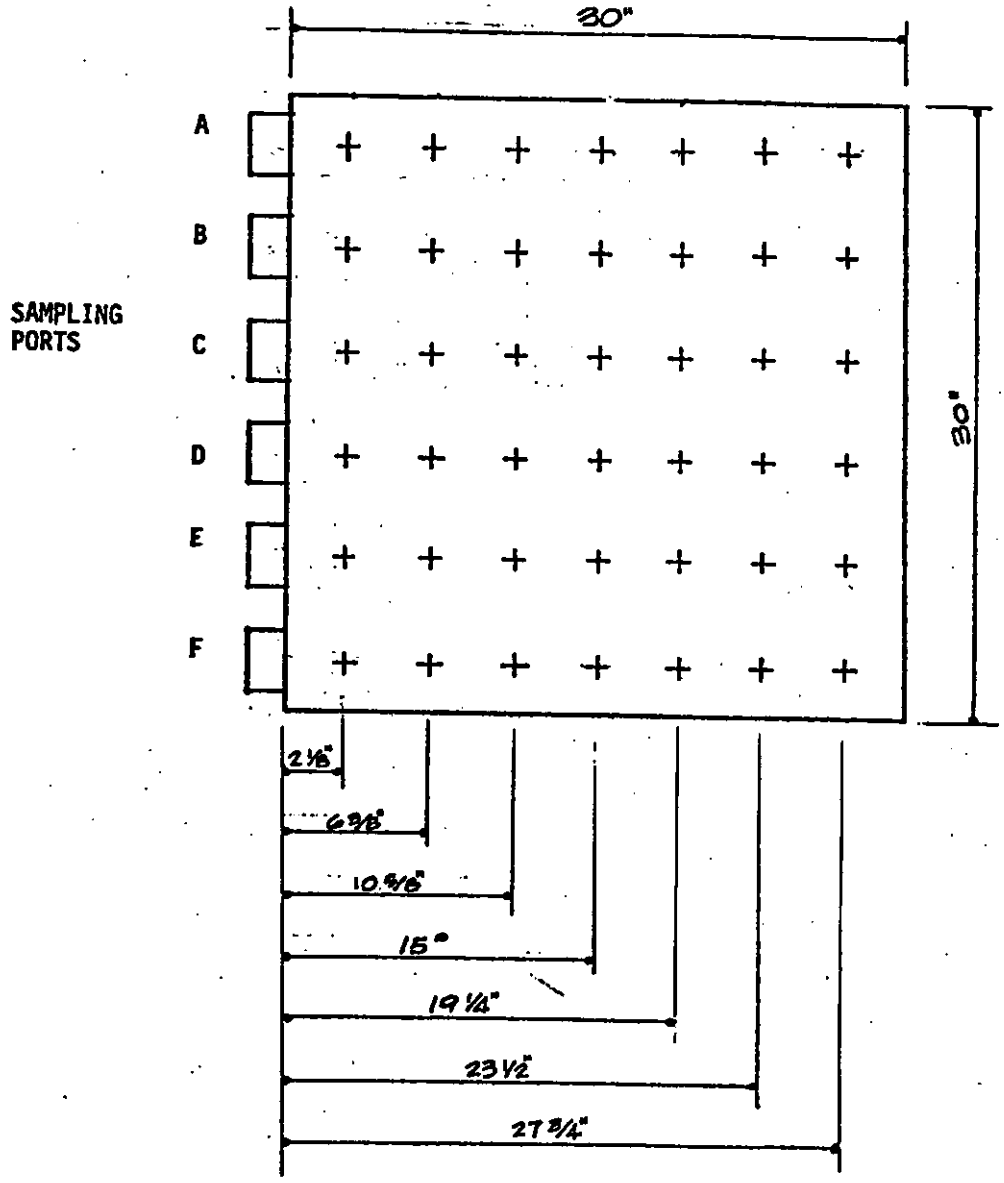
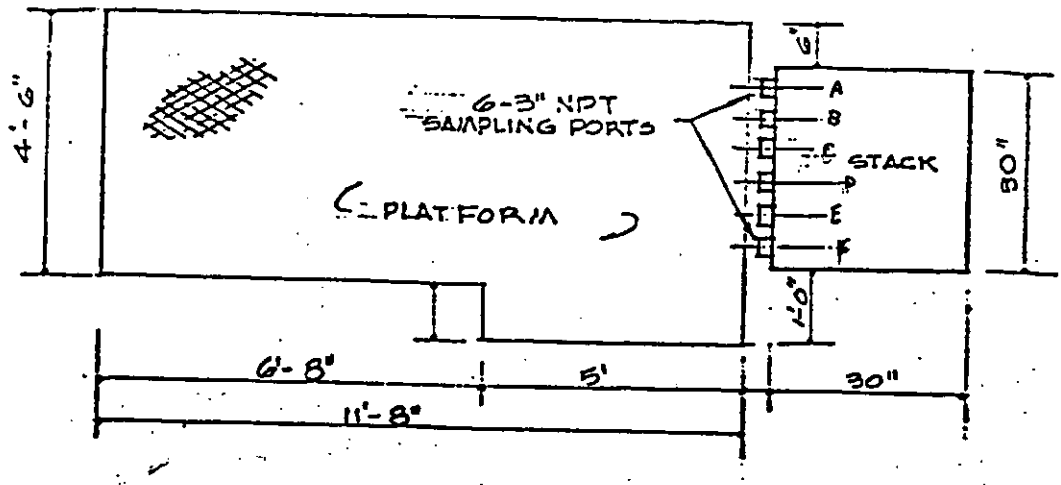
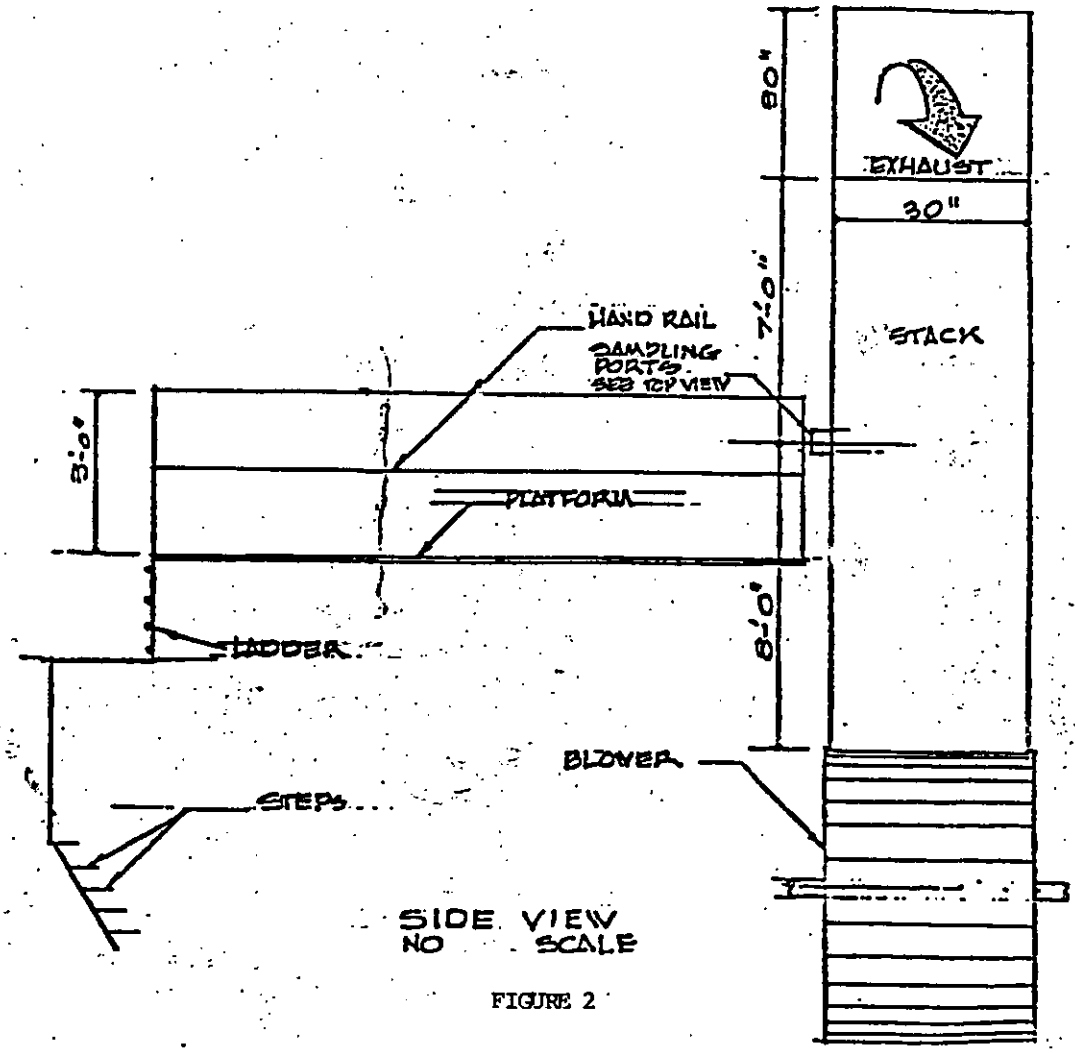


Figure 1



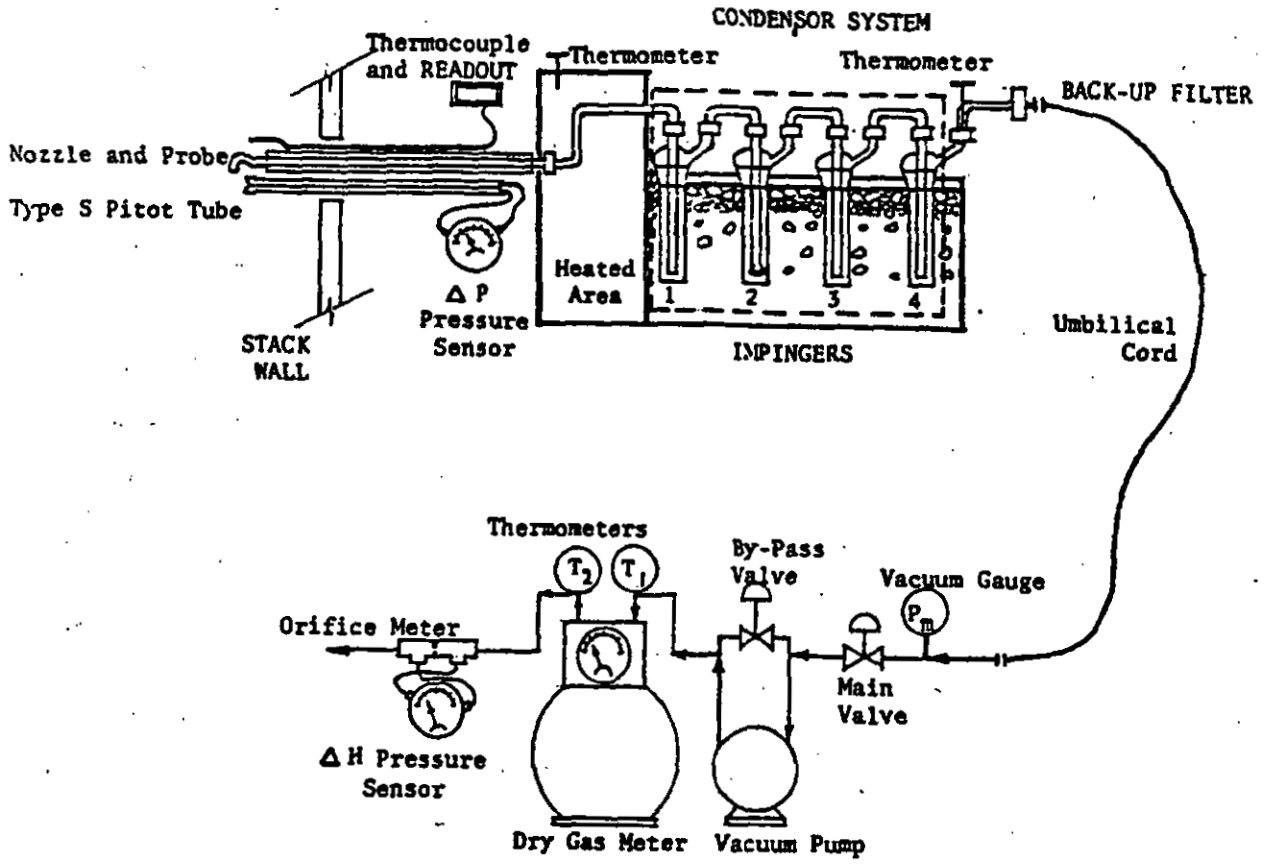
TOP VIEW
NO SCALE



SIDE VIEW
NO SCALE

FIGURE 2

SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT



LEGEND

Greenburg-Smith Type Impingers

No. 1 Mod- 100 ML Deionized Water

No. 2 Std- 100 ML Deionized Water

No. 3 Mod- Dry

No. 4 Mod- Dry

Mod - Modified Type
Std - Standard Type

FIELD DATA ABBREVIATIONS

PT = Point Number
T_s = Stack Temperature, °F
P = Pitot Tube Pressure Differential, in.H_2O
VEL= Stack Velocity, fps
H = Orifice Meter Pressure Drop, in. H_2O
T_1 = Meter Inlet Temperature, °F
T_2 = Meter Outlet Temperature, °F
P_m = Pump Vacuum, in. Hg
T_i = Impinger Temperature, °F
P_{bar} = Barometric Pressure, in. Hg

FIGURE 3: PARTICULATE MATTER SAMPLING TRAIN

AIR POLLUTION CONTROL DEPARTMENT - COUNTY OF SAN DIEGO

TEST NO. 87163
U.S. SILICA
RUN 1

TEST DATE JUNE 12, 1987

PT	T_s	P	VEL	H	T_1	T_2	P_m	T_i	CO_2
A1	123.	1.500	71.6	.75	78.0	96.0	.00	44.00	1.30
A2	127.	1.500	71.9	.75	78.0	100.0	.00	43.00	1.30
A3	123.	1.300	66.7	.60	78.0	104.0	.00	43.00	1.30
A4	122.	1.300	66.6	.60	78.0	108.0	.00	42.00	1.30
A5	125.	1.200	64.2	.55	78.0	108.0	.00	42.00	1.30
A6	123.	1.300	66.7	.60	78.0	110.0	.00	42.00	1.30
A7	128.	1.300	66.9	.60	78.0	110.0	.00	42.00	1.30
B1	123.	1.400	69.2	.65	80.0	108.0	.00	42.00	1.30
B2	124.	1.600	74.0	.75	80.0	112.0	.00	44.00	1.30
B3	122.	1.500	71.5	.70	80.0	114.0	.00	44.00	1.30
B4	121.	1.300	66.5	.60	80.0	114.0	.00	44.00	1.30
B5	130.	1.400	69.6	.65	84.0	102.0	.00	46.00	1.30
B6	128.	1.500	71.9	.70	82.0	112.0	.00	44.00	1.30
B7	128.	1.500	71.9	.70	82.0	116.0	.00	44.00	1.30
C1	125.	1.500	71.7	.70	84.0	100.0	.00	46.00	1.30
C2	123.	2.000	82.7	.90	84.0	114.0	.00	44.00	1.30
C3	123.	1.500	71.6	.70	84.0	116.0	.00	44.00	1.30
C4	123.	1.600	74.0	.75	84.0	118.0	.00	44.00	1.30
C5	127.	1.600	74.2	.75	84.0	118.0	.00	45.00	1.30
C6	123.	1.800	78.4	.80	84.0	120.0	.00	45.00	1.30
C7	122.	1.800	78.4	.80	84.0	120.0	.00	45.00	1.30
D1	124.	1.000	58.5	.50	86.0	110.0	.00	42.00	1.30
D2	121.	2.000	82.5	.90	86.0	118.0	.00	44.00	1.30
D3	123.	1.800	78.4	.80	86.0	120.0	.00	44.00	1.30
D4	122.	1.800	78.4	.80	86.0	120.0	.00	44.00	1.30
D5	125.	2.000	82.8	.90	86.0	120.0	.00	44.00	1.30
D6	128.	2.300	89.0	1.05	86.0	122.0	.00	45.00	1.30
D7	125.	2.300	88.8	1.05	86.0	122.0	.00	45.00	1.30
E1	120.	1.800	78.2	.80	88.0	112.0	.00	44.00	1.30

AIR POLLUTION CONTROL DEPARTMENT - COUNTY OF SAN DIEGO

TEST NO. 87163
U.S. SILICA
RUN 1

TEST DATE JUNE 12, 1987

SAMPLE COLLECTION DATA

PT	T_s	P	VEL	H	T_1	T_2	P_m	T_i	CO_2
E2	115.	2.500	91.8	1.15	88.0	120.0	.00	44.00	1.30
E3	115.	2.600	93.6	1.20	88.0	122.0	.00	44.00	1.30
E4	114.	2.900	98.8	1.35	89.0	116.0	.00	44.00	1.30
E5	123.	3.000	101.3	1.40	90.0	114.0	.00	46.00	1.30
E6	120.	3.200	104.3	1.45	88.0	118.0	.00	47.00	1.30
E7	123.	3.500	109.4	1.60	88.0	120.0	1.00	47.00	1.30
F1	111.	3.200	103.5	1.45	86.0	110.0	1.00	47.00	1.30
F2	107.	3.200	103.1	1.45	86.0	120.0	1.00	47.00	1.30
F3	111.	3.500	108.3	1.60	86.0	120.0	1.00	47.00	1.30
F4	114.	4.000	116.0	1.80	86.0	122.0	2.00	48.00	1.30
F5	115.	4.200	119.0	1.90	86.0	122.0	2.00	49.00	1.30
F6	116.	4.000	116.2	1.80	86.0	122.0	2.00	48.00	1.30
F7	117.	3.800	113.4	1.70	86.0	124.0	2.00	48.00	1.30
AVG	121.	2.058	83.7	.98	83.9	114.6	.29	44.69	1.30

$$VEL = 85.48 * C_p * SQ.RT.((P_s * T_s)/(P_s * M_s))$$

AVERAGE DELTA P = 2.1429

DRY GAS METER VOLUME UNCORRECTED = 56.470 P_{bar} = 29.88in Hg

METER CORRECTION FACTOR = 1.0350 P_s (STACK PRESSURE) = 2.8 in water

NOTES - 1. AVG P IS THE SQUARE OF THE MEAN (SQ.RT)
2. (VEL) = VEL*COS(ANG)
3. AVG CO_2 IS THE VELOCITY WEIGHTED AVERAGE

TEST NO. 87163 PAGE 10

COUNTY OF SAN DIEGO - AIR POLLUTION CONTROL DISTRICT

PARTICULATE MATTER
LABORATORY DATA

PARTICULATES

A. ACETONE WASH NOZZLE, PROBE IMPINGERS. Final 1.0520 g Net Wt. .0405 g

Pan # 253 Tare 1.0115 g

B. WATER WASH NOZZLE, PROBE, IMPINGERS, IMPINGER CATCH Final 1.0295 g Net Wt. .0172 g

Pan # 252 Tare 1.0123 g

C. BACK-UP FILTER Final 1.1232 g Net Wt. .0018 g

Pan # 245 Tare 1.0141 g

Filter # 115 Tare .1073 g

D. BLANKS

1000 ml Water .0001 g/100ml .0003 g Water Correction

500 ml Acetone .0001 g/100ml .0002 g Acetone Correction

Water Pan# W-3 .0005 g Net Weight

Acetone Pan# W-2

Total Weight of Particulate Matter (A + B + C - D) .0590 g

Condensed Moisture Final 319 ml

Impinger tare 200 ml

Net Gain 119 ml

Wash Volumes

Acetone 171 ml

Filtered D.I. Water 78 ml

Imp. Tare 200 ml

Total Water 278 ml

DL 7/9/87

APCD TEST No. 87163

JUNE 12, 1987

U.S. SILICA COMPANY
3231 OCEANSIDE BLVD., OCEANSIDE, CA.

SAND FLUID BED DRYER WITH ANTIPOL WET TYPE
AIR SCRUBBER AND PROCESS LINE (P/O 0236)

I. PRODUCTION DATA

TIME	TONNAGE	Δ TONS	Δ TIME, MINS	TONS/HR	MATERIAL
0907	(START TEST)				CONSTRUCTION SAND
0916	45513.24				
		4.96	4	74.4	" "
0920	45518.20				
		18.10	15	72.4	" "
0935	45536.30				
		39.29	32	73.7	" "
1007	45575.59				
		22.49	18	75.0	" "
1025	45598.08				
		27.64	23	72.1	" "
1048	45625.72				
		8.09	7	69.3	" "
1055	45633.81				
		8.93	7	76.5	
1102	45642.74	(SHUTDOWN)			
1118	45642.74	(STARTUP)			GLASS SAND

I. Production Data (Continued)

Time	Tonnage	ΔTons	ΔTime, mins	Tons/hr	Material
		6.81	7	58.4	Glass Sand
1125	45648.55				
		15.49	15	62.0	" "
1140	45664.04				
		10.55	10	63.3	" "
1150	45674.59				
(End of Test @ 1156)		9.47	8	71.0	" "
1158	45684.06				

Overall Average Production Rate During Test

Final Tonnage - Initial Tonnage

45684.06 - 45513.24 = 170.82 Tons

Final Time - Initial Time

1158 - 0916 = 2 hrs 42 mins - 16 mins (Down Time) = 2 hrs 26 mins = 2.43 hrs

Overall Average Production Rate = 170.82/2.43 = 70.3 Tons/hr

II Equipment Operation

		Temperature °F				Pressure "H_2O				PSIG
Time	Test Pt.	T_4	T_5	T_6	T_7	P_4	P_{10}	P_{11}	MV	$P_{scrubber}$
0907	A-1 (Start Test)									
0920		780	220	180	100	16	-.5	-9	-.45	25
0932	B-1									
0935		780	220	180	100	16	-.4	-8.8	-.45	25
0943	(Power Loss to Test Equipment)									
0955	B-7									

		Temperature °F				Pressure "H_2O				PSIG
Time	Test Pt.	T_4	T_5	T_6	T_7	P_4	P_{10}	P_{11}	MV	$P_{scrubber}$
1007		780	230	180	95	16	-.2	-8.6	-.45	25
1025	C-7	780	230	180	95	16	-.6	-8.9	-.45	25
1034	D-3									
1055		780	230	190	95	15.5	-.3	-8.6	-.50	25
1102	(Plant Shutdown)									
1118	(Plant Startup)									
1123	E-4 (Start Test)									
1125		750	220	195	90	14.0	-.5	-8.7	-.45	25
1133	E-7									
1135	F-1									
1140		750	220	185	85	15.0	-.4	-8.8	-.45	30
1150		750	210	180	80	15.0	-.4	-8.8	-.45	30
1156	F-7 (End of Test)									
1158		745	210	180	80	15.0	-.5	-8.8	-.45	45

Notes:

1. Instrumentation Notations

T_4 - gas temperature below dryer grid
T_5 - gas temperature above dryer grid
T_6 - sand temperature at dryer discharge
T_7 - gas temperature at dryer exit
P_4 - pressure below dryer grid
P_{10} - pressure at cyclone inlet
P_{11} - pressure at cyclone exit
MV - millivolt reading of damper position at fan exhaust
$P_{scrubber}$ - inlet water pressure to scrubber

2. Six (6) particulate sampling traverses of seven (7) points each were made within [illegible] sampling time

of three (3) minutes per test point.

3. There were air leaks in the exhaust system downstream of the fan caused by holes in the ducting and fan scroll due to the effects of corrosion and abrasion. Attempts to seal the leaks were not effective. Leakage was estimated to be less than 5% of the total flow. Photos were taken of the equipment.

4. The steam plume from the exhaust stack showed no visible particulate emissions.

5. The fluidized bed heater was gas-fired. The inlet natural gas supply pressure was 10 PSIG.

6. Attached is the Air Pollution Control Inspector visible emissions report.

Andrew Segal

ANDREW SEGAL
Associate Air Pollution Control Engineer

SAN DIEGO AIR POLLUTION
CONTROL DISTRICT
9150 CHESAPEAKE DRIVE
SAN DIEGO, CA 92123-1095

P/O #236

VISIBLE EMISSION OBSERVATION FORM

VIOLATION NO. _____

(07A) (#92A)

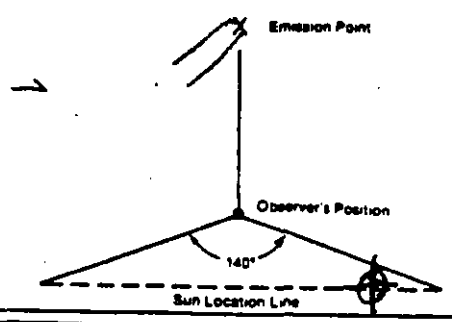
COMPANY NAME	US SILICA
STREET ADDRESS	3231 OCEANSIDE BLVD
	(Mark Lough) (Dan Stover)
CITY	Oceanside
STATE	CA
ZIP	92054
PHONE (KEY CONTACT)	
SOURCE ID NUMBER	94A

PROCESS EQUIPMENT	Fluilized bed dryer 180 °F
OPERATING MODE	75 TONS PER HOUR
CONTROL EQUIPMENT	Cyclone - wet scrubber
DESCRIBE EMISSION POINT	Stack down stream from wet scrubber and air moverer
HEIGHT ABOVE GROUND LEVEL	40'
HEIGHT RELATIVE TO OBSERVER	Start 25' End 25'
DISTANCE FROM OBSERVER	Start 150' End 150'
DIRECTION FROM OBSERVER	Start NW End NW
DESCRIBE EMISSIONS	Start W.V. plume End W.V. plume
EMISSION COLOR (invisible)	Start Clear End Clear
IF WATER DROPLET PLUME	Attached X Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED	Start CANNOT READ End
DESCRIBE PLUME BACKGROUND	Start GREY End GREY
BACKGROUND COLOR	Start GREY End GREY
SKY CONDITIONS	Start Cloudy End Cloudy
WIND SPEED	Start 4-8 End 4-8
WIND DIRECTION	Start W End W
AMBIENT TEMP	Start 64 End 65
WET BULB TEMP	62
RH, percent	91

SOURCE LAYOUT SKETCH

Stack with Plume
Sun
Wind

Draw North Arrow



ADDITIONAL INFORMATION

OBSERVATION DATE	START TIME	END TIME
6-12-87	0930	0950

MIN \ SEC	0	15	30	45	COMMENTS
1					A Hashed w.v.
2					plume approx
3					100' long before
4					disipating. Solid
5					overcast, cannot
6					see any VE.
7					observed plume
8					for 20 minutes.
9					Not possible
10					to detect any
11					VE at point w.v.
12					plume disipates
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

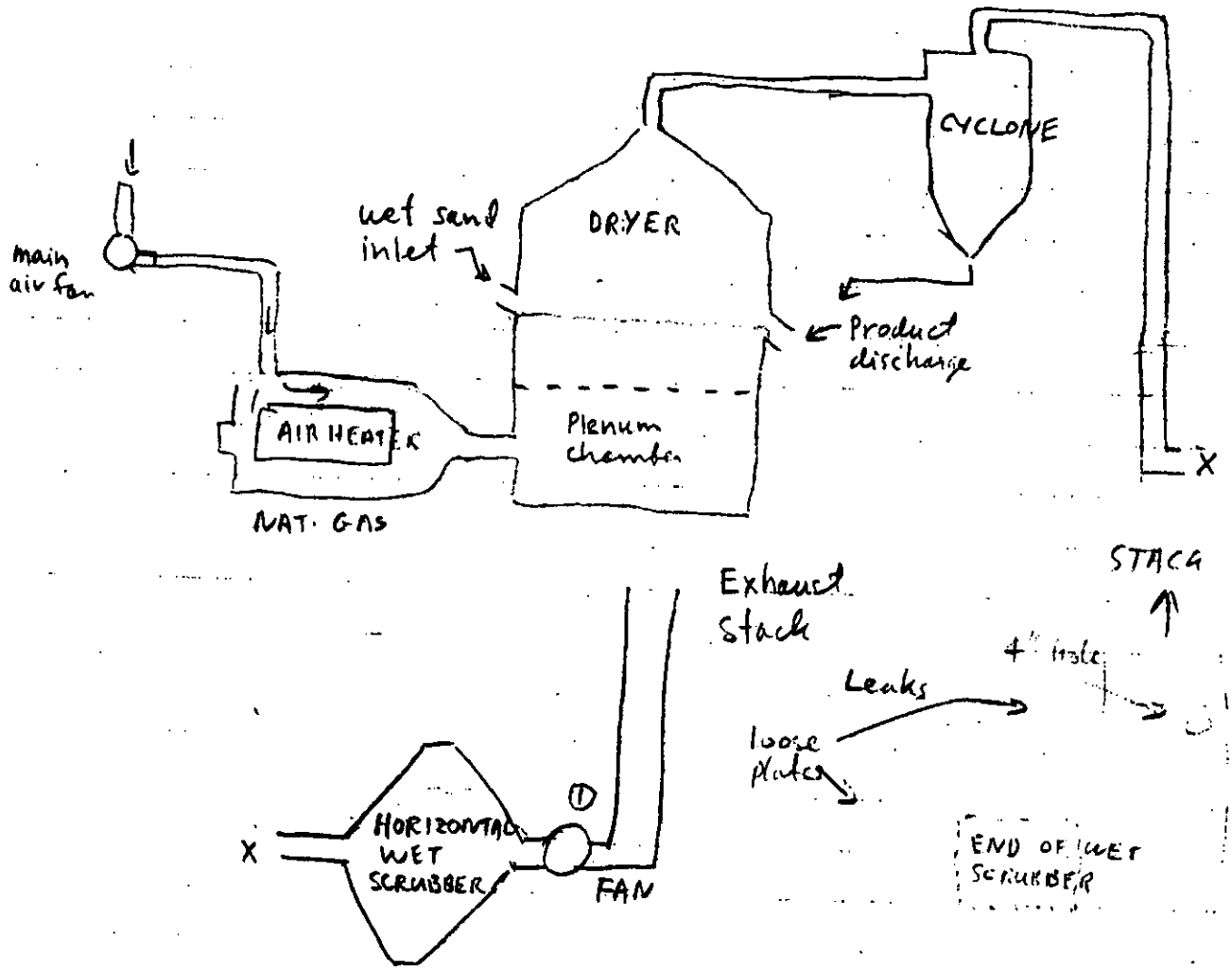
OBSERVER'S NAME (PRINT)	Edward Slater
OBSERVER'S SIGNATURE	Edward Slate
DATE	6-12-87
ORGANIZATION	APCD
CERTIFIED BY	CARB
DATE	
CONTINUED ON VEO FORM NUMBER	

DISTRIBUTION: WHITE - APCD FILE YELLOW - APCD INSPECTOR PINK - CLIENT

APCD030587

U.S. SILICA

6-12-87



① loss of approx 5 to 10% of exhaust gases through openings in fan housing down stream from wet scrubber

apcd
County of San Diego

R. J. Sommerville
Air Pollution Control Officer

U. S. Silica Company
Mr. Dan Stover
3231 Oceanside Blvd.
Oceanside, CA 92056

Dear Sir;

The enclosed test report is the result of testing done at your facility.

If you have any questions, please call me at (619) 565-5911.

C.W. Ridenour
Senior Air Pollution Chemist

CWR:pj

Enclosures

AIR POLLUTION CONTROL DISTRICT
9150 Chesapeake Drive. San Diego, California 92123-1095

SOURCE TEST
COMPUTER INPUT DATA FORM

TEST NO.	RUN NO.	CARD NO.	TEST SITE
1 2 3 4 5	6 7	8 9	10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

V.S. Silica test #87163 QC Copy
6-12-87

NOTE:

Start coding at Column 1. The decimal point must also be coded, otherwise, it is assumed that the decimal point is after column 7. Up to 7 digits can be coded. Minus sign should also be coded for negative numbers.

WRD:ST:8-11-83

DATA	CARD NO.	
29.88	01	Barometric Pressure, in.Hg
2.8	02	Stack Pressue, in. H_2O
573.500	03	Start meter Volume, ft^3
629.970	04	Final Meter volume, ft^3
.5203	05	Max. vapor permitted at T_I, in. Hg
3.543	06	Max. water vapor permitted at T_S, in. Hg
119.0	07	Volume of condensed water, ml.
1.035	08	Meter calibration factor
1.3	09	% CO_2 (min. value = 0.04)
0.0	10	% CO
20.1	11	% O_2
79.9	12	% N_2
.822	13	Pitot tube correction Factor
6.25	14	Area of stack, ft^2
.147	15	Nozzle diameter, in.
126.0	16	Duration of sampling, min.
	17	Wt of particulate matter collected, gm.
0.0	18	PPM NO_2, DRY
0.0	19	PPM SO_2, DRY
0.0	20	Auxillary Fuel Flow Rate, CFM
-2		
1 2 3 4 5 6 7 8 9		

540.000 T_1 = 44 T_2 = 68 ΔH = 2.51 [illegible] 68°F K = .456 3 min/Point #1
547.440 = 106 = 70 G CARRIER US SILICA
P JARMAN
C RIDEMOUR

PROBE # SW4 Length 3'

FILTER NO 115
SAMPLE BOX NO 2
P. BARO ____ in.Hg.
INITIAL QUICK CK. 1.025

NOZZLE DIA .147 in.
P.STACK ____ in.H2O
FINAL QUICK CK. ____

SAN DIEGO APCD
SAMPLE COLLECTION DATA
A SEGAL (eng)

DATE 6/12/87
TEST NO 87163 RUN 1
OPERATOR G CARRIER

CHECKS	POINT NO.	STACK TEMP. °F	PITOT P in.H2O	GAS METER START VOLUME: 573.500 H	T1	T2	VAC	T I °F	GAS VOL. Ft3	0907 TIME ~~0905~~	CARD	α or %CO2
INITIAL +3.2 OK	A1	123	1.5	.75	78	96	0.0	44	574.800		-	
Pitot 4.6												
Thermo. OK #2,#3	A2	127	1.5	.75	78	100	0.0	43	575.900		-	
Train #15 Hg LOOZ TMIN	A3	123	1.3	.60	78	109	0.0	43	577.000		-	
INTERMEDIATE												
Pitot ____	A4	122	1.3	.60	78	108	0.0	42	.		-	
Train	A5	125	1.2	.55	78	108	0.0	42	579.200		-	
FINAL ____												
Pitot ____	A6	123	1.3	.60	78	110	0.0	42	.		-	
Train ____	A7	128	1.3	.60	78	110	0.0	42	581.300	0928	-	
	B1	123	1.4	.65	80	108	0.0	42	582.400	0930	-	
	B2	124	1.6	.75	80	112	0.0	44	583.500		-	
SDAPCD ST #53 (2/79)	B3	122	1.5	.70	80	114	0.0	44	584.700		-	
	B4	121	1.3	.60	80	114	0.0	44	585.750	0942	-	
									.		-	

#2

US SILICA

PROBE # _____ Length _____

FILTER NO _____ NOZZLE DIA ____ in.

SAMPLE BOX NO _____

P. BARO ____ in.Hg. P.STACK +2.8 in.H2O

INITIAL QUICK CK. _____ FINAL QUICK CK. _____

SAN DIEGO APCD
SAMPLE COLLECTION DATA

DATE 6/12/87

TEST NO 87463 RUN ____

OPERATOR G. CARRIER

CHECKS	POINT NO.	STACK TEMP. °F	PITOT P in.H2O	GAS METER START VOLUME: H	T_1	T_2	VAC	T I °F	GAS VOL. Ft^3	TIME	CARD	α or %CO_2
INITIAL	85	130	1.7	.65	84	102	0.0	46	586.850		0947-	
Pitot ___											-	
Thermo. ___	86	128	1.5	.70	82	112	0.0	44				
Train ___	87	128	1.5	.70	82	116	0.0	44	589.200		0956-	
INTERMEDIATE												
Pitot ___	01	125	1.5	.70	84	100	0.0	46	590.400		1002-	
Train	02	123	2.0	.90	84	114	0.0	44				
FINAL ___											-	
Pitot ___	03	123	1.5	.70	84	116	0.0	44	592.850			
Train ___	04	123	1.6	.75	84	118	0.0	44	594.100		-	
	05	127	1.6	.75	84	118	0.0	45	595.200		-	
	06	123	1.8	.80	84	120	0.0	45			-	
SDAPCD ST #53 (2/79)	07	122	1.8	.80	84	120	0.0	45	597.600		1023- 1027	
	08	124	1.0	.50	86	110	0.0	42	598.000		-	
											-	

#3

PROBE # _____ Length _____

FILTER NO _____ NOZZLE DIA ____ in.

SAMPLE BOX NO _____

P. BARO ____ in.Hg. P.STACK ____ in.H2O

INITIAL QUICK CK. _____ FINAL QUICK CK. _____

SAN DIEGO APCD
SAMPLE COLLECTION DATA

DATE 6/12/87

TEST NO 87163 RUN ____

OPERATOR G CARRIER

CHECKS	POINT NO.	STACK TEMP. °F	PITOT P in.H2O	GAS METER START VOLUME: H	T_1	T_2	VAC	T I °F	GAS VOL. Ft^3	TIME	CARD	α or %CO_2
INITIAL	D2	121	2.3	.90	86	118	0.0	44	599.950		-	
Pitot ___												
Thermo. ___	D3	123	1.8	.80	86	120	0.0	44	601.200		-	
Train ___	D4	122	1.9	.80	86	120	0.0	44	602.400		-	
INTERMEDIATE												
Pitot ___	D5	125	2.0	.90	86	120	0.0	44	603.700		-	
Train	~~D5~~	~~125~~	~~2.0~~									
	D6	128	2.3	1.05	86	122	0.0	45	605.150		1048	
FINAL ___	~~D6~~											
Pitot ___											-	
Train ___	D7	125	2.3	1.05	86	122	0.0	45	606.625		1048 -	
											1058	
	E1	120	1.8	.80	88	112	0.0	44			-	
	E2	115	2.5	1.15	88	120	0.0	44			-	
SDAPCD ST #53 (2/79)	E3	115	2.6	1.20	88	122	0.0	44	610.800		-	
									611.400		1103	
1 MIN	E4	115	2.0	1.4	88	122	0.0	44			1222 -	
2 MIN		113	2.8	1.3	90	110	0.0	44	612.452		-	

#4

630.4

PROBE # _____ Length _____

FILTER NO _____
SAMPLE BOX NO _____
P. BARO _____ in.Hg.
INITIAL QUICK CK. _____

NOZZLE DIA _____ in.
P.STACK _____ in.H2O
FINAL QUICK CK. 1.034 (2)

SAN DIEGO APCD
SAMPLE COLLECTION DATA

DATE 6/12/87
TEST NO 87163 RUN _____
OPERATOR G CARRIER

CHECKS	POINT NO.	STACK TEMP. °F	PITOT P in.H2O	GAS METER START VOLUME: H	T_1	T_2	VAC	T I °F	GAS VOL. Ft³	TIME	CARD	α or %CO2
INITIAL	E5	123	3.0	1.4	90	114	0.0	46	614.500		-	
Pitot ___												
Thermo. ___	E6	120	3.2	1.45	88	118	0.0	47	615.750		-	
Train ___	E7	123	3.5	1.6	88	120	1.0	47	617.500		1133 ~~1104~~ -	
INTERMEDIATE												
Pitot ___	F1	111	3.2	1.45	86	110	1.0	47	.		1135 -	
Train	F2	107	3.2	1.45	86	120	1.0	47	620.850		-	
FINAL	F3	111	3.5	1.6	86	120	1.0	47	.		-	
Pitot OK +4.5 -4.6												
Train 5" Hg <.001 1 min (20)	F4	114	4.0	1.8	86	122	2.0	48	624.400		-	
	F5	115	4.2	1.9	86	122	2.0	49	626.300		-	
	F6	116	4.0	1.8	86	122	2.0	48	.		-	
SDAPCD ST #53 (2/79)	F7	117	3.8	1.7	86	124	2.0	48	629.970		1156 -	
			.	.			.		.		-	
			.	.			.		.		-	

25

AIR POLLUTION CONTROL DEPARTMENT - COUNTY OF SAN DIEGO

ORSAT FIELD DATA

Test No. 87163 Date 6/12/87

Site US SILICA Leak Check OK @ 4 mm

	%		1st Reading	2nd Reading	3rd Reading	4th Reading	5th Reading	Stable Reading
MB IR	0.0	CO_2	0.0	0.0				0.0
	20.9	O_2	20.9	20.9				20.9
		CO						
MPLE A	1.3	CO_2	1.3	1.3				1.3
	18.8	O_2	20.1	20.1				20.1
		CO						
MPLE A	1.3	CO_2	1.3	1.3				1.3
	18.8	O_2	20.1	20.1				20.1
		CO						
MPLE		CO_2						
		O_2						
		CO						
MPLE		CO_2						
		O_2						
		CO						

SAMPLE # A AVERAGE ANALYSIS SAMPLE #

1.3	CO_2
~~20.1~~ 18.8	O_2
0.0	CO

	CO_2
	O_2
	CO

871631 OU.S. SILICA JUNE 12, 1987

29.88
2.8
573.500
629.970
.3203
3.543
119.0
1.035
1.3
0.0
18.8
79.9
.822
6.25
.147
126.0
.0590
0.0
0.0
0.0

A1	123.	1.5	.75	78.	96.	0.0	44.	1.3
A2	127.	1.5	.75	78.	100.	0.0	43.	1.3
A3	123.	1.3	.6	78.	104.	0.0	43.	1.3
A4	122.	1.3	.6	78.	108.	0.0	42.	1.3
A5	125.	1.2	.55	78.	108.	0.0	42.	1.3
A6	123.	1.3	.6	78.	110.	0.0	42.	1.3
A7	128.	1.3	.6	78.	110.	0.0	42.	1.3
B1	123.	1.4	.65	80.	108.	0.0	42.	1.3
B2	124.	1.6	.75	80.	112.	0.0	44.	1.3
B3	122.	1.5	.7	80.	114.	0.0	44.	1.3
B4	121.	1.3	.6	80.	114.	0.0	44.	1.3
B5	130.	1.4	.65	84.	102.	0.0	46.	1.3
B6	128.	1.5	.7	82.	112.	0.0	44.	1.3
B7	128.	1.5	.7	82.	116.	0.0	44.	1.3
C1	125.	1.5	.7	84.	100.	0.0	46.	1.3
C2	123.	2.0	.9	84.	114.	0.0	44.	1.3
C3	123.	1.5	.7	84.	116.	0.0	44.	1.3
C4	123.	1.6	.75	84.	118.	0.0	44.	1.3
C5	127.	1.6	.75	84.	118.	0.0	45.	1.3
C6	123.	1.8	.8	84.	120.	0.0	45.	1.3
C7	122.	1.8	.8	84.	120.	0.0	45.	1.3
D1	124.	1.	.5	86.	110.	0.0	42.	1.3
D2	121.	2.	.9	86.	118.	0.0	44.	1.3
D3	123.	1.8	.8	86.	120.	0.0	44.	1.3
D4	122.	1.8	.8	86.	120.	0.0	44.	1.3
D5	125.	2.	.9	86.	120.	0.0	44.	1.3
D6	128.	2.3	1.05	86.	122.	0.0	45.	1.3
D7	125.	2.3	1.05	86.	122.	0.0	45.	1.3
E1	120.	1.8	.8	88.	112.	0.0	44.	1.3
E2	115.	2.5	1.15	88.	120.	0.0	44.	1.3
E3	115.	2.6	1.2	88.	122.	0.0	44.	1.3
E4	114.	2.9	1.35	89.	116.	0.0	44.	1.3
E5	123.	3.	1.4	90.	114.	0.0	46.	1.3
E6	120.	3.2	1.45	88.	118.	0.0	47.	1.3
E7	123.	3.5	1.6	88.	120.	1.	47.	1.3
F1	111.	3.2	1.45	86.	110.	1.	47.	1.3
F2	107.	3.2	1.45	86.	120.	1.	47.	1.3
F3	111.	3.5	1.6	86.	120.	1.	47.	1.3
F4	114.	4.	1.8	86.	122.	2.	48.	1.3

F5	115.	4.2	1.9	86.	122.	2.	49.	1.3
F6	116.	4.	1.8	86.	12[illegible]	2.	48.	1.3
F7	117.	3.8	1.7	86.	12[illegible]	2.	48.	1.3

END

.42

AIR POLLUTION CONTROL DEPARTMENT - COUNTY OF SAN DIEGO

TEST NO. 87163
U.S. SILICA
RUN 1

TEST DATE JUNE 12, 1987

SUMMARY FINAL CALCULATIONS

T.	c_s GRAIN LOADING(DRY)	=	.017	grains/scf
UU.	PARTICULATE EMISSION RATE	=	3.68	lb/hr
OO.	$\%CO_2$ (GAS ANALYSIS)	=	1.30	%
PP.	C_{12} GRAIN LOADING(DRY) AT 12% CO_2 ,T*12/OO.	=	.154	grains/scf

ZZ. EXCESS AIR = $\dfrac{(\%\ \text{OXYGEN} - \%\ \text{CO}) * 100}{0.264*(\%\ N2) - (\%\ OX) + 0.5*(\%\ CO)}$ = 820. %

SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT

TEST DAY LOG

SITE: U.S. Silica

APCD PERSONELL: ~~[illegible]~~ CARRIER RIDENOUR Seapl (ENG)

DATE: 6-12-87

TEST #

P.O. #

0430 Arrive at APCD

Prelim traverse showed lower ΔP's across stack

0505 Leave APCD

0600 Arrive site check in @ office

0610 Begin set-up test equipment

0650 QA check complete 1.025

0722 Ready to test Leak checks complete

0907 Begin test

0728 (A)	Port change	0956 (B)	Port change	1027 (C)	Port change
1048 (D)	Port change	1133 (E)	Port change		Port change
	Port change		Port change		Port change

1156 End test

Quick & leak check complete

Equipment dismantle complete

Leave site

Arrive APCD

COMMENTS:

TEST NO.: 87163

TEST DATE: 6/12/87

TEST SITE: US SILICA

LOCATION: Oceanside Blvd Oceanside

SOURCE TEST PERSONNEL: ~~[illegible]~~ carrier Rilenour

FACILITY CONTACT: Mark Lowe

APCD ENGINEER: Segal

APCD INSPECTOR: ~~Segal~~

SAMPLE BOX NO.: 2

METER BOX NO.: D-337

FILTER NO.: 115

NOZZLE DIAMETER: .147

STACK SIZE: 30x30 6.25 ft²

AMBIENT TEMP., °F: 66°

ASSUMED MOISTURE, %: 15%

NO. OF SAMPLE POINTS: ~~30~~ 42

MINUTES/POINT: 3 min/PT

START TIME: 0907

STOP TIME: 1156

TOTAL TEST TIME: 126 min

INITIAL VOLUME, FT³: 573.500

FINAL VOLUME, FT³: 629.970

Probe 3' SN 2
Cp .822

LEAK CHECKS:	INITIAL	FINAL
1. VAC. LINE (RED):	ok	ok
2. PRESSURE LINE (GREEN):	ok	ok
3. SAMPLE LINE:	< .02 CFM	< .02 CFM

(MUST BE ≤0.002 FT³/MIN.)

SDAPCD WRD 10/17/84

SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT

TEST# 87163 DATE# 6/12/87 SITE# US SILICA

UNIT# P.O.

ABSOLUTE PRESSURE IN METER: 29.92

ABSOLUTE PRESSURE IN STACK: 29.92

ABSOLUTE TEMP. IN METER: 90°F

PRESSURE DROP ACROSS METER: 2.57

% MOISTURE OF STACK GAS: 15%

CORRECTION FACTOR: 1.22

STACK TEMPERTURE: 140°F

AVE. DIFFERENTIAL PRESSURE: 2.457 ≈ 2.5

IDEAL NOZZLE DIAMETER: .158

NOZZLE USED: .147

TEST DIFFERENTIAL PRESSURE: ΔP 3.4/1.85 $\frac{1.85}{3.4}$ = K = .544

HAND K = .4559

Omit a point

checked curve 6/12

Site ΔP's changed from previous test

US SILICA

460
140
600

$$846.872(.147)^4(2.57)(.823)^2(.85)^2 \quad \frac{550}{600}$$

$$846.872(.0004669)(2.57)(.677329)(.7225)(.916667) = .4559 = K$$

$$= .4559$$

START

$$\frac{10}{7.44}\left[\frac{.0319(545)}{29.92}\right]^{1/2}$$

547.440
540.000
7.440

106
94
200/2 = 100+69
190
55+460 545

$$\left[\frac{17.3855}{29.92}\right]^{1/2} = 1.025$$

.762277

FINISH

$$\frac{10}{7.5}\left[\frac{.0319(564)}{29.92}\right]^{1/2} = 1.034$$

122
86
208

86

104
460
564

637.9
630.4
7.5

Source Test Field Notes
U.S. Silica - formerly Crystal Silica - Oceanside Blvd
Date: 6/12/87
Arr. onsite: 7:15 - test sched start 7:30
1. Intro myself to Mark Lough. Plant Mgr.
2. Went to S.T. location - team set up, ready to go
3. Observed stack - several sizable leaks - dir. above dampers ~(2"x4"), 1" diam holes., One leakage at joint of rotary fan. ~½"x2"
4. Told A. Segal - Engineer of leaks - & we went to informed plant mgr. - Mark Lough who tried to get leaks fixed.
Dan Stover informed us they could n't patch it without shutting system down & this would take 16 hrs to bring it back up. They made a minor fix with a sand bag on horizontal leak.
5. Ed Slater, Inspector, arrived I asked him to observe leak rate also & estimate
6. Andy S. informed Stover that they had a choice scrub this test & pay for time in so far, go ahead w/ test & hope it would be close to prev. test values, which we estimated to be between 5.28 lbs (last rpt) and 12 lbs/hr. The limit is 40.
Andy told Stover
If the emissions are in this range (below 10 lbs/hr) and we assume the worst leakage rate is 50% or less than results could be 15 lbs & they'd still pass limit easily but if they are around 30 lbs ± 50% = 45 lbs then a retest, at their expense would be required. Stover agreed to this. We informed him a test is $4,000
7. At that point 9 A.M. I said start the test
8. Test start at 9:07 A.M.

9. 106 min sampling - 11 A.M. ✓.

10. Left site after getting Andy to document the size of the holes in the stack. ~ 12:30-1 lunch

11. 2 P.M. called SW explained car problem - missing po w/ her permission I took ½ hr VA & went st. home at the 52/5 turnoff to save going in & then having to turn around & come home.

12. This site should be given a very rigorous annual inspection - it has deteriorated very badly in 1 year - ~~[illegible]~~ control of fugitives is non-existent.

871631 OU.S. SILICA JUNE 12, 1987
29.88
2.8
573.500
629.970
.3203
3.543
119.
1.035
1.3
0.0
18.8
79.9
.822
6.25
.147
126.
.0590
0.0
0.0
0.0

A1	123.	1.5	.70	78.	96.	0.0	44.	1.3
A2	127.	1.5	.70	78.	100.	0.0	43.	1.3
A3	123.	1.3	.60	78.	104.	0.0	43.	1.3
A4	122.	1.3	.60	78.	108.	0.0	42.	1.3
A5	125.	1.2	.55	78.	108.	0.0	42.	1.3
A6	123.	1.3	.6	78.	110.	0.0	42.	1.3
A7	128.	1.3	.6	78.	110.	0.0	42.	1.3
B1	123.	1.4	.65	80.	108.	0.0	42.	1.3
B2	124.	1.6	.75	80.	112.	0.0	44.	1.3
B3	122.	1.5	.70	80.	114.	0.0	44.	1.3
B4	121.	1.3	.6	80.	114.	0.0	44.	1.3
B5	130.	1.4	.65	84.	102.	0.0	44.	1.3
B6	128.	1.5	.70	82.	112.	0.0	44.	1.3
B7	128.	1.5	.70	82.	116.	0.0	44.	1.3
C1	125.	1.5	.70	84.	100.	0.0	46.	1.3
C2	123.	2.0	.9	84.	114.	0.0	44.	1.3
C3	123.	1.5	.70	84.	116.	0.0	44.	1.3
C4	123.	1.6	.75	84.	118.	0.0	44.	1.3
C5	127.	1.6	.75	84.	118.	0.0	45.	1.3
C6	123.	1.8	.80	84.	120.	0.0	45.	1.3
C7	122.	1.8	.80	84.	120.	0.0	45.	1.3
D1	124.	1.0	.5	86.	110.	0.0	42.	1.3
D2	121.	2.0	.90	86.	118.	0.0	44.	1.3
D3	123.	1.8	.80	86.	120.	0.0	44.	1.3
D4	122.	1.8	.80	86.	120.	0.0	44.	1.3
D5	125.	2.0	.90	86.	120.	0.0	44.	1.3
D6	128.	2.3	1.05	86.	122.	0.0	45.	1.3
D7	125.	2.3	1.05	86.	122.	0.0	45.	1.3
E1	120.	1.8	.80	88.	112.	0.0	44.	1.3
E2	115.	2.5	1.15	88.	120.	0.0	44.	1.3
E3	115.	2.6	1.2	88.	122.	0.0	44.	1.3
E4	114.	2.9	1.35	89.	116.	0.0	44.	1.3
E5	123.	3.0	1.4	90.	114.	0.0	46.	1.3
E6	120.	3.2	1.45	88.	118.	0.0	47.	1.3
E7	123.	3.5	1.6	88.	120.	1.0	47.	1.3
F1	111.	3.2	1.45	86.	110.	1.0	47.	1.3
F2	107.	3.2	1.45	86.	120.	1.0	47.	1.3
F3	111.	3.5	1.6	86.	120.	1.0	47.	1.3
F4	114.	4.0	1.8	86.	122.	2.0	48.	1.3

7/7/87
(9)

F5	115.	4.2	1.9	86.	122.	2.0	49.	1.3
F6	116.	4.0	1.8	86.	122.	2.0	48.	1.3
F7	117.	3.8	1.7	86.	124.	2.0	48.	1.3

END

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AIR POLLUTION CONTROL DEPARTMENT - COUNTY OF SAN DIEGO

TEST NO. 87163
U.S. SILICA
RUN 1

TEST DATE JUNE 12, 1987

PT	T_s	P	VEL	H	T_1	T_2	P_m	T_i	CO_2
A1	123.	1.500	71.6	.70	78.0	96.0	.00	44.00	1.30
A2	127.	1.500	71.9	.70	78.0	100.0	.00	43.00	1.30
A3	123.	1.300	66.7	.60	78.0	104.0	.00	43.00	1.30
A4	122.	1.300	66.6	.60	78.0	108.0	.00	42.00	1.30
A5	125.	1.200	64.2	.55	78.0	108.0	.00	42.00	1.30
A6	123.	1.300	66.7	.60	78.0	110.0	.00	42.00	1.30
A7	128.	1.300	66.9	.60	78.0	110.0	.00	42.00	1.30
B1	123.	1.400	69.2	.65	80.0	108.0	.00	42.00	1.30
B2	124.	1.600	74.0	.75	80.0	112.0	.00	44.00	1.30
B3	122.	1.500	71.5	.70	80.0	114.0	.00	44.00	1.30
B4	121.	1.300	66.5	.60	80.0	114.0	.00	44.00	1.30
B5	130.	1.400	69.6	.65	84.0	102.0	.00	44.00	1.30
B6	128.	1.500	71.9	.70	82.0	112.0	.00	44.00	1.30
B7	128.	1.500	71.9	.70	82.0	116.0	.00	44.00	1.30
C1	125.	1.500	71.7	.70	84.0	100.0	.00	46.00	1.30
C2	123.	2.000	82.7	.90	84.0	114.0	.00	44.00	1.30
C3	123.	1.500	71.6	.70	84.0	116.0	.00	44.00	1.30
C4	123.	1.600	74.0	.75	84.0	118.0	.00	44.00	1.30
C5	127.	1.600	74.2	.75	84.0	118.0	.00	45.00	1.30
C6	123.	1.800	78.4	.80	84.0	120.0	.00	45.00	1.30
C7	122.	1.800	78.4	.80	84.0	120.0	.00	45.00	1.30
D1	124.	1.000	58.5	.50	86.0	110.0	.00	42.00	1.30
D2	121.	2.000	82.5	.90	86.0	118.0	.00	44.00	1.30
D3	123.	1.800	78.4	.80	86.0	120.0	.00	44.00	1.30
D4	122.	1.800	78.4	.80	86.0	120.0	.00	44.00	1.30
D5	125.	2.000	82.8	.90	86.0	120.0	.00	44.00	1.30
D6	128.	2.300	89.0	1.05	86.0	122.0	.00	45.00	1.30
D7	125.	2.300	88.8	1.05	86.0	122.0	.00	45.00	1.30
E1	120.	1.800	78.2	.80	88.0	112.0	.00	44.00	1.30

7/7/87

AIR POLLUTION CONTROL DEPARTMENT - COUNTY OF SAN DIEGO

TEST NO. 87163
U.S. SILICA
RUN 1

TEST DATE JUNE 12, 1987

SAMPLE COLLECTION DATA

PT	T_s	P	VEL	H	T_1	T_2	P_m	T_i	CO_2
E2	115.	2.500	91.8	1.15	88.0	120.0	.00	44.00	1.30
E3	115.	2.600	93.6	1.20	88.0	122.0	.00	44.00	1.30
E4	114.	2.900	98.8	1.35	89.0	116.0	.00	44.00	1.30
E5	123.	3.000	101.3	1.40	90.0	114.0	.00	46.00	1.30
E6	120.	3.200	104.3	1.45	88.0	118.0	.00	47.00	1.30
E7	123.	3.500	109.4	1.60	88.0	120.0	1.00	47.00	1.30
F1	111.	3.200	103.5	1.45	86.0	110.0	1.00	47.00	1.30
F2	107.	3.200	103.1	1.45	86.0	120.0	1.00	47.00	1.30
F3	111.	3.500	108.3	1.60	86.0	120.0	1.00	47.00	1.30
F4	114.	4.000	116.0	1.80	86.0	122.0	2.00	48.00	1.30
F5	115.	4.200	119.0	1.90	86.0	122.0	2.00	49.00	1.30
F6	116.	4.000	116.2	1.80	86.0	122.0	2.00	48.00	1.30
F7	117.	3.800	113.4	1.70	86.0	124.0	2.00	48.00	1.30
AVG	121.	2.058	83.7	98	83.9	114.6	.29	44.64	1.30

$VEL = 85.48 * C_p * SQ.RT.((P_s * T_s)/(P_s * M_s))$

AVERAGE DELTA P = 2.1429

DRY GAS METER VOLUME UNCORRECTED = 56.470 P_{bar} = 29.88in Hg

METER CORRECTION FACTOR = 1.0350 P_s (STACK PRESSURE) = 2.8 in water

NOTES - 1. AVG P IS THE SQUARE OF THE MEAN (SQ.RT)
2. (VEL) = VEL*COS(ANG)
3. AVG CO_2 IS THE VELOCITY WEIGHTED AVERAGE

AIR POLLUTION CONTROL DEPARTMENT - COUNTY OF SAN DIEGO

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TEST DATE JUNE 12, 1987

A.	V_m	METER VOLUME, UNCORRECTED*FACTOR	= 58.45	cu ft
B.	P_m	METER PRESSURE, P_{bar} + H/13.6	= 29.95	in Hg
C.	T_m	METER TEMPERATURE, 460+(T_1 +T_2)/2	= 559.	DEG. R
D.	T_i	IMPINGER TEMPERATURE	= 45.	DEG. F
E.	T_s	AVERAGE STACK TEMPERATURE, 460+DEG. F	= 581.	DEG. R
F.	P_s	STACK PRESSURE, P_{bar} + P_g /13.6	= 30.09	in Hg
G.	VP_i	MAX. H_2O VP PERMITTED AT T_i (SEE APPENDIX)	= .32	in Hg
H.	V_{lc}	VOLUME OF CONDENSED H_2O (SEE LAB SHEET)	= 119.	ml
I.	V_{calc}	H_2O VAPOR , METER COND., H*C/B*0.00267	= 5.93	cu ft
J.	V_{wv}	MOISTURE METERED AT METER COND., A*G/B	= .63	cu ft
K.	V_{dry}	SAMPLE VOLUME AT METER COND., DRY, A-J	= 57.82	cu ft
L.	%M	PER CENT MOISTURE CALC. 100*(I+J)/(A+I)	= 10.19	%
M.	VP_s	MAX. H_2O VP PERMITTED AT T_s (SEE APPENDIX)	= 3.54	in Hg
N.	%M_s	PER CENT MOISTURE PERMITTED, M/F*100	= 11.8	%
	B	ENTER LOWER OF L OR N	= 10.2	%
O.	$M.C._{ws}$	MOISTURE CORRECTION FACTOR, (100-L OR N)/100	= .898	
P.	$V_{m(std)}$	SAMPLE VOL., STD COND. (DRY), K*528/29.92*B/C	= 54.614	cu ft
S.	m	WEIGHT OF PARTICULATE MATTER COLLECTED	= .059	g
T.	c_n	GRAIN LOADING (DRY), 15.43*S/P	= .017	grains/scf

AIR POLLUTION CONTROL DEPARTMENT - COUNTY OF SAN DIEGO

TEST NO. 87163
U.S. SILICA
RUN 1

TEST DATE JUNE 12, 1987

GAS ANALYSIS				
COMPONENT	VOL. %/100	*MOISTURE CORR	*MOL. WT.	=WT./MOLE WET BASIS
WATER, B_{ws}	.1019	1.00000	18.0	1.834
OXYGEN	.1880	.89814	32.0	5.403
CARBON MONOXIDE	.0000	.89814	28.0	.000
CARBON DIOXIDE	.0130	.89814	44.0	.514
NITROGEN & INERTS	.7990	.89814	28.2	20.237
AA. M_s AVERAGE MOLECULAR WEIGHT				27.987

DD. C_p PITOT TUBE CORRECTION FACTOR = .822

EE. V_s STACK VELOCITY AT STACK COND. (SEE SAMPLE DATA) = 83.71 ft/sec

FF. $V_{s(std)}$ STACK VEL. AT STD COND.(DRY),EE*528/29.92*F/E*0 = 68.65 ft/sec

GG. DURATION OF SAMPLING = 126. min

HH. AVERAGE SAMPLING RATE (DRY),P/GG = .433 scfm

II. SELECTED NOZZLE DIAMETER = .147 in

JJ. SAMPLING VELOCITY AT STD COND.,HH/II**2*144/60*4/3. = 61.30 ft/sec

KK. I ISOKINETIC VARIATION, JJ/FF*100 = 89. %

LL. A_s AREA OF STACK = 6.25 sq ft

MM. Q_{sd} FLOW RATE AT STD. COND.(DRY), FF*LL*60 = 25742. scfm

NN. Q_s FLOW RATE AT STACK COND., EE*LL*60 = 31391. acfm

UU. PARTICULATE EMISSION RATE, 0.00847*T*MM = 3.68 lb/hr

AIR POLLUTION CONTROL DEPARTMENT - COUNTY OF SAN DIEGO

TEST NO. 87163
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RUN 1

TEST DATE JUNE 12, 1987

SUMMARY FINAL CALCULATIONS

T.	c_s GRAIN LOADING(DRY)	=	.017 grains/scf
UU.	PARTICULATE EMISSION RATE	=	3.68 lb/hr
OO.	$\%CO_2$ (GAS ANALYSIS)	=	1.30 %
PP.	C_{12} GRAIN LOADING(DRY) AT 12% CO_2 ,T*12/OO.	=	.154 grains/scf
ZZ.	EXCESS AIR = $\frac{(\%\ OXYGEN - \%\ CO) * 100}{0.264*(\%\ N2) - (\%\ OX) + 0.5*(5\ CO)}$	=	820. %

COMPANY: U.S. Crystal Silica

ADDRESS:

EQUIPMENT:

FEE SCHEDULE:

NUMBER OF FEE UNITS:

TOTAL FEE RECEIVED:

A/C; P/O; REF, OTHER:

APPLICATION NUMBER:

DATE	LABOR HOURS	WORK DESCRIPTION	INITIALS / CLASS
6/12/87	4.0	~~6/12/87~~ Testing + travel	
6/11/87	0.5	test prep.	
7/9/87	1.5	report reviewed & additional test	
7/10/87	0.3	review of revision	

DATE COMPLETED:

SENIOR ENGINEER: