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:	11.3
Reference:	27
Title:	Source Emission Tests At Stark Ceramics, Inc., East Canton, OH, No. 3 Kiln Stack, CSA Company, Alliance, OH, September 16, 1993.

CSA COMPANY

(Custom Stack Analysis)

ENGINEERING REPORT

SOURCE EMISSION TESTS
AT
STARK CERAMICS,INC
EAST CANTON,OHIO
NO.3 KILN STACK
SEPTEMBER 16,1993

TECHNICAL SERVICES FOR POLLUTION CONTROL

SOURCE TESTING - LAB SERVICE - BOILER CONSULTING

STARK CERAMICS,EAST CANTON,OH,NO.3KILN STACK,SEPTEMBER 16,1993

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CSA CO., PO BOX 3750, ALLIANCE, OH 44601 PH (216)525-5119
FAX (216)525-7908

SOURCE EMISSION TESTS

AT

STARK CERAMICS,INC.

EAST CANTON,OHIO

NO.3 KILN STACK

SEPTEMBER 16,1993

Brief of Tests

Tests were performed on the stack of the brick kiln as per EPA Federal Register methods for particulate matter,sulfur dioxide and flouride emissions for stationary sources.

The tunnel kiln is a continuos operation where the green product is loaded on cars that travel through the various heat zones and discharge as a finished product at the other end. The kiln is heated with natural gas with the proudcts of combustion and the emissions from the curring process discharging to a refractory stack via induced draft fan. The samples were extracted from the stack above the roofline.

Results (See tables 1,2 & 3)

A) The particulate emission rate was 5.04 pounds per hour.

B) The sulfur dioxide emission rate was 22.6 pounds per hour.

C) The flouride emission rate was 1.86 pounds per hour or 55.50 milligrams per cubic meter.

D) The process weight rate was 5,842 pounds per hour. WRONG

Test Methods

A twelve point traverse was selected for the thirty five inch square brick stack as per method 1. Each point was sampled for five minutes for a total test time of 60 minutes. (See figure 1) The CO_2 and O_2 analysis were conducted by an orsat flue gas analyzer from an integrated sample taken at the test ports to provide data for method 3.

Method 5 was used to determine the particulate quantity, moisture determination by method 4 and gas velocity by method 2 using a Research Appliance Corp. "Stacksamplr".

Method 6 was used for the determination of sulfur dioxide.

Method 13B was used for flouride emissions.

Particulate Test Apparatus (See figure 2)

The dust laden gases were passed through a pyrex lined probe and heated glass cyclone separator bypass followed by a four inch filter holder containing Gelman Type A-E fiberglass filter media. The gases leaving the filter were cooled in a series of three impingers packed in ice. The first and third impinger were the modified Greenburg-Smith type and the second one was a standard Greenburg-Smith. The First and second impingers were filled with 100 ml of distilled water with the third one used as a dry trap. After leaving the dry trap, the gases passed through a "Drierite" column containing about 500 grams of calcium sulfate (CaS04) desicant to remove the remaining water vapor. The dry gas passed through the hose portion of the umbilical cord to a Research Appliance Corp. model 2343 "Stacksamplr" module. In the module the gas was moved through the system by a leakless air pump to a rockwell 175-S dry test meter. The dry test meter exhausted to a calibrated orifice to measure the flow rate of the gases passing through the sampling apparatus. A type "S" pitot tube was attached to the sheath of the heated probe to measure the velocity head of the flue gases near the tip of the probe nozzle. The orifice pressure taps and the pitot tube were connected to a Dwyer dual 10 inch combination inclined well type manometer. One half of the manometer measured the orifice differential (ΔH) and the other half measured the flue gas velocity head (ΔP).

The temperature of the flue gas was measured by a type "K" thermocouple connected to a PyroMation digital temperature indicator.

The CO_2 and 0_2 were measured with a Burrell "Industro" Model B orsat from an integrated sample taken by withdrawing a constant flow rate of gas from the stack and injecting it into a Tedlar bag. This was done by drawing the gas through an in-stack filter via neoprene tubing to a condenser and condensate collector ahead of a leakless diaphragm vacuum-pressure pump. The pump discharged to the rotometer and the Tedlar bag. The apparatus is equipped with valves to by-pass the rotometer and bag when clearing the sample line as shown in figure 3.

Particulate Test Procedures

The probe, filter and glassware was assembled and leak tested in our lab before transporting to the job site. Three sets of equipment were used. At the job site a preliminary pitot traverse was performed to select the proper nozzle size. The nozzles were measured with an inside vernier caliper and micrometer calibrated with a one inch micrometer standard.

The first and second impingers were filled with 100 ml of distilled water and the "Drierite" columns were connected just prior to elevating the probe into position.

After leak testing the apparatus at 10 inches of mercury the probe was inserted at the first sample point to start the test.

The isokinetic sampling rates were determined using a portable desk top computer programmed to calculate the proper Δ H setting at the flue gas temperature, pressure, density and the assumed moisture along with the temperature, Δ P and an assumed Δ H of the test module. The sampling rate (Δ H) can be determined in less than 5 seconds using this technique.

The apparatus was leak tested after the test was completed at a vacuum exceeding that encountered during the test.

The moisture content was determined from the amount of condensate collected in the impingers and the difference of the tare and gross weight of the "Drierite" desicant column. The desicant column was weighed on an Ohaus 5 Kg electronic toploader balance to the nearest tenth gram.

The filter media was dried in a desicator at room temperature to dryness before tare and gross weighing on a Stanton CL4D analytical balance.

The probe liner, nozzle, cyclone bypass and front half of the filter holder were washed with acetone and brush after testing and evaporated to dryness at room temperature in 500 ml beakers. The beakers were dried and tare weighed prior to sample evaporation and gross weighed after allowing the samples to desicate to dryness. These weights were accomplished with the Stanton Balance.

The contents of the impingers were measured by weighing the three impingers and contents before and after testing. The total

moisture was determined by adding net weight of the impingers to the net weight of the drierite column.

The integrated gas sampler was started at the beginning of the method 5 test with about two cubic foot of gas collected in the tedlar bag at the end of the test. The sampling rate was maintained constant during the test by maintaining a constant reading on the rotometer.

The orsat analysis was performed on the gases contained in the bag shortly after the test was completed.

Sulfur Dioxide Test Apparatus

A schematic of the test apparatus is shown in figure 4. The gases were drawn through a heated pyrex probe with a fiberglass wad attached to the sampling end of the probe. The probe was connected to the impinger train where it first passed through a midget bubbler containing 15 ml of 80% isopropyl alcohol. A wad of glass wool was packed in the top of the bubbler to collect any acid mist carryover. The gases then passed through two midget impingers,each containing 15 ml of 3% hydrogen peroxide solution followed by an empty midget impinger to collect the carryover from the preceeding impingers. The midget bubbler and impingers were contained in an ice bath to condense acid and water vapor. After leaving the dry trap the gases passed through a "Drierite" column containing about 500 grams of "Drierite" via rubber hose to remove the remaining water vapor. The dry gas was transmitted to the module through "polyflow" tubing. In the module the gas was moved through the system by a leakless air pump connected to the rotometer to measure the gas flow rate and a Rockwell type "S" dry test meter to measure the gas volume. The dry test meter was equipped with a thermometer located in the top half of the gas meter to measure the temperature of the meter. The gas from the meter was discharged to the atmosphere.

Sulfur dioxide test procedures

Two method 6 runs of twenty minute duration comprised one test. A single point near the center of the duct using one of the method 5 sample ports was used for the sample location.

The sample train was leak checked using a calibrated vacuum gage. The vacuum gage was connected to the inlet of the sample

train and the system was brought to a ten inch mercury vacuum and held for one minute before starting the test. After the test was completed the system was purged for fifteen minutes at the same flow rate using a seperate vacuum pump and rotometer. After purging the system, the contents of the midget bubbler were discarded and the contents of the midget impingers along with the washings were placed in a marked polyethylene bottle. The samples were titrated at our Alliance lab as per EPA Federal Register methods using barium perclorate titrant and thorin indicator. The barium perclorate was standardized against a purchased .01 normal sulfuric acid standard. The dry gas volumetric flow rate (Q-CFH) from method 5 was used to calculate the pounds per hour of sulfur dioxide emission.

Flouride emissions test apparatus and procedures.

The apparatus was the same as the method 5 apparatus except the probe liner and nozzle were made of one piece construction as shown in figure 5. A teflon coated filter back-up and a Watman™ No.1 filter were used in place of the fiberglas filter and fritted glas back-up plate.

The preparation of the sample train was identical to the method 5 train.

The sampling procedure was the same as the method 5 procedure.

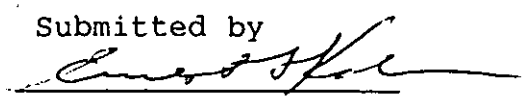
The cleanup differed from the method 5 cleanup by using distilled water instead of acetone.

The filter was placed in the contents of the probe wash combined with the impinger contents and impinger wash. The total volume of the combined sample was measured and a distilled water blank of the same volume with a filter included was transported to another lab for analysis. The analysis were performed as per method 13B.

Miscellaneous

The raw data and calculations are shown in appendix I and the Intent to Test Notification is shown in Appendix II.

Submitted by



Ernest L.Kolm

Test	1	2	3	Average
Date	9/16/93	9/16/93	9/16/93	
Time	9:42/11:01	11:51/13:05	13:55/15:07	
FLOURIDE EMISSIONS				
Grains/f3 Dry STP	0.02438	0.02395	0.02428	0.02420
Pounds/Hr.	1.8758	1.8080	1.8872	1.8570
STACK GAS CONDITIONS				
Temperature -dg. F	583.0	588.0	595.0	588.7
Static Pressure-in H2O	0.00	0.00	0.00	0.00
CO2 - %	3.4	3.1	3.2	3.2
O2 - %	16.4	16.6	16.6	16.5
H2O - %	6.2	6.3	6.2	6.2
Velocity - FPS	37.92	37.40	38.74	38.02
Stack Area - sqr. ft.	8.50	8.50	8.50	8.50
Gas Flow - ACFM	19337	19073	19757	19389
Gas Flow (DSTP) CFH	537395	527140	542883	535806
SAMPLE TRAIN CONDITIONS				
Pitot Delta P in H2O	.222	.214	.228	
Orifice Delta P in H2O	2.77	2.73	2.96	
Temp. Meter - dg. F	89	101	105	
Gas Volume - CF Dry STP	48.26	48.60	49.35	
Barometer - in Hg	29.08	29.08	29.08	
Probe Tip Dia. - in.	0.391	0.385	0.383	
Isokinetic Var. - %	91.9	97.4	97.0	

STARK CERAMICS,INC.
EAST CANTON,OHIO
NO.1 KILN STACK
COMPILED DATA

Table 2

Test	1	2	3	Average
Date	9/16/93	9/16/93	9/16/93	
Time	9:42/11:Ø1	11:51/13:Ø5	13:55/14:17	
PARTICULATE QUANTITY				
Grains/f3 Dry STP	Ø.Ø7375	Ø.Ø5182	Ø.Ø6315	Ø.Ø629Ø
Pounds/Hr.	5.8452	4.1293	5.1344	5.Ø363
GASEOUS EMISSIONS				
SO2 Pounds/Hr	2Ø.75	23.82	23.26	22.61
STACK GAS CONDITIONS				
Temperature -dg. F	583.Ø	588.Ø	595.Ø	588.7
Static Pressure-in H2O	Ø.ØØ	Ø.ØØ	Ø.ØØ	Ø.ØØ
CO2 - %	3.4	3.1	3.2	3.2
O2 - %	16.4	16.6	16.6	16.5
H2O - %	6.7	6.2	6.4	6.4
Velocity - FPS	39.27	39.45	4Ø.59	39.77
Stack Area - sqr. ft.	8.5Ø	8.5Ø	8.5Ø	8.5Ø
Gas Flow - ACFM	2ØØ27	2Ø121	2Ø7Ø2	2Ø283
Gas Flow (DSTP) CFH	553572	556565	567866	559334
SAMPLE TRAIN CONDITIONS				
Pitot Delta P in H2O	.237	.238	.251	
Orifice Delta P in H2O	1.Ø9	1.15	1.22	
Temp. Meter - dg. F	83	93	97	
Gas Volume - CF Dry STP	31.68	32.13	34.39	
Barometer - in Hg	29.Ø8	29.Ø8	29.Ø8	
Probe Tip Dia. - in.	Ø.313	Ø.313	Ø.313	
Isokinetic Var. - %	91.4	92.2	96.7	

STARK CERAMICS, INC.
EAST CANTON, OHIO
NO 3 KILN STACK
COMPILED DATA

Table 1

FLOURIDE CONCENTRATION

$Cs = Ft/Vm_{stp}$ Ft = mg Flouride, Vm_{stp} = cubic meters (m^3)

TEST 1

$48.26\ Ft^3$ Dry stp X $0.02831\ m^3/Ft^3 = 1.3666\ m^3$

$76.4\ mg/1.3666\ m^3$ = **55.91 mg** Flouride/$\mathbf{m^3}$

TEST 2

$48.60\ Ft^3$ Dry stp X $0.02831\ m^3/Ft^3 = 1.3760\ m^3$

$75.6\ mg/1.3760\ m^3$ = **54.94 mg** Flouride/$\mathbf{m^3}$

TEST 3

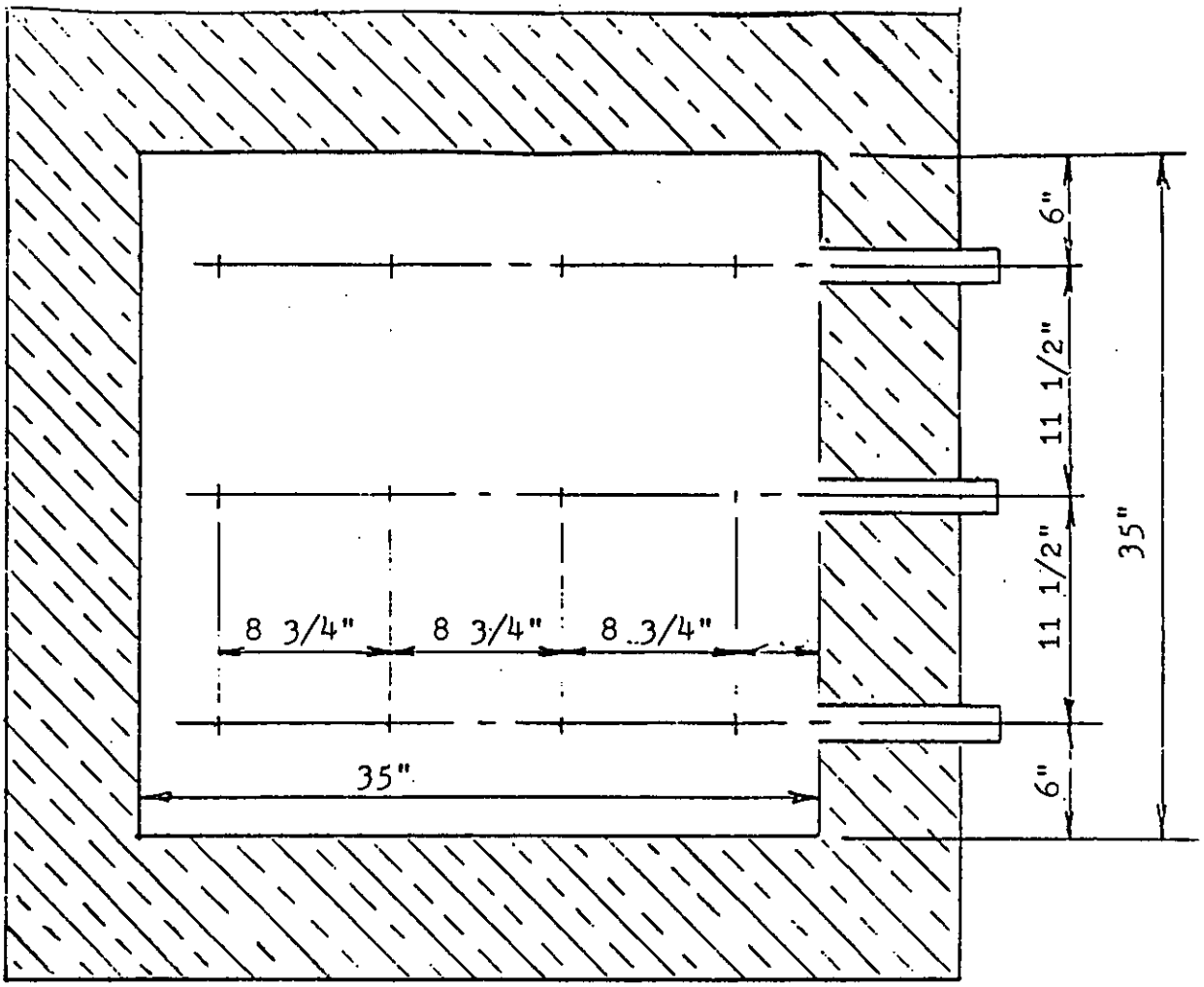
$49.35\ Ft^3$ Dry stp X $0.02831\ m^3/Ft^3 = 1.3974\ m^3$

$77.8\ mg/1.3974\ m^3$ = **55.67 mg** Flouride/$\mathbf{m^3}$

AVERAGE OF 3 TESTS = **55.50 mg/$\mathbf{m^3}$**

STARK CERAMICS,INC.
EAST CANTON,OHIO
NO.3 KILN STACK
COMPIED DATA

TABLE 3

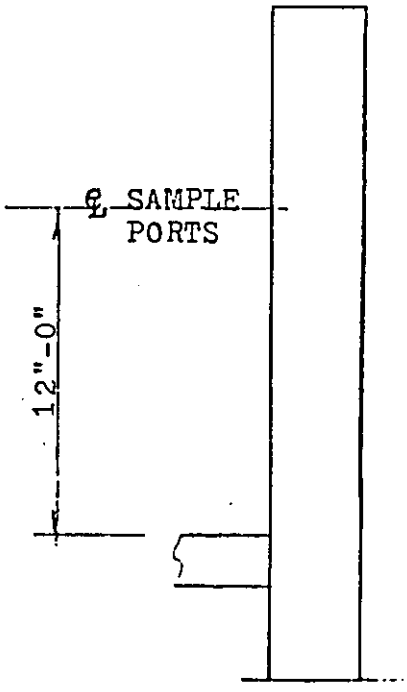


AREA = 8.5 f^2

EQUIVALENT DIA. = 35"

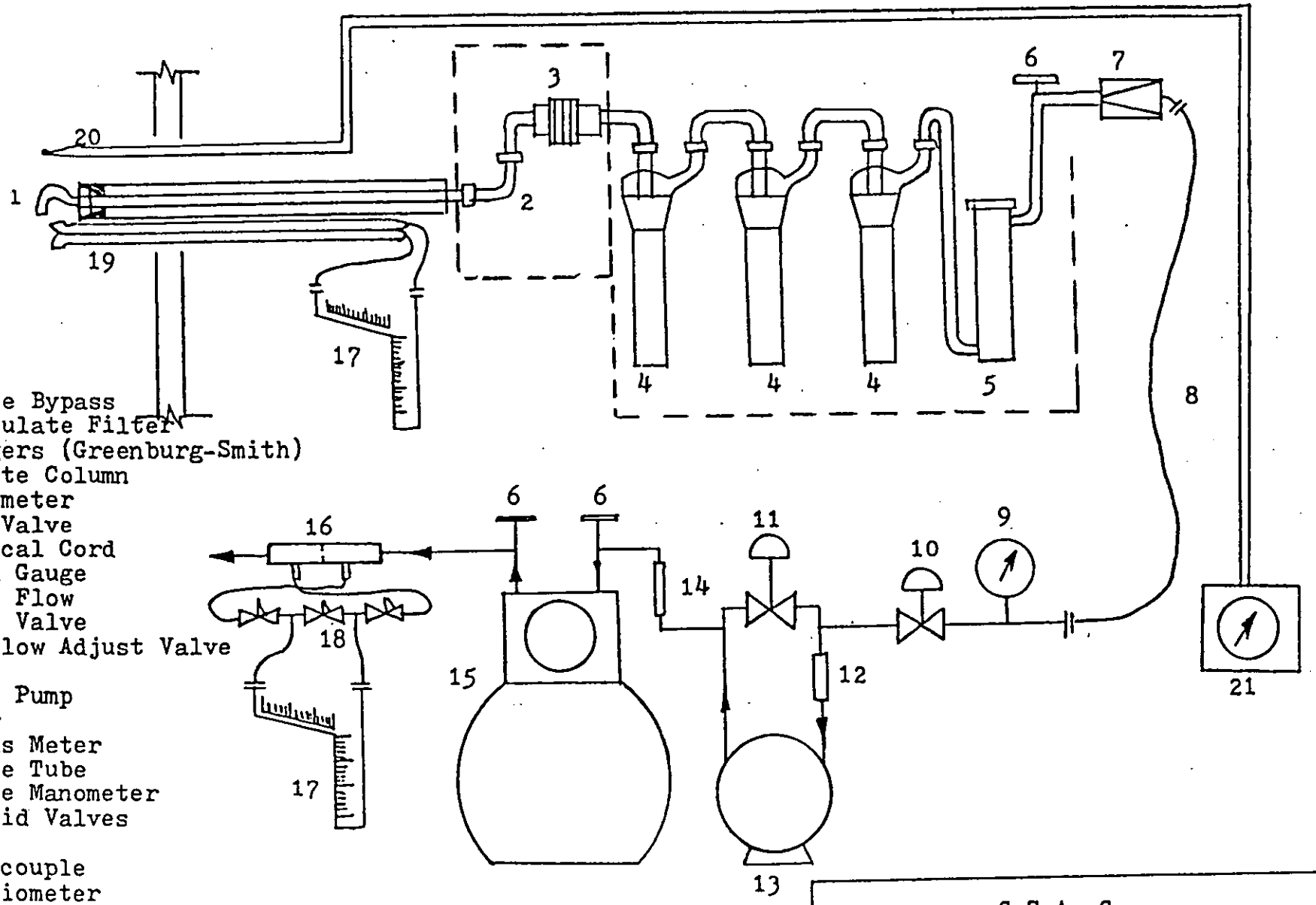
EQUIV. DIA. UPSTREAM = 4.1

EQUIV. DIA. DOWNSTREAM = 2+



STARK CERAMICS

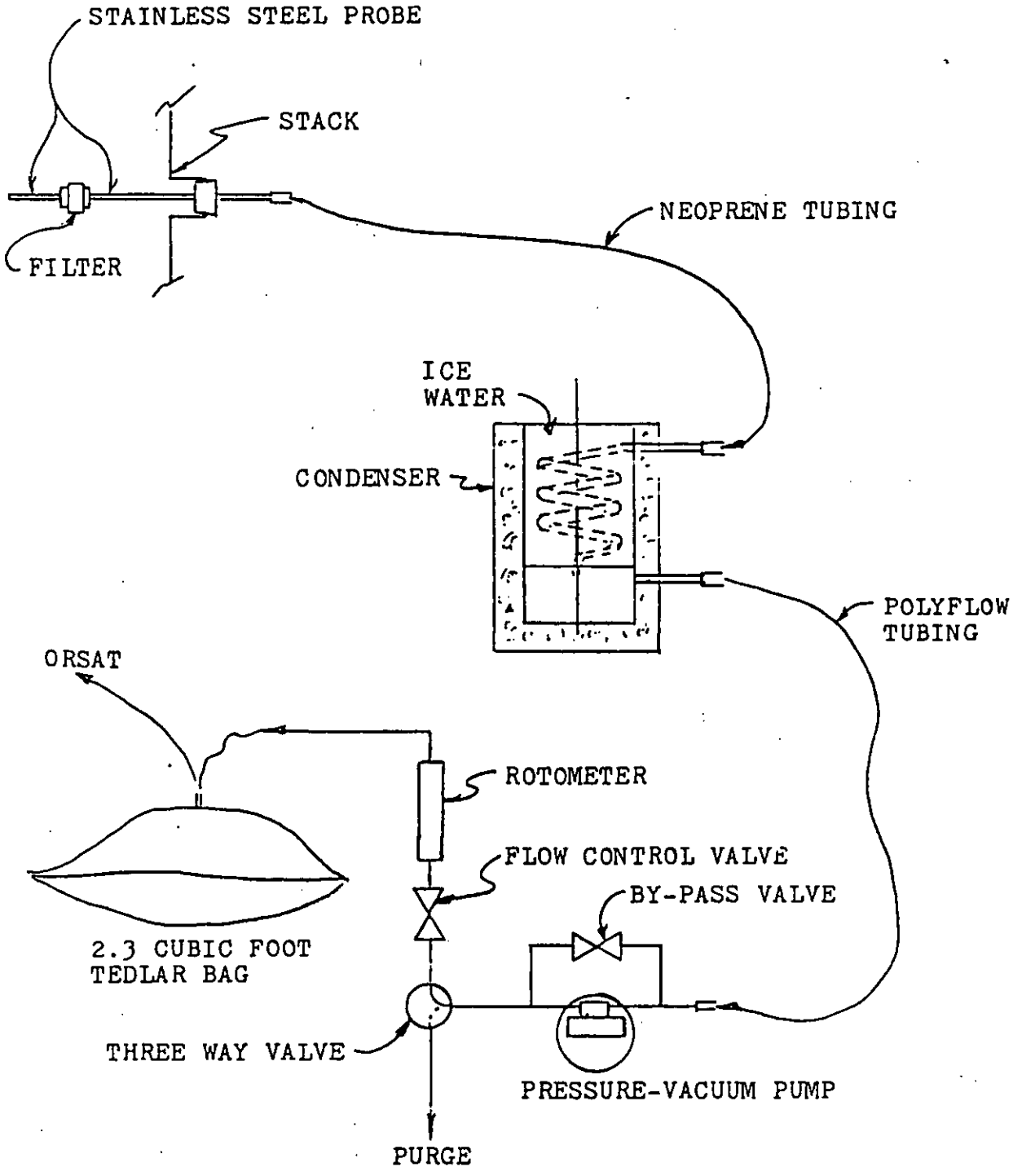
FIGURE 1



1) Probe
2) Cyclone Bypass
3) Particulate Filter
4) Impingers (Greenburg-Smith)
5) Drierite Column
6) Thermometer
7) Check Valve
8) Umbilical Cord
9) Vacuum Gauge
10) Course Flow Adjust Valve
11) Fine Flow Adjust Valve
12) Oiler
13) Vacuum Pump
14) Filter
15) Dry Gas Meter
16) Orifice Tube
17) Incline Manometer
18) Solenoid Valves
19) Pitot
20) Thermocouple
21) Potentiometer

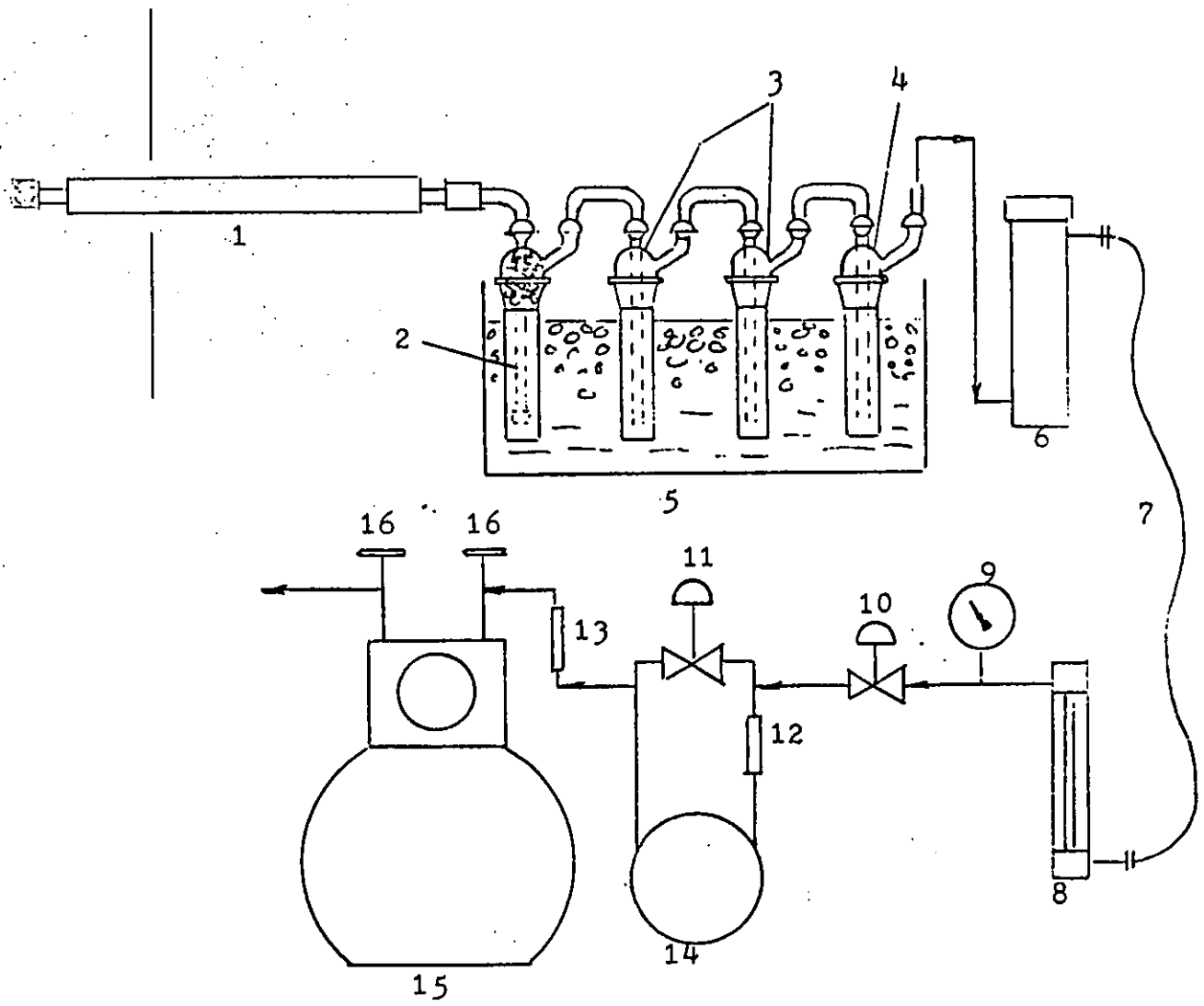
C.S.A. Co.
MODIFICATION OF R.A.C. SAMPLE TRA
USING DRIERITE COLUMN IN PLACE OF IMPINGER DESICANT
DATE 3-2-76 BY D.V.S

Figure 2



INTEGRATED SAMPLER

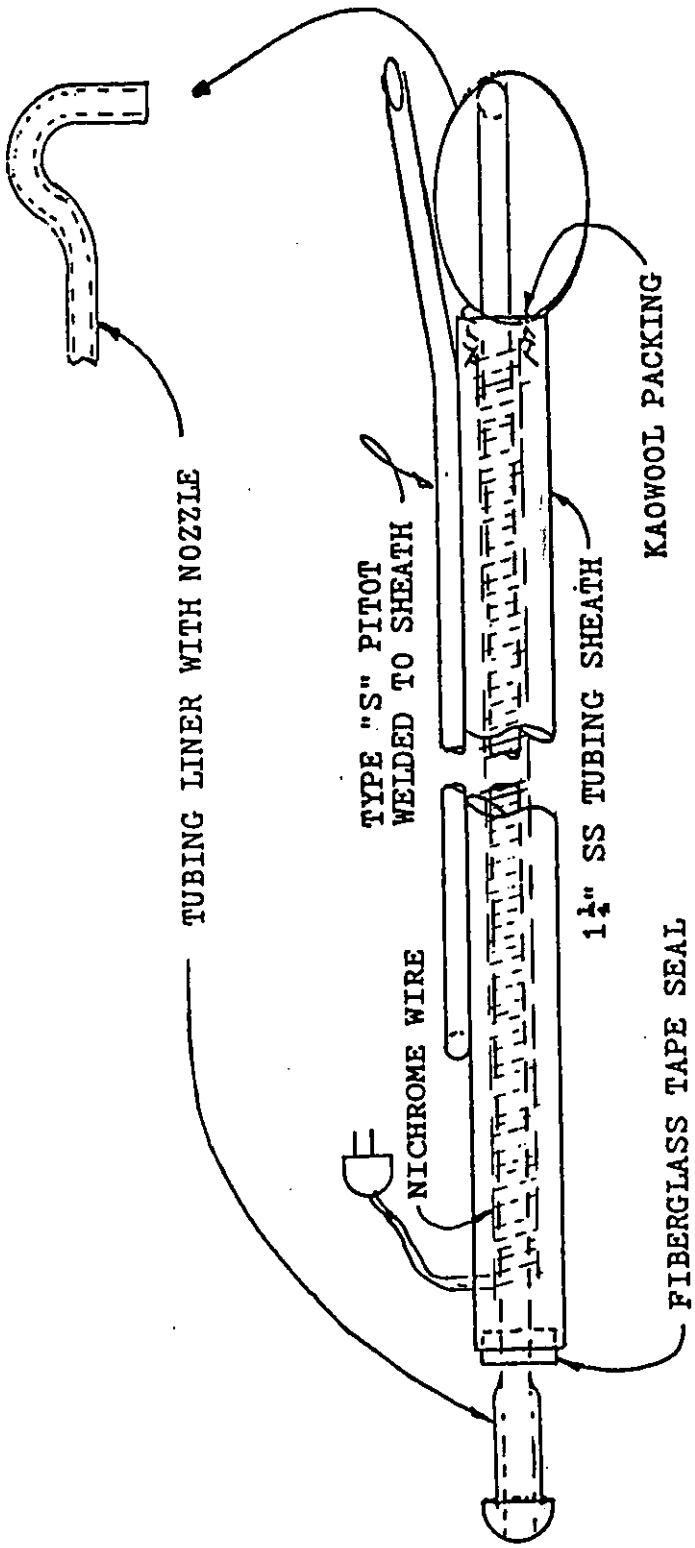
FIGURE 3



1) HEATED PYREX LINED PROBE. END PACKED WITH QUARTZ WOOL
2) MIDGET BUBBLER. TOP PAKED WITH GLASS WOOL
3) MIDGET IMPINGERS. EACH FILLED WITH 15 ml OF H_2O_2 (3%)
4) MIDGET IMPINGER. DRY TRAP
5) ICE BATH
6) DRIERITE COLUMN. FILLED WITH CALCIUM SULFATE DESICANT
7) UMBILICAL CORD
8) ROTAMETER
9) VACUUM GAGE
10) VALVE FOR COARSE FLOW ADJUSTMENT
11) VALVE FOR FINE FLOW ADJUSTMENT
12) OILER
13) OIL FILTER
14) VACUUM PUMP
15) DRY GAS TEST METER
16) THERMOMETER

E.P.A. METHOD 6 SO_2 SAMPLING TRAIN

FIGURE 4



HEATED ONE PIECE PROBE LINER/NOZZLE

FIGURE 5

APPENDIX I

METHOD 5

COMPUTER NOMENCLATURE

SYMBOL	DESCRIPTION	UNITS
VM, FT^3	METER VOLUME	CUBIC FEET
Pb, IN.H2O	BAROMETER	INCHES MERCURY
ΔH, IN H2O	ORIFICE DIFFERENTIAL	INCHES WATER
PMA, IN Hg	ABSOLUTE METER PRESSURE	INCHES MERCURY
TM, F	METER TEMPERATURE	DEGREES FARENHEIT
TS, F	STACK TEMPERATURE	DEGREES FARENHEIT
PG, IN H2O	STACK STATIC PRESSURE	INCHES WATER
PSA, IN Hg	ABSOLUTE STACK PRESSURE	INCHES MERCURY
CP,	PITOT COEFFICIENT	DIMENTIONLESS
$\sqrt{\Delta P}$, IN H2O	AVERAGE SQUARE ROOT OF ΔP	$INCHES\ WATER^2$
%CO2	CARBON DIOXIDE	PERCENT
%O2	OXYGEN	PERCENT
%CO	CARBON NONOXIDE	PERCENT
%N2	NITROGEN	PERCENT
MD	MOLECULAR WEIGHT DRY	DIMENTIONLESS
VLC,ML	VOLUME OF CONDENSATE	MILLILITERS
AS, FT2	STACK AREA	SQUARE FEET
MN, MG	TOTAL PARTICULATE CATCH WEIGHT	MILLIGRAMS
O, MIN	TEST TIME	MINUTES
DN, IN	NOZZLE DIAMETER	INCHES
AN, FT2	NOZZLE AREA	SQUARE FEET
L, #/HR	EMISSION RATE	POUNDS PER HOUR
I, %	ISOKINETIC VARIATION	PERCENT
VMSTP, FT3	METER VOLUME @ STANDARD TEMP. & PRESS. (DRY)	CUBIC FEET
VWSTP	METER VOLUME @ STANDARD TEMP. & PRESS. (WET)	CUBIC FEET
BWO%	MOISTURE	PERCENT
MS	MOLECULAR WEIGHT @ STACK CONDITIONS	DIMENTIONLESS
VS, FT/SEC	STACK VELOCITY	FEET PER SECOND
QS, FT3/HR	STACK GAS FLOW	CUBIC FEET PER HOUR
CS, #/SCF	EMISSION RATE	LB./DRY F3 @ STP
C"S,GR/SCF	EMISSION RATE	GRAINS/DRY F3 @ STP

CSA CO.

PARTICULATE CALCULATIONS FOR CFR METHOD 5

Dry Molecular Weight lb/lb-mole

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

Dry Gas Volume (standard conditions), ft^3

$$V_{mstd} = 17.64 V_m Y (P_{bar} + \Delta H/13.6)/T_m$$

Volume of Water (standard conditions), ft^3

$$V_{wstd} = 0.04707\ V_{lc}$$

Moisture Content (proportion by volume)

$$B_{wo} = V_{wstd}/(V_{mstd} + V_{wstd})$$

Molecular Weight of Stack Gas (wet basis), lb/lb-mole

$$M_s = M_d(1-B_{wo}) + 18B_{wo}$$

Stack Gas Velocity ft/sec

$$V_s = 85.49 C_p \sqrt{\Delta P_{avg}} \sqrt{T_{s(avg)}/P_s M_s}$$

Stack Gas Volumetric Fow Rate (dry standard conditions), ft^3/hr

$$Q_s = 3600(1-B_{wo})\ V_s A_s (528/T_s avg)(P_{sa}/29.92)$$

Concentration (particulate in gas), $lb/f^3_{std\ dry}$

$$C_s = 2.205 \times 10^{-6}\ M_n/V_{mstd}$$

Load (particulate in stack gas), lb/hour

$$L = Q_s C_s$$

Concentration (particulate in gas), $grains/f^3_{std\ dry}$

$$C"_s = 0.0154 M_n V_{mstd}$$

Isokinetic Variation, %

$$I = 100 T_s [0.002669 V_{lc} + (V_m Y/T_m)(P_{bar} + \Delta H/13.6)]/60\theta V_s P_s A_n$$

Dry wt in # 1hr

		Shade	Shape	Pcs.			
143	FTX	516	8WC80D	220	—	9,042	10,046 ✓
(5)		333	8W5	40	—	1,004	
(4)							
370	FTX	516	8WC80D	280		11,508	11,508 ✓
262	FTX	516	8WC80D	244		10,028.4	
		904	8W54L	17		311.1	10,472 ✓
(3)		904	8W54R	4		73.2	
		815	S-453	3	@20#	60.0	
264	FTX	516	8WC80D	244		10,028.4	10,028 ✓
(2)		815	S-453	36			
249	FTX	516	8WC80D	232		9,535.2	
		333	8W5	29		727.9	10,324 ✓
(1)		815	S-453	3	@20#	60.0	
282	FTX	516	8WC80D	244		10,028.4	
		815	S-453	36	@20	720.0	10,748 ✓
285	FTX	516	8WC80D	41		1,685.1	
		1022	412-4	1188	x10.9	12,949.2	15,701
		904	6TT20D-K	84	12.7	1066.8	

		Grade	Shape	Pcs (3)	
	#357 (14)	195	8WCA	880	13,200
	#304 (13)	195	8WCA	880	13,200
	#275 (12)	127	8WCA	880	13,200
2 #264	#272 (11)	127	8WCA	7	105 13,200
	#372	195	8WCA	873	13,095
#249	(10)	127	8WCA	472	7,080 (11683.2)
	#265	127	8WC80D	112	4,603.2
#282 F	(9) FTX	516			
	#330 FTX	516	8WC80D	220	9,042 (10,046)
#285 FT.	(8)	333	8W5	40	1004
	#346 FTX	516	8WC80D	220	9,042 (10,046)
	(7)	333	8W5	40	1,004
	#257 FTX	516	8WC80D	220	9,042 (10,046)
	(6)	373	8W5	40	1,004

		Shape	Tons		Dry Wt in lbs	
281	564	8WCV80BT	134	C 44.4	5950	
	904	6TT20D-K	30	C 12.7	381	12,146
(23)	177	8WCV80BT	131	C 44.4	5816	
#278	#177	8WCV80BT	256		11366	
(22)	904	6TT20D-K	30		381	11,747
(21)						
#359	177	8WCV80BT	280			12,432
#239	#177	8WCV80BT	250		11,100	
	904	8W54R	20		366	11,466
(20)						
#352	177	8WCV80BT	20		888	
	195	8WCA	796		11,940	12,828
(19)						
#353	195	8WCA	880		13,200	
(18)						
#259	195	8WCA	880		13,200	
(17)						
#116	195	8WCA	880		13,200	
(16)						
#324	195	8WCA	880		13,200	
(15)						

		Grade	Shape	Pcs.		(1)	(2)
343	(31)	904	8WC6R	466		10,311-2	
		031	4W83-S484	12	@ $31.5	378	
		516	8W24AL	20		288	11,524
		516	4T58NR	6	@7.17	47	
*335	(30)	564	8WCV80BT	244		10834	
		031	4W83-S483	18	@31.5	378	11,212
*289	(29)	564	8WCV80BT	232		10301	
		516	4T58NR	4	@7.8	109	10,786
		516	4T58NL	10			
		516	8W24CR	16		376	
*277	(28)	564	8WCV80BT	232		10301	
		516	8W24CR	6		141	10,955
		031	4W83-5484	7	x31.5	220	
		516	8W54L	16		292.8	
*276	(27)	564	8WCV80BT	244		10834	
		516	6T54R	19	@10.8	205	11,240
		516	8W54L	8		146.4	
		904	8W54L	3		54.9	
*371	(26)	564	8WCV80BT	256		11366	11,659
		904	8W54L	16		292.8	
*302	(25)	904	8WC6R	425		9,860	
		904	6TT20D-K	46	@12.7	584	12,975
		564	8WCV80BT	57		2531	
*320	(24)	564	8WCV80BT	250		11100	11760
		904	6TT20D-K	52		660	

	Shade	Shape	Pos.			
353	904	8WCGR	476	@23.2	10811	11756
(36)	031	HW83-5484	30	@31.5	945	
354	904	8WCGR	516		11971	12962
(35)	904	6TT20D-K	78	@12.7	991	
358	904	8WCGR	516		11971	12911
34	904	6TT20D-K	74		940	
354	904	8WCGR	516		11971	12784
33	904	6TT20D-K	64		813	
351	904	8WCGR	474		10997	11,893
	772	5W8	40	@13.5	540	
(32)	904	6TT20D-K	28		356	

Total for 37 KCs = 438783

Avg Dry wt per KC = 11,859 lbs

Or 5.93 Tons

5,842 #/HR

SEP-27-95 MON 10:01 STARK CERAMICS P.05

AMERICAN ANALYTICAL LABORATORIES, INC.

INDUSTRIAL HYGIENE AND ENVIRONMENTAL SCIENCES

840 S. MAIN STREET
AKRON, OHIO 44311-1516
(216) 535-1300

WORK ORDER #: 93-09-229

SAMPLES RECEIVED: 09/17/93
ANALYSIS REPORTED: 09/27/93

REPORT ISSUED TO:

Ernie Kolm
CSA Company
Custom Stack Analysis
P.O. BOX 3750
Alliance, Ohio 44601

WORK ID: Flouride Analysis

SAMPLED BY: Client
SAMPLE TYPE: Water/Air

SAMPLE ANALYSIS REPORT

SAMPLE ID / AAL LAB #	DATE COLLECTED / PARAMETER(S)	RESULT(S)	UNITS	METHOD(S)
SC Test 1 9309229-01	09/16/93 Total Flouride Emmissions	**76.4**	mg/Sample	EPA 13B
SC Test 2 9309229-02	09/16/93 Total Flouride Emmissions	**75.6**	mg/Sample	EPA 13B
SC Test 3 9309229-03	09/16/93 Total Flouride Emmissions	**77.8**	mg/Sample	EPA 13B
SC Blank 1 9309229-04	09/16/93 Total Flouride Emmissions	**<0.5**	mg/Sample	EPA 13B
SC Blank 2 9309229-05	09/16/93 Total Flouride Emmissions	**<0.5**	mg/Sample	EPA 13B
SC Blank 3 9309229-06	09/16/93 Total Flouride Emmissions	**<0.5**	mg/Sample	EPA 13B

ANALYSIS REVIEWED AND APPROVED BY

• ACCREDITED BY THE AMERICAN INDUSTRIAL HYGIENE ASSOCIATION •

30.24
1.20
29.04

CSA CO. DATA SHEET (METHOD 5)

TEST NO. 1 PLANT STARK CERAMICS DATE 9/16/93

LOCATION NO 3 KILN STACK BY GT MH MA

BAROMETER (P_B) 29.08 AMBIENT TEMP ASSUMED MOISTURE "Y" 1.001

MOUDULE NO. 2031 PROBE NO. 1-2 FILTER NO. 12 HEATER NO. 3 NOZZLE DIA. 5/16

TEST POINT	METER VOLUME (Vm)	METER TEMP (Tm) IN	METER TEMP (Tm) OUT	COND TEMP °F	FILTER HEATER TEMP°F	STACK TEMP °F(Ts)	STACK PRESS. (Ps)	VACUUM "Hg	ORIFICE "H_2O (ΔH) (Pm)	VEL HEAD (ΔP)	TIME
1	222.1	66	65	60	252	586	0	3-	1.3	~~.28~~	9:42
A 1	225.0	74	67	52	251	576	0	3-	1.3	.28	47
2	227.8	79	70	52	251	577	0	3-	1.0	.24	52
3	230.8	84	72	48	252	584	0	3+	1.6	.35	57
4	234.7	88	74	48	250	587	0	4-	2.1	.45	10:02
1	234.7	88	78	49	251	583	0	3-	.9	~~.19~~	10:14
1	236.7	88	79	54	252	582	|	3-	.9	.19	.19
2	240.2	90	80	55	250	580	|	3-	.9	.19	24
3	242.6	91	82	58	250	581	|	3-	.8	.18	29
4	245.6	91	84	58	251	585	|	3-	1.4	.29	34
1	245.6	89	85	57	250	588	|	3+	.8	~~.17~~	.41
1	248.2	94	86	56	252	583	|	3-	.8	.17	.46
2	250.5	95	87	58	251	582	|	3-	.7	.14	.51
3	252.9	97	88	58	250	582	|	3+	.8	.17	.56
4	255.6	98	88	58	251	589	|	3+	1.1	.29	11.01
							|				
							|				
							|			

E.P.A. METHOD 5

DATA INPUT

Pb,In Hg	Barometer	29.Ø8
VM,ft3	Meter Volume	33.5
△H,In H2O	Orifice Differential	1.Ø9
PG,In H2Ø	Stack Static Pressure	Ø
Tm,F	Meter Temperture	83
Ts,F	Stack Temperture	583
CP	Pitot Coefficient	.84
$\sqrt{\triangle P}$,In H2Ø	Average Square Root Of Delta P	.487Ø
% CO2	Carbon Dioxide	3.4
% O2	Oxygen	16.4
% N	Nitrogen	8Ø.2
VCL,Ml	Volume Of Condensate	48.5
AS,ft2	Stack Area	8.5
MN,Mg	Total Particulate Catch Weight	151.7
Ø,Min	Test Time	6Ø
DN,In	Diameter Of Nozzle	.313

RESULTS

Pma,In Hg	Absolute Meter Pressure	29.16
PSA,In Hg	Absolute Stack Pressure	29.Ø8
MD	Molecular Weight Dry Gas	29.2Ø
MS	Molecular Weight @ Stack Conditions	28.45
VMSTP,ft3	VM Standard Temp.& Press. Dry	31.68
VWSTP,ft3	VM Standard Temp.& Press. Wet	2.28
BWO,%	Moisture	6.72
I.%	Isokeinetic Variation	91.43
VS,ft/Sec	Stack Velocity	39.27
QA,ASCFM	Stack Gas Flow (Actual)	2ØØ27
QS,ft3/HR	Stack Gas Flow (Dry STP)	553573
L,#/Hr	Emission Rate	5.85
CS,#/SCF	Particulate Emission	1.Ø55898E-Ø5
C''S,Grn/SCF	Particulate Emission	Ø.Ø7375

STARK CERAMICS
EAST CANTON OH
NO 1 KILN STACK
9/16/93
TEST 1

CSA CO. DATA SHEET (METHOD 5)

TEST NO. 2 PLANT Stark Ceramics DATE 9/16/97

LOCATION No 3 Kiln Stack BY Am

BAROMETER (P_B) 29.08 AMBIENT TEMP ASSUMED MOISTURE "Y" 1.001

MOUDULE NO. 2031 PROBE NO. 2-4 FILTER NO. 11 HEATER NO. 4 NOZZLE DIA. 5/16

TEST POINT	METER VOLUME (Vm)	METER TEMP (Tm) IN	METER TEMP (Tm) OUT	COND TEMP °F	FILTER HEATER TEMP°F	STACK TEMP °F(Ts)	STACK PRESS. (Ps)	VACUUM "Hg	ORIFICE "H_2O (ΔH) (Pm)	VEL HEAD (ΔP)	TIME
1	255.8	86	86	58	250	581	0	0	.6	~~.13~~	11:51
1	258.0	86	86	58	251	587		0	.6	.13	:56
2	261.2	92	87	59	251	590		2-	1.9	.40	12:01
3	265.1	96	87	66	252	592		2+	2.1	.43	06
4	269.0	99	88	65	251	591		2+	2.0	.41	11
1	269.0	92	88	64	250	591		0	1.0	~~.20~~	19
1	271.4	95	89	54	251	585		3	1.0	.20	24
2	274.1	99	90	64	252	584		3+	.9	.18	29
3	277.0	100	90	58	251	590		4	.9	.18	34
4	279.9	102	92	56	250	596		4	1.8	.35	39
1	279.9	96	92	56	251	596		4+	.9	~~.18~~	.45
1	282.6	100	93	58	250	590		3-	.9	.18	.50
2	285.1	101	92	56	251	586		4+	.9	.17	55
3	287.0	102	96	60	251	583		15	.8	.16	13.00
4	290.2	102	96	60	252	587		17	1.0	.20	05
	255.8										
(Vm)	34.6	96.5	90.1								
AVERAGE		93		****	******	588	0	MAX 17	1.15	.238	60 MINUTES

INTEGRATED GAS SAMPLE					AVG
CO_2	3.1				3.1
O_2	16.6				16.6
CO					

N_2 = 80.3

CONDENSATE COLLECTED	FINAL	INITIAL	TOTAL
DRIERITE	976.7	971.7	5.0
IMPINGER	240.2	200	40.2

FILTER WT	PROBE WASH WT	IMPINGER WASH WT	GRAND TOTAL 45.2
GROSS .7707	178.4070		LEAK RATE @ 18 "Hg = <.02
TARE .6789	178.3907	N/A	STACK AREA (As) 8.5 ft²
NET .0918	.0163		AVG SQ RT ΔP .4883

TOTAL PARTICULAT WT (Mn) 108.1 Mg

E.P.A. METHOD 5

DATA INPUT

Pb,In Hg	Barometer	29.Ø8
VM,ft3	Meter Volume	34.6
ΔH,In H2O	Orifice Differential	1.15
PG,In H2Ø	Stack Static Pressure	Ø
Tm,F	Meter Temperture	93
Ts,F	Stack Temperture	588
CP	Pitot Coefficient	.84
$\sqrt{\Delta P}$,In H2Ø	Average Square Root Of Delta P	.4883
% CO2	Carbon Dioxide	3.1
% O2	Oxygen	16.6
% N	Nitrogen	8Ø.3
VCL,Ml	Volume Of Condensate	45.2
AS,ft2	Stack Area	8.5
MN,Mg	Total Particulate Catch Weight	1Ø8.1
Ø,Min	Test Time	6Ø
DN,In	Diameter Of Nozzle	.313

RESULTS

Pma,In Hg	Absolute Meter Pressure	29.16
PSA,In Hg	Absolute Stack Pressure	29.Ø8
MD	Molecular Weight Dry Gas	29.16
MS	Molecular Weight @ Stack Conditions	28.47
VMSTP,ft3	VM Standard Temp.& Press. Dry	32.13
VWSTP,ft3	VM Standard Temp.& Press. Wet	2.13
BWO,%	Moisture	6.21
I,%	Isokeinetic Variation	92.23
VS,ft/Sec	Stack Velocity	39.45
QA,ASCFM	Stack Gas Flow (Actual)	2Ø122
QS,ft3/HR	Stack Gas Flow (Dry STP)	556565
L,#/Hr	Emission Rate	4.13
CS,#/SCF	Particulate Emission	7.419186E-Ø6
C''S,Grn/SCF	Particulate Emission	Ø.Ø5182

STARK CERAMICS
EAST CANTON OH
NO 1 KILN STACK
9/16/93
TEST 2

CSA CO. DATA SHEET (METHOD 5)

TEST NO. 3 PLANT Stark Ceramics DATE 9/16/93

LOCATION No 3 Kiln Stack BY AD

BAROMETER (P_B) 29.08 AMBIENT TEMP ASSUMED MOISTURE "Y" 1.001

MOUDULE NO. 2031 PROBE NO. 6 FILTER NO. 9 HEATER NO. 6 NOZZLE DIA. 5/16

TEST POINT	METER VOLUME (Vm)	METER TEMP (Tm) IN	METER TEMP (Tm) OUT	COND TEMP °F	FILTER HEATER TEMP°F	STACK TEMP °F(Ts)	STACK PRESS. (Ps)	VACUUM "Hg	ORIFICE "H_2O (ΔH) (Pm)	VEL HEAD (ΔP)	TIME
1	290.7	89	89	58	250	591	0	2-	1.0	~~.20~~	13:55
1	293.5	91	87	60	252	594		3+	1.0	.20	14:00
2	296.7	96	87	60	251	592		3+	1.4	.30	05
3	300.2	100	90	60	252	596		5+	1.9	.38	10
4	304.0	102	91	60	250	598		5+	1.9	.38	15
1	304.0	96	92	61	252	596		3-	1.0	~~.21~~	14:22
1	306.8	100	93	61	250	595		3-	1.0	.21	27
2	309.5	102	94	62	252	593		3-	.9	.19	32
3	312.4	104	94	62	251	593		3-	1.1	.22	37
4	315.5	105	95	62	252	595		3+	1.3	.25	42
1	315.5	100	95	61	251	599		3+	1.1	~~.22~~	14:47
1	318.3	103	96	58	250	599		3+	1.1	.22	52
2	321.7	105	97	58	252	593		3-	1.2	.24	07
3	324.7	106	97	58	250	595		3-	1.1	.21	12
4	328.0	107	98	58	251	596		4-	1.3	.25	17
	290.7										
(Vm)	37.3	100.5	93.0								
AVERAGE		97		****	******	595	0	MAX 5	1.22	.251	60 MINUTES

INTEGRATED GAS SAMPLE				AVG
CO_2		3.2		3.2
O_2		16.6		16.6
CO				

N_2 = 80.2

CONDENSATE COLLECTED	FINAL	INITIAL	TOTAL
DRIERITE	992.1	984.7	7.4
IMPINGER	242.3	200	42.3
GRAND TOTAL			49.7

FILTER WT	PROBE WASH WT	IMPINGER WASH WT
GROSS .7838	169.4020	
TARE .6824	169.3624	N/A
NET .1014	.0396	

LEAK RATE @ 11 "Hg ≤ .02

STACK AREA (As) ft²

AVG SQ RT ΔP .5007

TOTAL PARTICULAT WT (Mn) 141.0 Mg

E.P.A. METHOD 5

DATA INPUT

Pb,In Hg	Barometer	29.Ø8
VM,ft3	Meter Volume	37.3
ΔH,In H2O	Orifice Differential	1.22
PG,In H2Ø	Stack Static Pressure	Ø
Tm,F	Meter Temperture	97
Ts,F	Stack Temperture	595
CP	Pitot Coefficient	.84
$\sqrt{\Delta P}$,In H2Ø	Average Square Root Of Delta P	.5ØØ7
% CO2	Carbon Dioxide	3.2
% O2	Oxygen	16.6
% N	Nitrogen	8Ø.2
VCL,Ml	Volume Of Condensate	49.7
AS,ft2	Stack Area	8.5
MN,Mg	Total Particulate Catch Weight	141.Ø
Ø,Min	Test Time	6Ø
DN,In	Diameter Of Nozzle	.313

RESULTS

Pma,In Hg	Absolute Meter Pressure	29.17
PSA,In Hg	Absolute Stack Pressure	29.Ø8
MD	Molecular Weight Dry Gas	29.18
MS	Molecular Weight @ Stack Conditions	28.46
VMSTP,ft3	VM Standard Temp.& Press. Dry	34.39
VWSTP,ft3	VM Standard Temp.& Press. Wet	2.34
BWO,%	Moisture	6.37
I.%	Isokeinetic Variation	96.75
VS,ft/Sec	Stack Velocity	4Ø.59
QA,ASCFM	Stack Gas Flow (Actual)	2Ø7Ø2
QS,ft3/HR	Stack Gas Flow (Dry STP)	567866
L,#/Hr	Emission Rate	5.13
CS,#/SCF	Particulate Emission	9.Ø41635E-Ø6
C''S,Grn/SCF	Particulate Emission	Ø.Ø6315

STARK CERAMICS
EAST CANTON OH
NO 1 KILN STACK
9/16/93
TEST 3

CSA CO.

EPA METHOD 6 (SULFUR DIOXIDE) DATA AND CALCULATION SHEET

TEST NO 1A PLANT STARK CERAMICS DATE 9/16/93

LOCATION NO KILN STACK BY BK GH MP

Vm	Tmi	ROTOMETER	TIME
162.678	60	4	10:43
162.938	66		48
163.198	69		53
163.457	72		58
163.717	74		11:03
Vm 1.039	avg 68		

Pb 29.08

20 min

$Vm_{std} = K_1 Y(Vm)(Pb)/(Tm)$

Vm_{std} = 17.64 (.998)(1.039)(29.08)/(460 + 68) = 1.007

	1st TITRATION	2nd TITRATION	3rd TITRATION	AVERAGE	V_b TITRATION
Vt	11.4	11.4		11.4	0

Cso_2 = Concentration of sulfur dioxide - lb/dry standard cubic foot
N = Normality of barium perchlorate titrant
Pb = Barometric pressure - inches Hg
Tm = Temperature of meter - °F
Va = Volume of sample aloquot - ml
Vm = Volume of gas at meter temperature and pressure - f^3
Vm_{std} = Vm corrected to standard temperature and pressure - f^3
Vsoln = Total volune of sample solution - ml
Vb = Volume of titrant used for blank - ml
Y = dry gas meter calibration factor - dimensionless
K_1 = 17.64
K_2 = 7.061 X 10^{-6}

N= NORMALITY OF BARIUM PERCHLORATE TITRATE
VT= VOLUME OF TITRANT, ML
VTB= VOLUME OF TITRANT FOR BLANK, ML
VA= VOLUME OF ALQUOT SAMPLE, ML
VM= VOLUME OF GAS SAMPLE FROM METHOD 5,VM(DSCF)
VSOLN= TOTAL VOLUME OF SAMPLE SOLUTION, ML
QS= DSCF/HOUR FROM METHOD 5 CALCULATION
DSCF= DRY STANDARD CUBIC FOOT
MM= 1.000.000
WHEN MMBTU/HR = 1, THEN LB/MMBTU = LB/HR

SULFUR DIOXIDE CONCENTRATION = SO_2 LB/DSCF = S2

N=	.0096
VT=	11.4
VTB=	0
VA=	20
VM=	1.007
VSOLN=	100
QS=	553572
MMBTU/HR=	1

S2= (.00007061 x N x (VT-VTB) x VSOLN)/VM x VA)= 3.836922E-05 LB SO_2/DSCF

SO PPM= 6.037 x MM x S2 = 231.635

SO_2 LB/MMBTU= QS x S2 / MMBTU/HR = 21.24012 = LB/HR

STARK CERAMICS
EAST CANTON OH
NO 1 KILN STACK
9/16/93
TEST 1A

CSA CO.

EPA METHOD 6 (SULFUR DIOXIDE) DATA AND CALCULATION SHEET

TEST NO 1B PLANT STARK CERAMICS DATE 9/16/93

LOCATION NO. 1 KILN STACK BY [illegible]

Vm	Tmi	ROTOMETER	TIME
163.717	72	3.5	9:42
163.949	78		
164.181	81		
164.413	83		
164.645	85		
..			
Vm .928	avg 80		

Pb 29.08

$Vm_{std} = K_1\ Y(Vm)(Pb)/(Tm)$

Vm_{std} = 17.64 (.998)(.928)(29.08)/(460 + 80) = .880

	1st TITRATION	2nd TITRATION	3rd TITRATION	AVERAGE	V_b TITRATION
Vt	9.5	~~9.4~~	9.5	9.5	0

$\frac{1A + 1B}{2}$ = AVG TEST 1

$\frac{21.24 + 20.25}{2}$ = 20.75 #/HR

Cso_2 = Concentration of sulfur dioxide - lb/dry standard cubic foot
N = Normality of barium perchlorate titrant
Pb = Barometric pressure - inches Hg
Tm = Temperature of meter - °F
Va = Volume of sample aloquot - ml
Vm = Volume of gas at meter temperature and pressure - f^3
Vm_{std} = Vm corrected to standard temperature and pressure - f^3
Vsoln = Total volune of sample solution - ml
Vb = Volume of titrant used for blank - ml
Y = dry gas meter calibration factor - dimensionless
K_1 = 17.64
K_2 = 7.061 X 10^{-6}

N= NORMALITY OF BARIUM PERCHLORATE TITRATE
VT= VOLUME OF TITRANT, ML
VTB= VOLUME OF TITRANT FOR BLANK, ML
VA= VOLUME OF ALQUOT SAMPLE, ML
VM= VOLUME OF GAS SAMPLE FROM METHOD 5,VM(DSCF)
VSOLN= TOTAL VOLUME OF SAMPLE SOLUTION, ML
QS= DSCF/HOUR FROM METHOD 5 CALCULATION
DSCF= DRY STANDARD CUBIC FOOT
MM= 1,000,000
WHEN MMBTU/HR = 1, THEN LB/MMBTU = LB/HR

SULFUR DIOXIDE CONCENTRATION = SO_2 LB/DSCF ▫ S2

N=	.0096
VT=	9.5
VTB=	0
VA=	20
VM=	.88
VSOLN=	100
QS=	553572
MMBTU/HR=	1

S2= (.00007061 x N x (VT-VTB) x VSOLN)/VM x VA)= 3.658883E-05 LB SO_2/DSCF

SO PPM= 6.037 x MM x S2 ▫ 220.8867

SO_2 LB/MMBTU= QS x S2 / MMBTU/HR ▫ 20.25455 = LB/HR

STARK CERAMICS
EAST CANTON OH
NO 1 KILN STACK
9/16/93
TEST 1B

CSA CO.

EPA METHOD 6 (SULFUR DIOXIDE) DATA AND CALCULATION SHEET

TEST NO 2A PLANT STARK CERAMICS DATE 9/16/93

LOCATION KILN KILN STACK BY [illegible]

Vm	Tmi	ROTOMETER	TIME
164.645	76	3.5	11:51
164.855	77		56
165.064	78		12:01
165.273	81		06
165.483	84		11
Vm .838	avg 79		

Pb 29.08

$Vm_{std} = K_1 Y(Vm)(Pb)/(Tm)$

Vm_{std} = 17.64 (.998)(.838)(29.08)/(460 + 79) = .796

	1st TITRATION	2nd TITRATION	3rd TITRATION	AVERAGE	V_b TITRATION
Vt	10.5	10.5		10.5	0

Cso_2 = Concentration of sulfur dioxide - lb/dry standard cubic foot
N = Normality of barium perchlorate titrant
Pb = Barometric pressure - inches Hg
Tm = Temperature of meter - ^oF
Va = Volume of sample aloquot - ml
Vm = Volume of gas at meter temperature and pressure - f^3
Vm_{std} = Vm corrected to standard temperature and pressure - f^3
Vsoln = Total volune of sample solution - ml
Vb = Volume of titrant used for blank - ml
Y = dry gas meter calibration factor - dimensionless
K_1 = 17.64
K_2 = 7.061 X 10^{-6}

N= NORMALITY OF BARIUM PERCHLORATE TITRATE
VT= VOLUME OF TITRANT, ML
VTB= VOLUME OF TITRANT FOR BLANK, ML
VA= VOLUME OF ALQUOT SAMPLE, ML
VM= VOLUME OF GAS SAMPLE FROM METHOD 5,VM(DSCF)
VSOLN= TOTAL VOLUME OF SAMPLE SOLUTION, ML
QS= DSCF/HOUR FROM METHOD 5 CALCULATION
DSCF= DRY STANDARD CUBIC FOOT
MM= 1,000,000

WHEN MMBTU/HR = 1, THEN LB/MMBTU = LB/HR

SULFUR DIOXIDE CONCENTRATION = SO_2 LB/DSCF ▫ S2

N=	.0096
VT=	10.5
VTB=	0
VA▫	20
VM=	.796
VSOLN=	100
QS▫	556565
MMBTU/HR=	1

S2= (.00007061 x N x (VT-VTB) x VSOLN)/VM x VA)= 4.470785E-05 LB SO_2/DSCF

SO PPM= 6.037 x MM x S2 = 269.9013

SO_2 LB/MMBTU= QS x S2 / MMBTU/HR = 24.88282 = LB/HR

STARK CERAMICS
EAST CANTON OH
NO 1 KILN STACK
9/16/93
TEST [redacted] 2A

CSA CO.

EPA METHOD 6 (SULFUR DIOXIDE) DATA AND CALCULATION SHEET

TEST NO 2B PLANT STARK CERAMICS DATE 9/16/91

LOCATION U2 KILN STACK BY [illegible]

Vm	Tmi	ROTOMETER	TIME
165.483	83	3.5	12:20
165.713	85		25
165.944	87		30
166.174	88		35
166.404	90		12:40
Vm .921	avg 87		

Pb 29.08

$Vm_{std} = K_1 Y(Vm)(Pb)/(Tm)$

Vm_{std} = 17.64 (.998)(.921)(29.08)/(460 + 87) = .862

	1st TITRATION	2nd TITRATION	3rd TITRATION	AVERAGE	V_b TITRATION
Vt	10.4	10.5	10.4	10.4	0

Cso_2 = Concentration of sulfur dioxide - lb/dry standard cubic foot
N = Normality of barium perchlorate titrant
Pb = Barometric pressure - inches Hg
Tm = Temperature of meter - ^oF
Va = Volume of sample aloquot - ml
Vm = Volume of gas at meter temperature and pressure - f^3
Vm_{std} = Vm corrected to standard temperature and pressure - f^3
Vsoln = Total volune of sample solution - ml
Vb = Volume of titrant used for blank - ml
Y = dry gas meter calibration factor - dimensionless
K_1 = 17.64
K_2 = 7.061×10^{-6}

N= NORMALITY OF BARIUM PERCHLORATE TITRATE
VT= VOLUME OF TITRANT, ML
VTB= VOLUME OF TITRANT FOR BLANK, ML
VA= VOLUME OF ALQUOT SAMPLE, ML
VM= VOLUME OF GAS SAMPLE FROM METHOD 5,VM(DSCF)
VSOLN= TOTAL VOLUME OF SAMPLE SOLUTION, ML
QS= DSCF/HOUR FROM METHOD 5 CALCULATION
DSCF= DRY STANDARD CUBIC FOOT
MM= 1.000.000

WHEN MMBTU/HR = 1, THEN LB/MMBTU = LB/HR

$$\frac{2A + 2B}{2} = \text{Avg } SO_2$$

$$\frac{24.882 + 22.759}{2} = 23.82 \ \#/hr$$

SULFUR DIOXIDE CONCENTRATION = SO_2 LB/DSCF ▫ S2

N=	.0096
VT=	10.4
VTB=	0
VA=	20
VM=	.862
VSOLN=	100
QS=	556565
MMBTU/HR=	1

S2= (.00007061 x N x (VT-VTB) x VSOLN)/VM x VA)= 4.089155E-05 LB SO_2/DSCF

SO PPM= 6.037 x MM x S2 = 246.8623

SO_2 LB/MMBTU= QS x S2 / MMBTU/HR = 22.75881 = LB/HR

STARK CERAMICS
EAST CANTON OH
NO 1 KILN STACK
9/16/93
TEST 2B

CSA CO.

EPA METHOD 6 (SULFUR DIOXIDE) DATA AND CALCULATION SHEET

TEST NO 3A PLANT STARK CERAMICS DATE 9/16/93

LOCATION NE KILN STACK BY [illegible]

Vm	Tmi	ROTOMETER	TIME
166.404	78	3.5	13:55
166.207	80		14:00
166.838	82		05
167.054	84		10
167.271	85		15
			20 MIN
Vm .867	avg 82		

Pb 29.08

$Vm_{std} = K_1 Y(Vm)(Pb)/(Tm)$

Vm_{std} = 17.64 (.998)(.867)(29.08)/(460 + 82) = .5189

	1st TITRATION	2nd TITRATION	3rd TITRATION	AVERAGE	V_b TITRATION
Vt	8.9	9.0	9.0	9	0

Cso_2 = Concentration of sulfur dioxide - lb/dry standard cubic foot
N = Normality of barium perchlorate titrant
Pb = Barometric pressure - inches Hg
Tm = Temperature of meter - ^oF
Va = Volume of sample aloquot - ml
Vm = Volume of gas at meter temperature and pressure - f^3
Vm_{std} = Vm corrected to standard temperature and pressure - f^3
Vsoln = Total volune of sample solution - ml
Vb = Volume of titrant used for blank - ml
Y = dry gas meter calibration factor - dimensionless
K_1 = 17.64
K_2 = 7.061 X 10^{-6}

METHOD 6

N= NORMALITY OF BARIUM PERCHLORATE TITRATE
VT= VOLUME OF TITRANT, ML
VTB= VOLUME OF TITRANT FOR BLANK, ML
VA= VOLUME OF ALQUOT SAMPLE, ML
VM= VOLUME OF GAS SAMPLE FROM METHOD 5,VM(DSCF)
VSOLN= TOTAL VOLUME OF SAMPLE SOLUTION, ML
QS= DSCF/HOUR FROM METHOD 5 CALCULATION
DSCF= DRY STANDARD CUBIC FOOT
MM= 1,000,000

WHEN MMBTU/HR = 1, THEN LB/MMBTU = LB/HR

SULFUR DIOXIDE CONCENTRATION = SO_2 LB/DSCF = S2

N=	.0096
VT=	9
VTB=	0
VA=	20
VM=	.8789
VSOLN=	100
QS=	567866
MMBTU/HR=	1

S2= (.00007061 x N x (VT-VTB) x VSOLN)/VM x VA)= 3.470648E-05 LB SO_2/DSCF

SO PPM= 6.037 x MM x S2 = 209.523

SO_2 LB/MMBTU= QS x S2 / MMBTU/HR = 19.70863 = LB/HR

STARK CERAMICS
EAST CANTON OH
NO 1 KILN STACK
9/16/93
TEST 3A

CSA CO.

EPA METHOD 6 (SULFUR DIOXIDE) DATA AND CALCULATION SHEET

TEST NO 3 B PLANT STARK CERAMICS DATE 9/16/93

LOCATION N.S. KILN STACK BY [illegible]

Vm	Tmi	ROTOMETER	TIME
167.271	85	3.0	14:22
167.436	87		:27
167.601	88		:32
167.767	89		:37
167.932	90		14:42
Vm .661	avg 88		

Pb 29.08

$Vm_{std} = K_1 Y(Vm)(Pb)/(Tm)$

Vm_{std} = 17.64 (.998)(.661)(29.08)/(460 + 88) = .6175

	1st TITRATION	2nd TITRATION	3rd TITRATION	AVERAGE	V_b TITRATION
Vt	8.6	8.6	–	8.6	0

Cso_2 = Concentration of sulfur dioxide - lb/dry standard cubic foot
N = Normality of barium perchlorate titrant
Pb = Barometric pressure - inches Hg
Tm = Temperature of meter - ^oF
Va = Volume of sample aloquot - ml
Vm = Volume of gas at meter temperature and pressure - f^3
Vm_{std} = Vm corrected to standard temperature and pressure - f^3
Vsoln = Total volune of sample solution - ml
Vb = Volume of titrant used for blank - ml
Y = dry gas meter calibration factor - dimensionless
K_1 = 17.64
K_2 = 7.061 X 10^{-6}

METHOD 6

N= NORMALITY OF BARIUM PERCHLORATE TITRATE
VT= VOLUME OF TITRANT, ML
VTB= VOLUME OF TITRANT FOR BLANK, ML
VA= VOLUME OF ALQUOT SAMPLE, ML
VM= VOLUME OF GAS SAMPLE FROM METHOD 5,VM(DSCF)
VSOLN= TOTAL VOLUME OF SAMPLE SOLUTION, ML
QS= DSCF/HOUR FROM METHOD 5 CALCULATION
DSCF= DRY STANDARD CUBIC FOOT
MM= 1,000,000

WHEN MMBTU/HR = 1, THEN LB/MMBTU = LB/HR

$\frac{3A + 3B}{2}$ = Avg Test 3

$\frac{19.709 + 26.805}{2}$ = 23.26 #/HR

SULFUR DIOXIDE CONCENTRATION = SO_2 LB/DSCF = S2

N=	.0096
VT=	8.6
VTB=	0
VA=	20
VM=	.6175
VSOLN=	100
QS=	567866
MMBTU/HR=	1

S2= (.00007061 x N x (VT-VTB) x VSOLN)/VM x VA)= 4.720294E-05 LB SO_2/DSCF

SO PPM= 6.037 x MM x S2 = 284.9641

SO_2 LB/MMBTU= QS x S2 / MMBTU/HR = 26.80494 = LB/HR

STARK CERAMICS
EAST CANTON OH
NO 1 KILN STACK
9/16/93
TEST 3B

FLOURIDE

CSA CO. DATA SHEET (METHOD 5)

TEST NO. 1 PLANT STARK CERAMICS DATE 9/16/93

LOCATION No 3 KILN STACK BY JCK MG MP

BAROMETER (P_B) 29.08 AMBIENT TEMP ASSUMED MOISTURE "Y" 1.001

MOUDULE NO. 2037 PROBE NO. 19 FILTER NO. 1 HEATER NO. 7 NOZZLE DIA. .391 .39

	TEST POINT	METER VOLUME (Vm)	METER TEMP (Tm) IN	METER TEMP (Tm) OUT	COND TEMP °F	FILTER HEATER TEMP°F	STACK TEMP °F(Ts)	STACK PRESS. (Ps)	VACUUM "Hg	ORIFICE "H_2O (ΔH)(Pm)	VEL HEAD (ΔP)	TIME
	1	101.3	67	65	60	250		0	7+	2.3	.22	9:42
B	1	105.2	78	67	52	250			7+	2.3	.22	47
	2	109.1	86	68	52	252			6+	1.8	.16	52
	3	113.0	94	72	52	250			7	2.3	.22	57
	4	117.2	98	76	48	248			12	3.0	.28	10:02
	1	117.2	90	78	49	248			5+	1.6	.14	10:16
	1	120.9	92	79	54	250			5+	1.6	.14	21
C	2	124.6	102	82	55	250			9+	2.3	.19	26
	3	129.2	104	83	55	251			11	2.7	.22	31
	4	134.0	106	84	55	250			18	3.9	.31	36
	1	134.0	96	84	55	252			14	3.1	.25	41
	1	139.1	111	88	56	252			14	3.1	.23	46
A	2	143.3	116	90	56	250			13+	2.6	.20	51
	3	147.6	119	92	56	249			14-	2.7	.22	56
	4	152.9	120	94	58	250			19	3.6	.28	11:01
		101.3										
	(Vm)	51.6	98.6	80.1								
	AVERAGE		89		****	******	583	0	MAX 19	2.77	.222	60 MINUTES

1 MIN PER POINT

INTEGRATED GAS SAMPLE 1 AVG N_2 = 80.2

		AVG
CO_2		3.4
O_2	FROM MS	16.4
CO		

16.4

CONDENSATE COLLECTED

	FINAL	INITIAL	TOTAL
DRIERITE	973.9	964.9	9.0
IMPINGER	359	300	59.0

FILTER WT	PROBE WASH WT	IMPINGER WASH WT
GROSS		
TARE		
NET		

GRAND TOTAL 68

LEAK RATE @ 20 "Hg = <.02

STACK AREA (As) 8.5 ft²

AVG SQ RT ΔP .4707

TOTAL PARTICULAT WT (Mn) 76.4 HF Mg

FLOURIDE

DATA INPUT

Pb,In Hg	Barometer	29.Ø8
VM,ft3	Meter Volume	51.6
ΔH,In H2O	Orifice Differential	2.77
PG,In H2Ø	Stack Static Pressure	Ø
Tm,F	Meter Temperture	89
Ts,F	Stack Temperture	583
CP	Pitot Coefficient	.84
√ΔP,In H2Ø	Average Square Root Of Delta P	.47Ø7
% CO2	Carbon Dioxide	3.4
% O2	Oxygen	16.4
% N	Nitrogen	8Ø.2
VCL,Ml	Volume Of Condensate	68
AS,ft2	Stack Area	8.5
MN,Mg	Total Fluorine Weight	76.4
Ø,Min	Test Time	6Ø
DN,In	Diameter Of Nozzle	.391

RESULTS

Pma,In Hg	Absolute Meter Pressure	29.28
PSA,In Hg	Absolute Stack Pressure	29.Ø8
MD	Molecular Weight Dry Gas	29.2Ø
MS	Molecular Weight @ Stack Conditions	28.5Ø
VMSTP,ft3	VM Standard Temp.& Press. Dry	48.26
VWSTP,ft3	VM Standard Temp.& Press. Wet	3.2Ø
BWO,%	Moisture	6.22
I.%	Isokeinetic Variation	91.95
VS,ft/Sec	Stack Velocity	37.92
QA,ASCFM	Stack Gas Flow (Actual)	19338
QS,ft3/HR	Stack Gas Flow (Dry STP)	537395
L,#/Hr	Emission Rate	1.88
CS,#/SCF	Fluorine Emission	3.49Ø58E-Ø6

STARK CERAMICS
EAST CANTON OH
NO 1 KILN STACK
9/16/93
TEST 1

FLOURIDE

CSA CO. DATA SHEET (METHOD 5)

TEST NO. 2 PLANT STARK CERAMICS DATE 9/16/03

LOCATION NO 3 KILN STACK BY AK GM MP

BAROMETER (P_B) 29.08 AMBIENT TEMP ASSUMED MOISTURE "Y" 1.001

MOUDULE NO. 203 PROBE NO. 29 FILTER NO. — HEATER NO. 8 NOZZLE DIA. 385 .388

	TEST POINT	METER VOLUME (Vm)	METER TEMP (Tm) IN	METER TEMP (Tm) OUT	COND TEMP °F	FILTER HEATER TEMP °F	STACK TEMP °F (Ts)	STACK PRESS. (Ps)	VACUUM "Hg	ORIFICE "H_2O (ΔH) (Pm)	VEL HEAD (ΔP)	TIME
	1	153.2	88	88	62	248		0	7	2.0	~~.15~~	11:51
B	1	157.3	94	88	60	250			7	2.0	.16	56
	2	161.3	102	88	58	251			11	2.6	.21	12:01
	3	166.1	110	89	58	250			18-	3.3	.28	06
	4	171.0	115	90	58	250			19+	3.5	.28	11
	1	171.0	98	89	58	250			7	1.6	~~.13~~	12:19
C	1	174.6	109	92	58	252			7	1.6	.12	24
	2	178.7	114	94	56	250			11	2.0	.15	29
	3	182.6	116	95	56	250			13	2.4	.18	34
	4	186.6	120	96	56	251			19+	3.6	.27	39
	1	186.6	109	94	58	252			18	3.2	~~.24~~	12:45
	1	191.2	113	97	56	251			18	3.2	.24	50
A	2	195.7	118	97	58	250			18+	3.3	.24	55
	3	200.3	122	98	58	250			18+	3.3	.24	13:00
	4	206.3	124	101	60	248			18+	3.4	.24	13:05
		153.2										
	(Vm)	53.1	109.9	93.0								
	AVERAGE		101		****	******	588	0	MAX 20	2.73	.214	60 MINUTES

INTEGRATED GAS SAMPLE — 7 — AVG

CO_2				5	3.1
O_2		From My			16.6
CO					

16.6

N_2 = 80.3

CONDENSATE COLLECTED

	FINAL	INITIAL	TOTAL
DRIERITE	1011.6	1000.2	11.4
IMPINGER	357.9	300	57.9

FILTER WT	PROBE WASH WT	IMPINGER WASH WT	GRAND TOTAL 69.3
GROSS			LEAK RATE @ 20 "Hg = <.02
TARE			STACK AREA (As) ft²
NET			AVG SQ RT ΔP .4628

TOTAL PARTICULAT WT (Mn) 75.6 (HF) Mg

FLOURIDE

DATA INPUT

Pb,In Hg	Barometer	29.Ø8
VM,ft3	Meter Volume	53.1
ΔH,In H2O	Orifice Differential	2.73
PG,In H2Ø	Stack Static Pressure	Ø
Tm,F	Meter Temperture	1Ø1
Ts,F	Stack Temperture	588
CP	Pitot Coefficient	.84
√ΔP,In H2Ø	Average Square Root Of Delta P	.4628
% CO2	Carbon Dioxide	3.1
% O2	Oxygen	16.6
% N	Nitrogen	8Ø.3
VCL,Ml	Volume Of Condensate	69.3
AS,ft2	Stack Area	8.5
MN,Mg	Total Particulate Catch Weight	75.6
Ø,Min	Test Time	6Ø
DN,In	Diameter Of Nozzle	.385

RESULTS

Pma,In Hg	Absolute Meter Pressure	29.28
PSA,In Hg	Absolute Stack Pressure	29.Ø8
MD	Molecular Weight Dry Gas	29.16
MS	Molecular Weight @ Stack Conditions	28.46
VMSTP,ft3	VM Standard Temp.& Press. Dry	48.6Ø
VWSTP,ft3	VM Standard Temp.& Press. Wet	3.26
BWO,%	Moisture	6.29
I.%	Isokeinetic Variation	97.36
VS,ft/Sec	Stack Velocity	37.4Ø
QA,ASCFM	Stack Gas Flow (Actual)	19Ø74
QS,ft3/HR	Stack Gas Flow (Dry STP)	527140
L,#/Hr	Emission Rate	1.81
CS,#/SCF	Particulate Emission	3.429823E-Ø6
C''S,Grn/SCF	Particulate Emission	Ø.Ø2395

STARK CERAMICS
EAST CANTON OH
NO 1 KILN STACK
9/16/93
TEST 2

HYDROGEN FLOURIDE

CSA CO. DATA SHEET (METHOD 5)

TEST NO. 3 PLANT STARK CERAMICS DATE 9/16/91

LOCATION N E KILN STACK BY EK MB GT AP

BAROMETER (P_B) 29.08 AMBIENT TEMP ASSUMED MOISTURE "Y" 1.001

MOUDULE NO. 2033 PROBE NO. 3 Q FILTER NO. — HEATER NO. 9 NOZZLE DIA. .303 .38±

TEST POINT	METER VOLUME (Vm)	METER TEMP (Tm) IN	METER TEMP (Tm) OUT	COND TEMP °F	FILTER HEATER TEMP °F	STACK TEMP °F (Ts)	STACK PRESS. (Ps)	VACUUM "Hg	ORIFICE "H_2O (ΔH) (Pm)	VEL HEAD (ΔP)	TIME
1	206.6	87	87	58	250		0	14	2.4	.19	13:55
1	211.0	97	90	58	251			14	2.4	.19	14:00
2	214.6	106	91	60	250			14	2.4	.19	05
3	219.1	112	92	60	250			16	2.6	.20	10
4	223.7	116	94	60	252			19	3.7	.28	15
1	223.7	103	92	60	252			14+	2.3	.18	14:22
1	228.0	112	94	60	251			14+	2.3	.18	27
2	232.9	117	96	61	248			13	2.1	.16	32
3	237.3	122	98	60	252			18	2.8	.22	37
4	242.1	125	100	60	250			18+	2.8	.22	42
1	242.1	110	98	58	249			19	3.5	.27	14:47
1	246.8	119	100	58	250			19	3.5	.27	53
2	251.4	121	101	58	250			19	3.6	.27	57
3	255.8	125	102	58	250			19+	3.8	.28	15:03
4	260.9	126	104	58	251			20-	4.7	.31	15:07
	206.6										
(Vm)	54.3	113.2	96.0								
AVERAGE		105		****	******	595	0	MAX 20	2.96	.228	60 MINUTES

INTEGRATED GAS SAMPLE		AVG
CO_2	FROM M-5	3.2
O_2		16.6
CO		

N_2 = 80.2

CONDENSATE COLLECTED	FINAL	INITIAL	TOTAL
DRIERITE	1031.4	1016.2	15.2
IMPINGER	354.2	306	54.2

FILTER WT	PROBE WASH WT	IMPINGER WASH WT	GRAND TOTAL 69.4
GROSS			LEAK RATE @ 20"Hg = <.02
TARE	N/A		STACK AREA (As) ft²
NET			AVG SQ RT ΔP .4780

TOTAL PARTICULAT WT (Mn) 77.8 (HF) Mg

16.6

FLOURIDE

DATA INPUT

Pb,In Hg	Barometer	29.Ø8
VM,ft3	Meter Volume	54.3
ΔH,In H2O	Orifice Differential	2.96
PG,In H2Ø	Stack Static Pressure	Ø
Tm,F	Meter Temperture	1Ø5
Ts,F	Stack Temperture	595
CP	Pitot Coefficient	.84
√ΔP,In H2Ø	Average Square Root Of Delta P	.4780
% CO2	Carbon Dioxide	3.2
% O2	Oxygen	16.6
% N	Nitrogen	8Ø.2
VCL,Ml	Volume Of Condensate	69.4
AS,ft2	Stack Area	8.5
MN,Mg	Total Particulate Catch Weight	77.8
Ø,Min	Test Time	6Ø
DN,In	Diameter Of Nozzle	.383

RESULTS

Pma,In Hg	Absolute Meter Pressure	29.3Ø
PSA,In Hg	Absolute Stack Pressure	29.Ø8
MD	Molecular Weight Dry Gas	29.18
MS	Molecular Weight @ Stack Conditions	28.48
VMSTP,ft3	VM Standard Temp.& Press. Dry	49.35
VWSTP,ft3	VM Standard Temp.& Press. Wet	3.27
BWO,%	Moisture	6.21
I,%	Isokeinetic Variation	97.ØØ
VS,ft/Sec	Stack Velocity	38.74
QA,ASCFM	Stack Gas Flow (Actual)	19758
QS,ft3/HR	Stack Gas Flow (Dry STP)	542883
L,#/Hr	Emission Rate	1.89
CS,#/SCF	Particulate Emission	3.47624E-Ø6
CGS,Grn/SCF	Particulate Emission	Ø.Ø2428

STARK CERAMICS
EAST CANTON OH
NO 1 KILN STACK
9/16/93
TEST 3

APPENDIX II

Agency Use Only
Date Received _____
No. Assigned _____
Premise No. _____

INTENT TO TEST NOTIFICATION

Proposed Test Date SEPT 16, 1993
Pre-Test Meeting Desired? Yes [ ] No [X]

A. Facility Information

Name STARK CERAMICS
Address 600 WEST CHURCH STREET, EAST CANTON, OH 44730
Contact Person SURINDER MAHESHWARY
Telephone Number (216) 488-1211

B. Testing Firm Information

Name CSA CO
Address 24385 CENTER ROAD, ALLIANCE, OH 44601
Contact Person ERNIE KOLM
Telephone Number (216) 525-5119

C. Source Sampling Information: Identify all sources and pollutants to be sampled.

Source	Control Equipment	Monitoring Equipment	Pollutant to be Tested	EPA Test Method	Filter Box Temperature	Number of Sampling Points	Total Time for Test Run	Number of Sampling Runs
NK-3 BRICK KILN	NONE.	NONE	PM	5	250°F	12	60 min	3
			SO_2	6	—	2	2 RUNS @ 20 MINEA	3
					—			

Any modifications to USEPA Reference Method(s)? Yes [ ] No [ ] ; If yes explain _____

Sampling Location(s): Inlet [ ] Outlet [ ] Simultaneous [ ] Will cyclonic flow check(s) be conducted? Yes [ ] No [ ]

Fuel Sampling: Coal - Proximate [ ] Ultimate [ ] Other (specify) _____

Emission Rate to be calculated using: F-Factor [ ] Ultimate Coal Analysis [ ] Other (specify) _____

Are concurrent Method 9 readings to be performed? Yes [ ] No [ ]

D. Sample Train Calibration: All affected measuring and metering equipment should be calibrated within 60 days of the scheduled testing.

Plant SYMRK CERAMICS Date 9/16/93

Location EAST CANYON Starting time 9 AM

Plant process BRICK KILN

For sample port and sample point locations, see sketch(s)

Calibration sheet(s) are attached.

GENERAL

The sample train is a Research Appliance Corp. model 2043 using a PYREX lined probe heated to 250 °F. The filter media is A/E FIBERGLASS enclosed in pyrex holders heated to 250 °F.

The impingers contain;

1st	100 ml DW	4th	
2nd	100 ml DW	5th	
3rd	EMPTY	6th	

A drierite column containing Drierite® (calcium sulfate) is used for final moisture removal in the impinger train.

The contents of the inpingers will be used for moisture determination and ——.

The front half glassware will be washed using acetone and brush or ——.

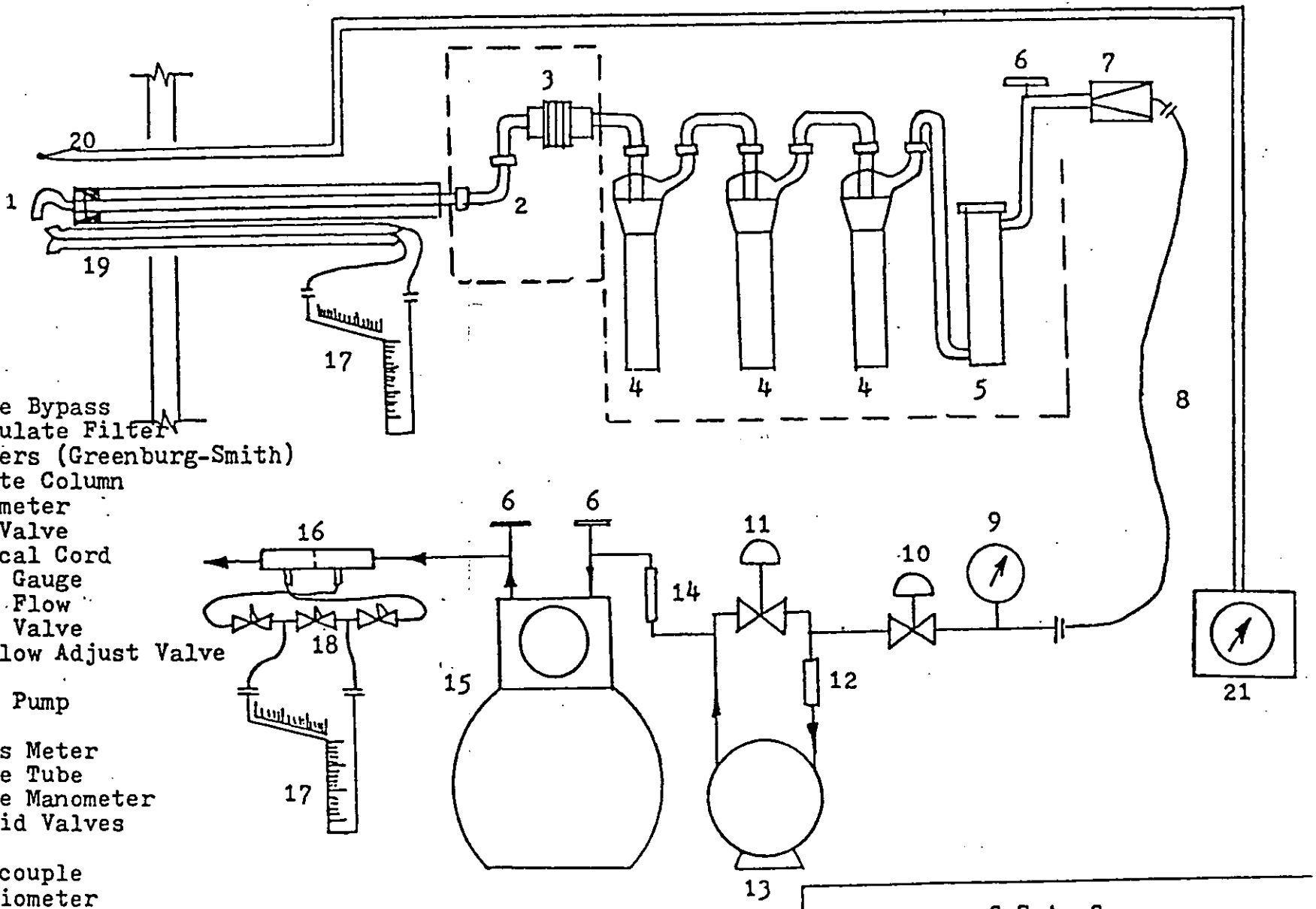
The back half will be washed using D.W.

The test and analytical procedures are as per latest Federal Register or local requirement.

~~CO measurement by method 10 10A using the MSA Lira 3000.~~ See sketch.

CO_2 and O_2 measurement by orsat from an integrated sample. See sketch.

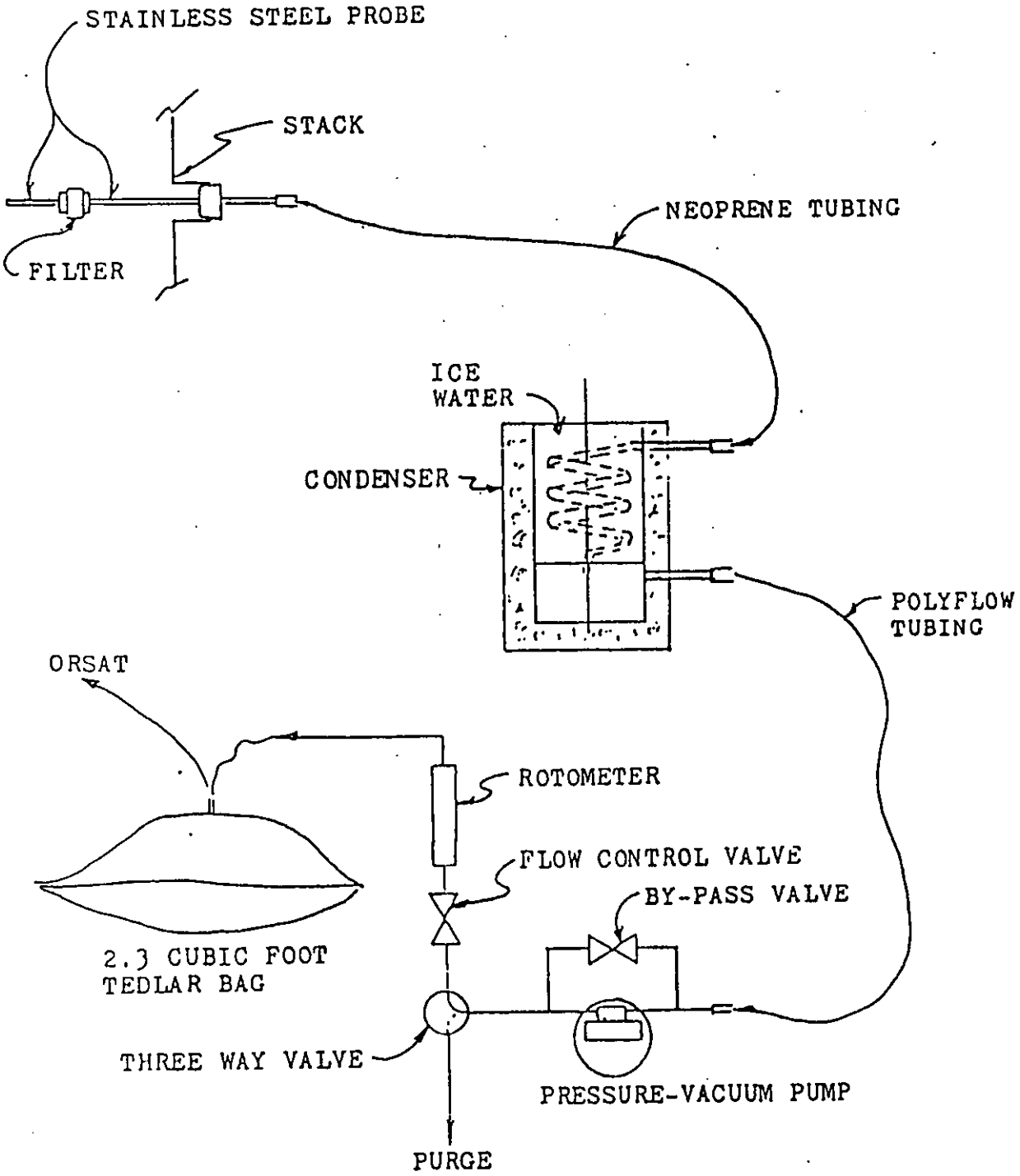
Other: EPA METHOD 6 - SEE SKETCH



1) Probe
2) Cyclone Bypass
3) Particulate Filter
4) Impingers (Greenburg-Smith)
5) Drierite Column
6) Thermometer
7) Check Valve
8) Umbilical Cord
9) Vacuum Gauge
10) Course Flow Adjust Valve
11) Fine Flow Adjust Valve
12) Oiler
13) Vacuum Pump
14) Filter
15) Dry Gas Meter
16) Orifice Tube
17) Incline Manometer
18) Solenoid Valves
19) Pitot
20) Thermocouple
21) Potentiometer

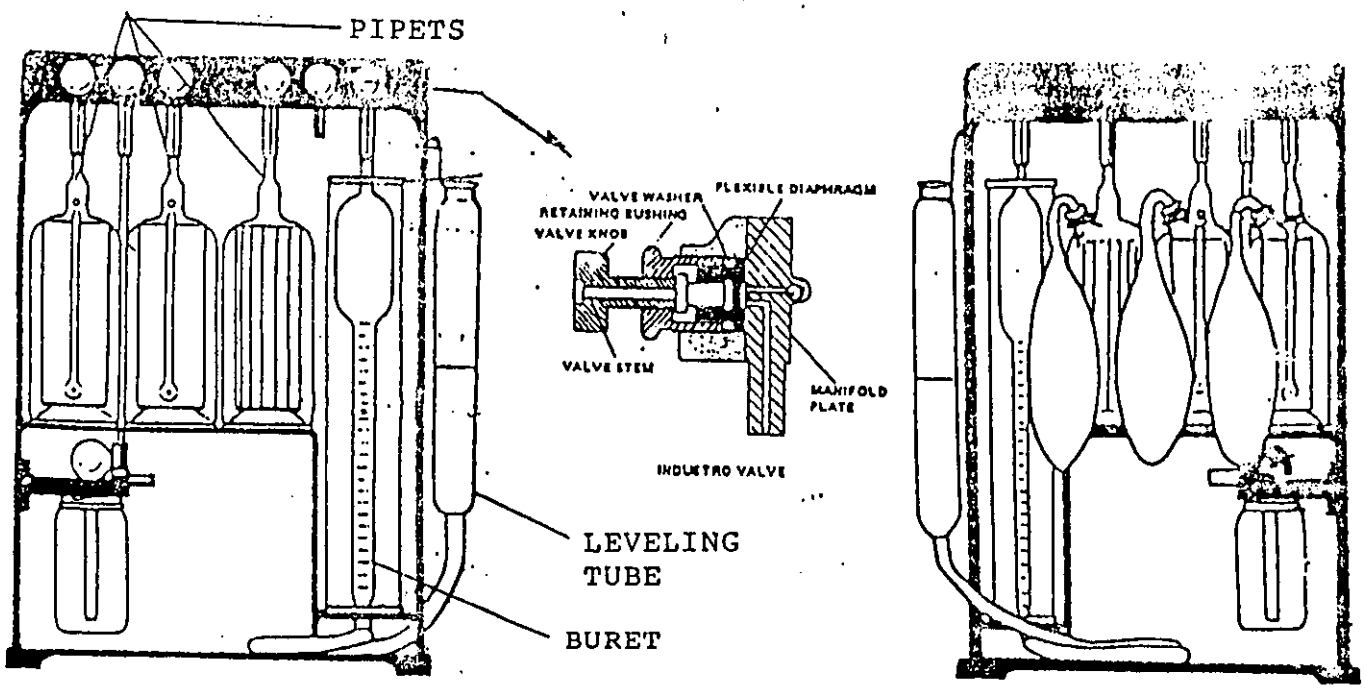
C.S.A. Co.
MODIFICATION OF R.A.C. SAMPLE TR
USING DRIERITE COLUMN IN PLACE C
IMPINGER DESICANT

Figure 2



INTEGRATED SAMPLER

FIGURE 3



LEAK CHECKING

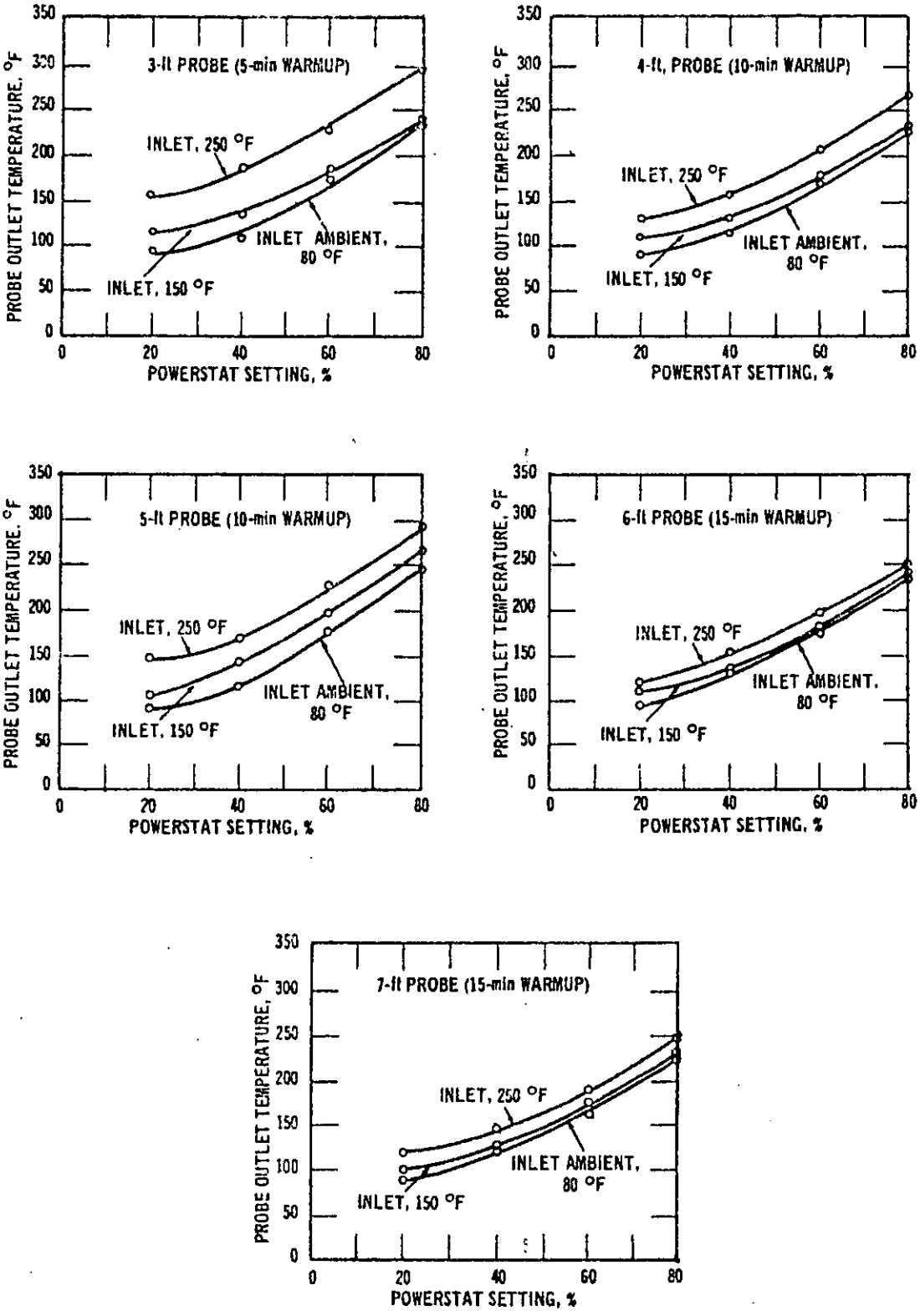
1) THE LEVEL OF THE SOLUTION IN THE PIPET WILL NOT BE MANTAINED AT ITS PROPER LEVEL IF THER IS A LEAK BETWEEN THE PIPET AND THE MANIFOLD VAVE OR IN THE MANIFOLD VALVE.

2) THE BURET SOLUTION IS SET TO ZERO WITH THE LEVELING TUBE. The LEVELING TUBE IS RAISED TO ABOUT TWENTY INCHES FOR TWO MINUTES TO APPLY PRESSURE TO THE MANIFOLD, VALVES AND REMAINING PART OF THE SYSTEM. THE LEVELING TUBE IS RETURNED TO ITS ORIGINAL ZERO POSITION. IF THER IS A LEAK, THE BURET SOLUTION WILL BE ABOVE THE ZERO MARK. IT WILL BE ON THE ZERO MARK IF THER ARE NO LEAKS.

THE LEAK CHECK IS PERFORMED BEFORE EACH GAS ANALYSIS OR SERIES OF ANALYSIS.

THE SOLUTIONS ARE PURCHASED FROM BURRELL CORP. THEY ARE IN THREE OUNCE BOTTLES THAT ARE THE PROPER SIZE FOR FILLING THE PIPET.
"DISORBENT" IS USED IN THE CONTACT PIPET FOR CO_2.
"OXORBENT" IS USED IN THE FIRST AUOTO-BUBBLER PIPET FOR O_2.
"COSORBENT IS USED IN THE SECOND AUTO-BUBBLER PIPET FOR CO.

THE BURREL MODEL B "INDUSTRO" ORSAT GAS ANALYZER



NOTE: Flow rate held constant at 0.75; 50% change in flow rate has little effect on probe temperature.

Figure 16

Probe Temperatures

CSA CO. DATA SHEET (METHOD 5)

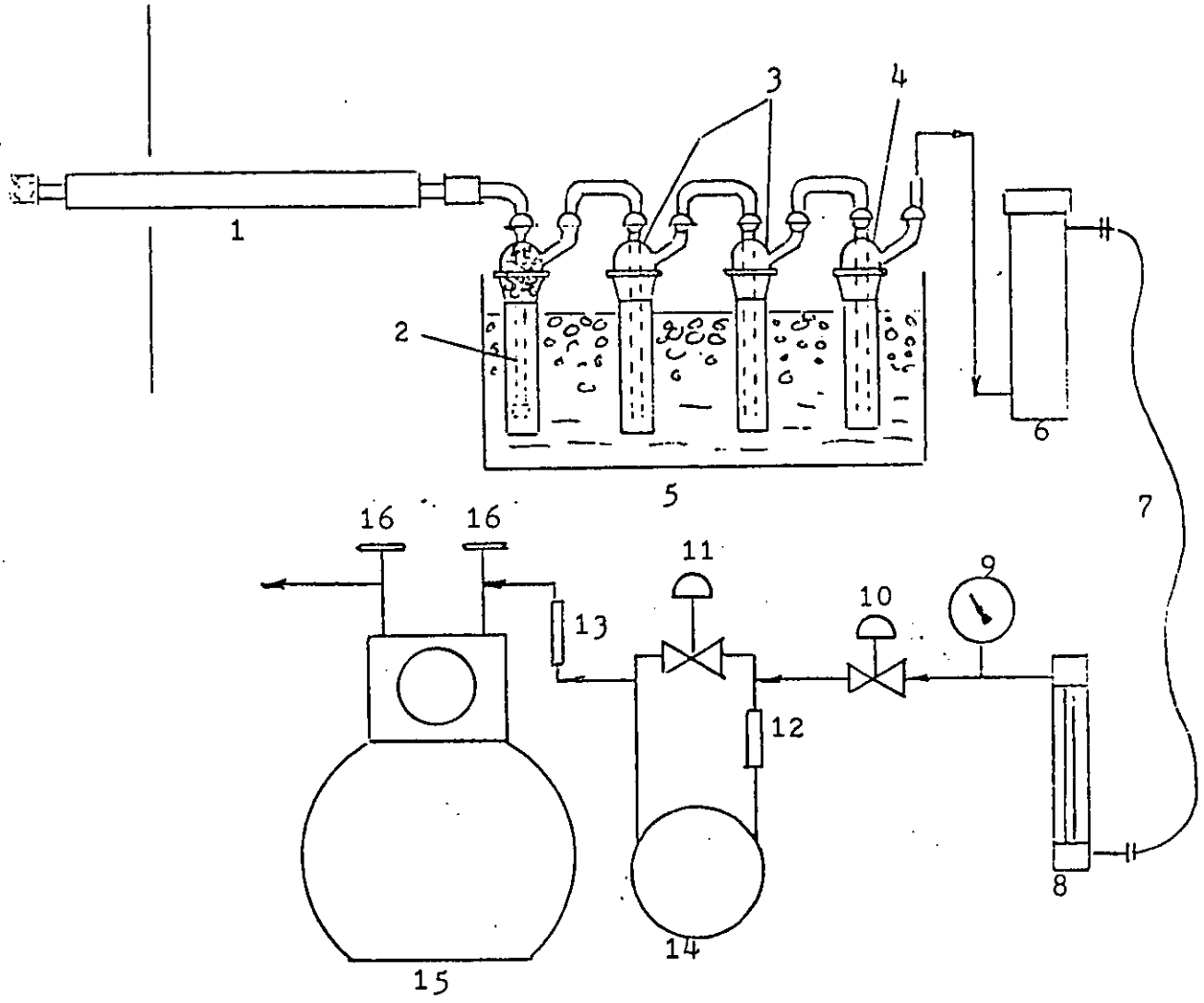
TEST NO. PLANT DATE

LOCATION BY

BAROMETER (P_B) AMBIENT TEMP ASSUMED MOISTURE "Y"

MOUDULE NO. PROBE NO. FILTER NO. HEATER NO. NOZZLE DIA.

TEST POINT	METER VOLUME (Vm)	METER TEMP (Tm) IN	METER TEMP (Tm) OUT	COND TEMP °F	FILTER HEATER TEMP°F	STACK TEMP °F (Ts)	STACK PRESS. (Ps)	VACUUM "Hg	ORIFICE "H_2O (ΔH) (Pm)	VEL HEAD (ΔP)	TIME



1) HEATED PYREX LINED PROBE. END PACKED WITH QUARTZ WOOL
2) MIDGET BUBBLER. TOP PAKED WITH GLASS WOOL
3) MIDGET IMPINGERS. EACH FILLED WITH 15 ml OF H_2O_2 (3%)
4) MIDGET IMPINGER. DRY TRAP
5) ICE BATH
6) DRIERITE COLUMN. FILLED WITH CALCIUM SULFATE DESICANT
7) UMBILICAL CORD
8) ROTAMETER
9) VACUUM GAGE
10) VALVE FOR COARSE FLOW ADJUSTMENT
11) VALVE FOR FINE FLOW ADJUSTMENT
12) OILER
13) OIL FILTER
14) VACUUM PUMP
15) DRY GAS TEST METER
16) THERMOMETER

E.P.A. METHOD 6 SO_2 SAMPLING TRAIN

FIGURE 1

C.S.A. CO.

EPA METHOD 6 (SULFUR DIOXIDE)

DATA AND CALCULATION SHEET

TEST NO._____ PLANT_____ DATE_____

LOCATION_____ BY_____

Vm	Tmi	Tmo	ROTOMETER	TIME
Vm	Tm			

Pbar_____

$V_{mstd} = K_1 Y \frac{V_m P_b}{T_m}$

$V_{mstd} = 17.64 \left(\quad\right) \frac{(\quad)(\quad)}{(460 + \quad)} =$ _____

	1st TITRATION	2nd TITRATION	3rd TITRATION	AVERAGE	Vb TITRATION
Vt					

$C_{SO_2} = K_2 \frac{(V_t - V_b)(N)\left(\frac{V_{soln}}{V_a}\right)}{V_{mstd}}$

$= .00007061 \frac{(\quad - \quad)(\quad)\left(\frac{\quad}{\quad}\right)}{(\quad)} =$ _____ $Lb/ft^3 DSTP$

SO_2 (PPM) $= (C_{SO_2})(6.037)(10^6) =$ _____

SO_2 Lb/Hr $= (\quad ft^3/Hr\ DSTP)(\quad C_{SO_2}) =$ _____

C_{SO_2} = Concentration of sulfur dioxide - lb/dry standard cubic foot
N = Normality of barium perclorate titrant
Pbar = Barometric pressure - inches Hg
Tmi = Temperature at meter inlet - °F
Tmo = Temperature at meter outlet - °F
Tm = Average meter temperature - °F
Va = Volume of sample aliquot titrated - ml
Vm = Dry gas volume as measured at meter - dcf
Vm(std) = Vm corrected to standard conditions - dscf
Vsoln = Total volume of sample solution - ml
Vt = Average volume of titrant used for sample aliquot - ml
Vb = Volume of titrant used for blank - ml
Y = Dry gas meter calibration factor
K_1 = 17.64 $K_2 = 7.061 \times 10^{-5}$

C.S.A. Co.
STACKSAMPLR CALIBRATION SHEET

Customer _____ Order No. _____
Date 6/11/93 Serial No. 2031 RAC Order No. _____

Pump OK Pump Oil OK Clean Quick Disconnects YES
Manometers OK Dry Test Meter OK Thermometers OK
Lights OK Electrical Check OK Variac OK
Vacuum Gauge OK Leak Check @ 27''Hg Vacuum NO LEAKS
Remarks PRESSURE CHECK @ 9"H2O - NO LEAKS

Barometer (Pb) 29.11

K	N	DH	CFw	CFd	Tw	ITd	OTd	TD	t	H	Y
.0158	.0368	0.5	5	5.10	68	80	75	78	12.78	1.848	0.998
.0317	.0737	1.0	5	5.12	68	85	81	83	9.05	1.838	1.002
.0634	.1470	2.0	10	10.33	68	90	86	88	12.88	1.845	1.000
.1268	.2490	4.0	10	10.30	68	88	90	89	9.14	1.844	1.001
.1902	.4310	6.0	10	10.28	68	92	90	91	7.47	1.848	1.000
.2536	.5880	8.0	10	10.25	68	96	91	94	6.48	1.851	1.003

Tolerances H=1.6-1.84-2.1 , Y=0.99-1.00-1.01

$H=(K/(Pb(OTd+460)))*(((Tw+460)t)/CFw)^2$

Y=(CFw Pb (Td avg.+460))/(CFd (Pb+N) (Tw+460))

DH= Orifice pressure drop - in. H_2O
CFw= Volume wet test meter - f^3
CFd= Volume dry test meter - f^3
Tw= Temp. wet test meter
ITd= Inlet temperature dry test meter
OTd= Outlet temperature dry test meter
Td avg.= Average temperature dry test meter
t= Time - minutes
Pb=Barometer press.

DIAL THERMOMETER CALIBRATION		ICE WATER	BOILING WATER
Precision Lab Thermometer		33	211
Meter Thermometers		ITd 32 OTd 33	ITd 211 OTd 211
Impinger Outlet Thermometer	(1)	32	211
	(2)	33	211

STACK DIGITAL TEMPERATURE INDICATORS
NBS TRACABLE FROM FACTORY. 2 UNITS CALIBRATED AGAINST EACH OTHER(PyroMation) ALL THERMOCOUPLES ARE CALIBRATED BY OVEN FROM 100 TO 500°F AGAINST A CMS LAB THERMOMETER (No. 227-934). ANY THERMOCOUPLE THAT IS MORE THAN ±2°F FROM STANDARD IS DISCARDED.

C.S.A. Co.
STACKSAMPLR CALIBRATION SHEET

Customer _____ Order No. _____
Date 8/12/93 Serial No. 2031 RAC Order No. _____

Pump OK Pump Oil CHG Clean Quick Disconnects YES
Manometers CHG FLUID Dry Test Meter OK Thermometers SEE BELOW
Lights OK Electrical Check OK Variac OK
Vacuum Gauge OK Leak Check @ 27''Hg Vacuum NO LEAKS
Remarks PRESSURE CHECK @ 9" H2O - NO LEAKS

Barometer (Pb) 29.13

K	N	DH	CFw	CFd	Tw	ITd	OTd	TD	t	H	Y
.0158	.0368	0.5	5	5.07	72	82	76	79	12.80	1.877	0.998
.0317	.0737	1.0	5	5.07	72	86	80	83	9.08	1.881	1.004
.0634	.1470	2.0	10	10.24	72	89	86	88	12.91	1.880	1.001
.1268	.2490	4.0	10	10.19	72	88	85	86	9.11	1.876	0.999
.1902	.4310	6.0	10	10.18	72	91	88	90	7.46	1.877	1.001
.2536	.5880	8.0	10	10.15	72	94	89	92	6.47	1.879	1.002

Tolerances H=1.6-1.84-2.1 , Y=0.99-1.00-1.01

1.00082
Y = 1.001

$H=(K/(Pb(OTd+460)))*(((Tw+460)t)/CFw)^2$

H = 1.88

$Y=(CFw\ Pb\ (Td\ avg.+460))/(CFd\ (Pb+N)\ (Tw+460))$

DH= Orifice pressure drop - in. H_2O
CFw= Volume wet test meter - f^3
CFd= Volume dry test meter - f^3
Tw= Temp. wet test meter
ITd= Inlet temperature dry test meter
OTd= Outlet temperature dry test meter
Td avg.= Average temperature dry test meter
t= Time - minutes
Pb=Barometer press.

DIAL THERMOMETER CALIBRATION		ICE WATER	BOILING WATER
Precision Lab Thermometer		33	211
Meter Thermometers		ITd 33 OTd ~~210~~ 33	ITd 210 OTd 210
Impinger Outlet Thermometer	(1)	33	211
	(2)	33	210

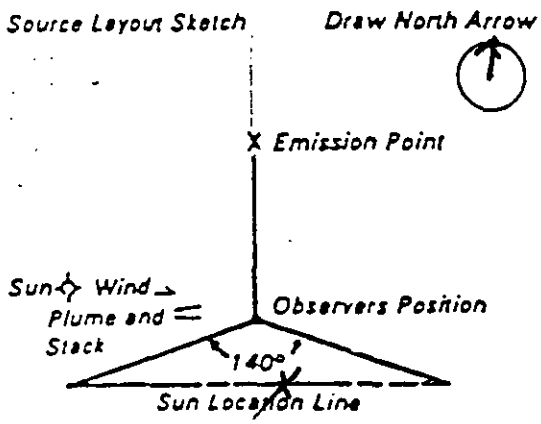
STACK DIGITAL TEMPERATURE INDICATORS
NBS TRACABLE FROM FACTORY. 2 UNITS CALIBRATED AGAINST EACH OTHER(PyroMation) ALL THERMOCOUPLES ARE CALIBRATED BY OVEN FROM 100 TO 500°F AGAINST A CMS LAB THERMOMETER (No. 227-934). ANY THERMOCOUPLE THAT IS MORE THAN ±2°F FROM STANDARD IS DISCARDED.

#1

Visible Emission Observation Form

SOURCE NAME	STARK CERAMICS
ADDRESS	
CITY	EAST CANTON
STATE	OHIO
ZIP	
PHONE	
SOURCE ID NUMBER	KILN NO. 3
PROCESS EQUIPMENT	KILN
OPERATING MODE	ON
CONTROL EQUIPMENT	NONE
OPERATING MODE	
DESCRIBE EMISSION POINT	STACK DISCH.
START	STOP
HEIGHT ABOVE GROUND LEVEL START	~50 STOP
HEIGHT RELATIVE TO OBSERVER START	0 STOP
DISTANCE FROM OBSERVER START	150 STOP
DIRECTION FROM OBSERVER START	W STOP
DESCRIBE EMISSIONS	GRAY SMOKE
START	STOP
EMISSION COLOR	GRAY
START	STOP
PLUME TYPE: CONTINUOUS	☑
FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT: NO ☑ YES ☐	
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	10/A FROM STOP
DESCRIBE BACKGROUND	GREEN TREES
START	STOP
BACKGROUND COLOR START	GREEN STOP
SKY CONDITIONS START	100% CST STOP
WIND SPEED START	1-2 MPH STOP
WIND DIRECTION START	SW STOP
AMBIENT TEMP. START	65°F STOP
WET BULB TEMP.	RH,percent

Source Layout Sketch



OBSERVATION DATE	START TIME	STOP TIME
9-16-93	9:30	11:00

SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
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2	5	5	5	5	32	5	5	5	5
3	5	5	5	5	33	5	5	5	5
4	5	5	5	5	34	5	5	5	5
5	5	5	5	5	35	5	5	5	5
6	5	5	5	5	36	5	5	5	5
7	5	5	5	5	37	5	5	5	5
8	5	5	5	5	38	5	5	5	5
9	5	5	5	5	39	5	5	5	5
10	5	5	5	5	40	5	5	5	5
11	5	5	5	5	41	5	5	5	5
12	5	5	5	5	42	5	5	5	5
13	5	5	5	5	43	5	5	5	5
14	5	5	5	5	44	5	5	5	5
15	0	5	5	5	45	5	5	5	5
16	5	5	5	5	46	5	5	5	5
17	5	5	5	5	47	5	5	5	5
18	5	5	5	5	48	5	5	5	5
19	5	5	5	5	49	5	5	5	5
20	5	5	5	5	50	5	5	5	5
21	5	5	5	5	51	5	5	5	5
22	5	5	5	5	52	5	5	5	5
23	5	5	5	5	53	5	5	5	5
24	5	5	5	5	54	5	5	5	5
25	5	5	5	5	55	5	5	5	5
26	5	5	5	5	56	5	5	5	5
27	5	5	5	5	57	5	5	5	5
28	5	5	5	5	58	5	5	5	5
29	5	5	5	5	59	5	5	5	5
30	5	5	5	5	60	5	5	5	5

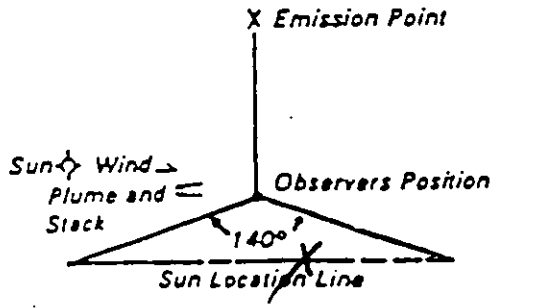
AVERAGE OPACITY FOR HIGHEST PERIOD	NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS MINIMUM	MAXIMUM
OBSERVER'S NAME (PRINT)	ANDY [illegible]20
OBSERVER'S SIGNATURE	DATE 9/16/93
ORGANIZATION	
COMMENTS	
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE	CERTIFIED BY / DATE
TITLE / DATE	VERIFIED BY / DATE

#2

Visible Emission Observation Form

SOURCE NAME	STARK CERAMICS
ADDRESS	
CITY	E. CANTON
STATE	OHIO
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	KILN NO. 3
OPERATING MODE	01
CONTROL EQUIPMENT	None
OPERATING MODE	
DESCRIBE EMISSION POINT START	STACK DISCH.
STOP	
HEIGHT ABOVE GROUND LEVEL START	~50'
STOP	
HEIGHT RELATIVE TO OBSERVER START	~8'
STOP	
DISTANCE FROM OBSERVER START	150'
STOP	
DIRECTION FROM OBSERVER START	W
STOP	
DESCRIBE EMISSIONS START	GRAY-BLUE SMOKE
STOP	
EMISSION COLOR START	GR-BL.
STOP	
PLUME TYPE: CONTINUOUS	☑
FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT: NO ☑ YES ☐	
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	1 DIA. DOWN
STOP	
DESCRIBE BACKGROUND START	GREEN TREES
STOP	
BACKGROUND COLOR START	GREEN
STOP	
SKY CONDITIONS START	100%
0 CST STOP	
WIND SPEED START	1-2 MPH
STOP	
WIND DIRECTION START	SW
STOP	
AMBIENT TEMP. START	68° F
STOP	
WET BULB TEMP.	
RH.percent	

Source Layout Sketch — Draw North Arrow



OBSERVATION DATE	START TIME	STOP TIME
9-16-93	1135	1:07

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1	5	5	5	5	31	5	5	5	5
2	5	5	5	5	32	5	5	5	5
3	5	5	5	5	33	5	5	5	5
4	5	5	5	5	34	5	5	5	5
5	5	5	5	5	35	5	5	5	5
6	5	5	5	5	36	5	5	5	5
7	5	5	5	5	37	5	5	5	5
8	5	5	5	5	38	5	5	5	5
9	5	5	5	5	39	5	5	5	5
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11	5	5	5	5	41	5	5	5	5
12	5	5	5	5	42	5	5	5	5
13	5	5	5	5	43	5	5	5	5
14	5	5	5	5	44	5	5	5	5
15	5	5	5	5	45	5	5	5	5
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17	5	5	5	5	47	5	5	5	5
18	5	5	5	5	48	5	5	5	5
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23	5	5	5	5	53	5	5	5	5
24	5	5	5	5	54	5	5	5	5
25	5	5	5	5	55	5	5	5	5
26	5	5	5	5	56	5	5	5	5
27	5	5	5	5	57	5	5	5	5
28	5	5	5	5	58	5	5	5	5
29	5	5	5	5	59	5	5	5	5
30	5	5	5	5	60	5	5	5	5

AVERAGE OPACITY FOR HIGHEST PERIOD	NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS MINIMUM	MAXIMUM
OBSERVER'S NAME (PRINT)	Andy Pasko
OBSERVER'S SIGNATURE	Andy Pasko
DATE	9-16-96
ORGANIZATION	
CERTIFIED BY	DATE
VERIFIED BY	DATE

COMMENTS

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE

TITLE

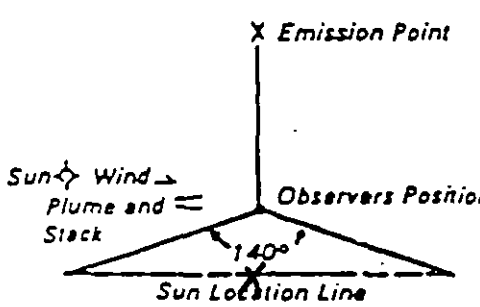
DATE

#3

Visible Emission Observation Form

SOURCE NAME	STARK CERAMICS
ADDRESS	
CITY	EAST CANTON
STATE	OHIO
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	KILN No. 3
OPERATING MODE	ON
CONTROL EQUIPMENT	NONE
OPERATING MODE	—
DESCRIBE EMISSION POINT START	STACK
DESCRIBE EMISSION POINT STOP	
HEIGHT ABOVE GROUND LEVEL START	N 50'
HEIGHT ABOVE GROUND LEVEL STOP	
HEIGHT RELATIVE TO OBSERVER START	N 8
HEIGHT RELATIVE TO OBSERVER STOP	
DISTANCE FROM OBSERVER START	N 150
DISTANCE FROM OBSERVER STOP	
DIRECTION FROM OBSERVER START	W
DIRECTION FROM OBSERVER STOP	
DESCRIBE EMISSIONS START	GRAY-BLUE
DESCRIBE EMISSIONS STOP	SMOKE
EMISSION COLOR START	GR-BLUE
EMISSION COLOR STOP	
PLUME TYPE: CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT: NO ☑ YES ☐	
IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	1 DIA. FROM STACK
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED STOP	
DESCRIBE BACKGROUND START	GREEN TREES
DESCRIBE BACKGROUND STOP	
BACKGROUND COLOR START	GREEN
BACKGROUND COLOR STOP	
SKY CONDITIONS START	100% CLOUD
SKY CONDITIONS STOP	
WIND SPEED START	1-2 MPH
WIND SPEED STOP	
WIND DIRECTION START	SW
WIND DIRECTION STOP	
AMBIENT TEMP. START	70° F
AMBIENT TEMP. STOP	
WET BULB TEMP.	
RH.percent	

Source Layout Sketch — Draw North Arrow



OBSERVATION DATE	START TIME	STOP TIME
9-16-93	1:45	3:06

SEC / MIN	0	15	30	45	MIN	0	15	30	45
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2	5	5	5	5	32	5	5	5	5
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4	5	5	5	5	34	5	5	5	5
5	5	5	5	5	35	5	5	5	5
6	5	5	5	5	36	5	5	5	5
7	5	5	5	5	37	5	5	5	5
8	5	5	5	5	38	5	5	5	5
9	5	5	5	5	39	5	5	5	5
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14	5	5	5	5	44	5	5	5	5
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17	5	5	5	5	47	5	5	5	5
18	5	5	5	5	48	5	5	5	5
19	5	5	5	5	49	5	5	5	5
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21	5	5	5	5	51	5	5	5	5
22	5	5	5	5	52	5	5	5	5
23	5	5	5	5	53	5	5	5	5
24	5	5	5	5	54	5	5	5	5
25	5	5	5	5	55	5	5	5	5
26	5	5	5	5	56	5	5	5	5
27	5	5	5	5	57	5	5	5	5
28	5	5	5	5	58	5	5	5	5
29	5	5	5	5	59	5	5	5	5
30	5	5	5	5	60	5	5	5	5

AVERAGE OPACITY FOR HIGHEST PERIOD	NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS MINIMUM	MAXIMUM
OBSERVER'S NAME (PRINT)	ANDY PASKO
OBSERVER'S SIGNATURE	Andy Pasko
DATE	9-16-93
ORGANIZATION	
CERTIFIED BY	
DATE	
VERIFIED BY	
DATE	

COMMENTS

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE

TITLE

DATE

STARK CERAMICS (SC)
STACK TEST OF SEPTEMBER 16, 1993
15 76 06 0014

A compliance test was done on kiln No. 3 on September 16, 1993 by CSA (Ernie Kolm). The parameters evaluated were particulates, SO_2 and HF. Audit samples for SO_2 were given to Ernie for analysis.

It took about 1½ hours to get an hour's VE readings because of the time it took to transfer the testing probe and equipment to different testing traverses.

The manufacturing of ceramic bricks entails the following sequence of operations:

1. Compounded clays are processed through extruder dies for specific shape bricks. There is 5-6% moisture in the extruded bricks.

2. The freshly extruded bricks are set on a conveyor that transports the brick to a pigment spray area where the raw bricks are coated on one side with an aqueous mixture of color pigment.

3. The freshly sprayed bricks are loaded by hand on numbered cars that ride on rails. These numbered cars are next pushed into dryers where they remain for 55 hours at 180°F. In the dryer, the moisture content of the sprayed bricks very slowly diminishes to less than 1%.

4. From the dryer the car of bricks goes into the kiln preheater where the temperature is raised to 500°F over a 32 hour period. In the preheater are 16 cars from beginning to end. From the exit of the kiln preheater, the bricks enter into kiln No. 3 at about 450°F.

5. In the kiln (No. 3) 37 cars are there at all times but very slowly moving through different temperature zones from 450°F up to 2050°F then down to 400°F at the kiln exit. The exposure time in the kiln is 73 hours from entrance to exit.

The testing period covered from 9:30 a.m. to 3:06 p.m. All VE readings observed were 5% except one zero.

All the car identification tags scheduled for movement into the preheater and kiln were examined for the presence of any reburns on the cars. None indicated the presence of any reburn material on any car.

Bricks on several cars on tracks waiting to go into the preheater were closely examined. The bricks were dry but not hard. Those that had come out of the kiln and were cooling down were dry but very hard and the color pigment shiny and hard.

In the kiln control room on the table is a record of all cars in the kiln and exactly where they are located in the kiln. The kiln has a multiplicity of temperature zones from 450°F to 2050°F and down to 400°F. Instruments there provide a temperature digital readout anywhere in the kiln.

A record was made of the last 16 cars in the kiln (those put in the kiln last) on September 14, 1993 and the 16 cars in the preheater awaiting a turn to enter the kiln from the preheater. The same segments of data were collected on September 15, 1993 for the kiln and preheater.

On September 16, 1993, the day of the test, an inventory was made of those car numbers that were in the kiln. All cars that were supposed to be in the kiln were there. All number sequences of cars in the kiln were exactly what they were supposed to be based on car numbers recorded from September 14 and 15, 1993.

Surinder is providing CSA with the weight of all bricks coming out of the kiln during the 9:30 a.m. - 3:06 p.m. test period.

Photographs taken in April of emissions coming from the plant were reviewed with Surinder. He said they were coming from a clay loading dock area and that other emissions noted were probably in a baghouse area by the C plant. One of the photographs showed a blue haze in the area of the No. 3 kiln stack. Surinder made no comment regarding the blue haze. This agency did request a compliance test for kiln No. 3 because of the blue haze observed in the discharge area of that stack. The test was run to quantify the SO_2 and HF released from the stack. A blue haze is indicative of the presence of SO_2 or HF. The test will reveal the concentration of both gaseous parameters and the quantity released per hour.

The area where aqueous color glaze is sprayed on bricks before they enter the dryer was closely examined. The overspray hits an impigment plate, falls to a collecting trough and is pumped to a slurry collecting tank in another room.

Next to the slurry impingement plate is an opening to an exhaust duct that leads above the roof. The area on the roof surrounding the exhaust stack had a layer of clay (gray-white color) on the roof. The thickness and area of the clay deposits suggested that this accumulation may have been a product of escaping overspray for an extensive period of time.

Surinder said that there was a set of impingement baffles mounted in the two foot diameter exhaust stack from the glaze pigment spray area. He said he would provide me with a set of prints which depicted the stack and the impingement baffles therein. The size fan that pushes air past the baffle plates would be noted.

The slurry directed from the spraying area goes to a slurry tank from where it goes to a filter press that squeezes out the water and leaves a damp filter cake for disposal.

The matter of lead pigments being released from the baghouse in the C plant area was mentioned to Surinder. I suggested that he have a quantitative lead analysis made on these emissions so that a level of health risk could be established for the emissions from this baghouse. He appeared to resist the suggestion. He said that any lead would not be in a pure form but in a compound form. I reminded him that the toxicity was still there.

I think we will have to push more forcefully to get a lead test run from this source.

ANDY PASKO

AP0922SC.TL

Stark Ceramics, Inc.
600 West Church Street
East Canton, Ohio 44730
(216) 488-1211
FAX (216) 488-0333

FAX TRANSMISSION

DATE: Sept. 2, 1993 TIME: 9:20 am

FAX #: 489-3335

ATTN: Mr. Bruce Blakenship

FIRM: Dir. of Air Pollution Control / C-C Dept.

FROM: Surinder Maheshwary

SUBJECT: C fet. Dust. Collector. / NO 3 kiln T-T curve

OF PAGES (including this page): 3

ADDITIONAL COMMENTS: Dear Mr. Blakenship :

Thank you for taking the time to visit our facility and walking through various stages of bricktile Mfg. operations. The explanation for C fet dust collector may be a bit more understandable given the account of events by Ken Icendall from his summary memo dated 9.1.93. It is WELL UNDER CONTROL FOR NOW. We'll follow up on your Suggestions of (a) Manometer installation (b) keeping log of inspections & incidents (c) Repair records. I am also sending you the time-Temp curve for NO 3 kiln as per your instructions. If you have any questions, please call me.

Thanks.

Sincerely

Smaheshwary

Stark
Stark Ceramics, Inc.

INTERNAL MEMORANDUM

SPECIAL INSTRUCTIONS - WRITE IT DOWN!

SUBJECT:	C Plant Dust Collector
DATE	9/01/93
ATTENTION:	Surinder Maheshwary
FROM:	Ken Kendall

The results of the findings concerning the dust collector at C plant are as follows:

1. Maintenance was performed on the dust collector 8/28/93. Dust collector was cleaned and checked for holes in bags. Everything ok.

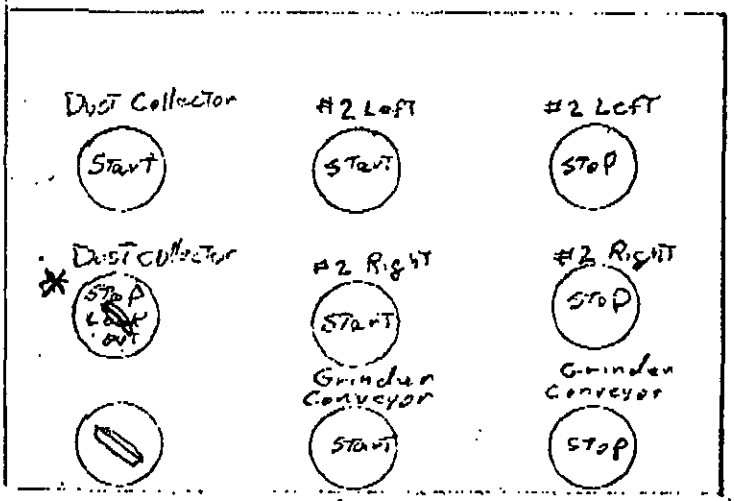
2. Approximately 10:00am 9/01/93, maintenance was called because of dust collector discharge. Was back in operation at ≈ 11:50 a.m.

3. Shaker mechanism was tested and found to be operating properly.

4. Results of the finding are that the* lockout key switch was used to shut the system down instead of the stop button. When system is locked out no power is supplied to the shaker mechanism. This caused the bags to be overloaded and function improperly.

5. Conclusions: The supervisor and grinder lead operators were advised to the proper shut down procedure. The dust collector should be shut down properly at 9:00 break, 11:30 lunch and 4:00. This will allow proper cleaning of the dust collector bags by the shaker mechanism.

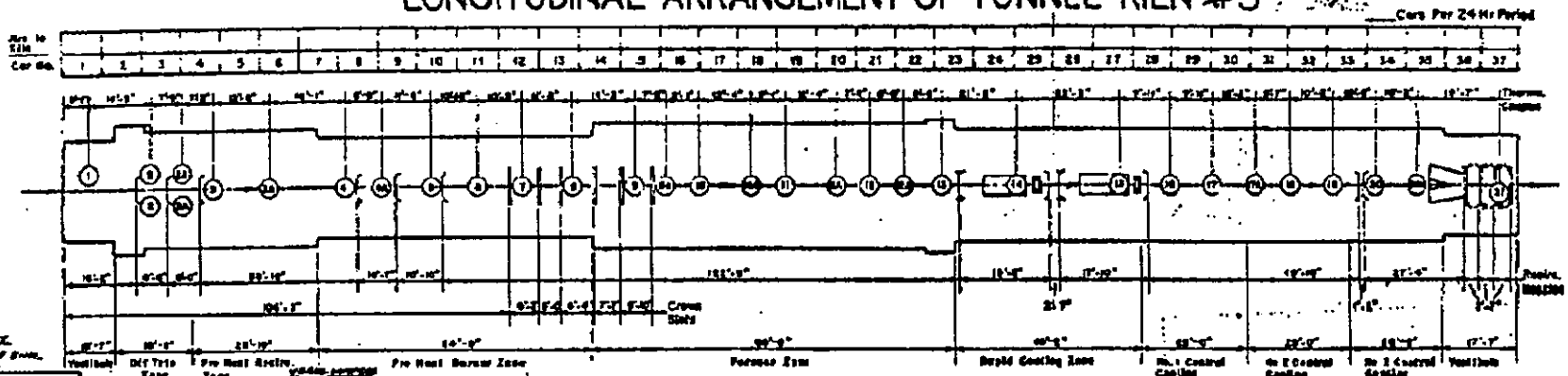
Control Panel for Grinders And Dust Collector

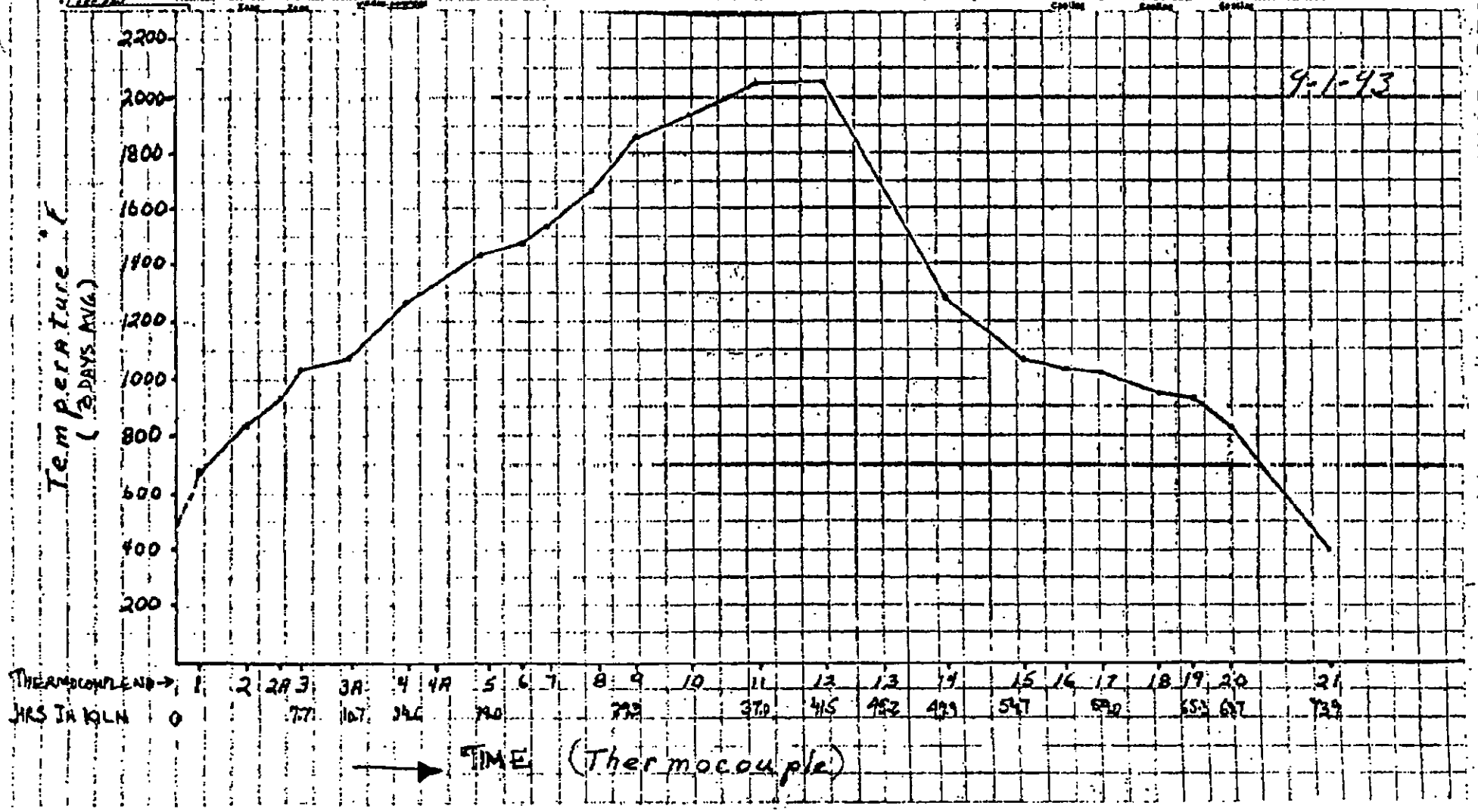


It is my understanding from discussions with Depts. foreman/ Maintenance/ Electrician
* Lock out key switch was accidently or otherwise used at morning break or earlier (Friday 8/27/93) causing shaker mechanism not to work. It was operational shortly before 12 noon on 9/1/93 as per dept. foreman/Electrician.
— Surinder Maheshwary 9.1.93

TIME-TEMPERATURE CURVE FOR #3 KILN

LONGITUDINAL ARRANGEMENT OF TUNNEL KILN #3





SEP- 2-93 THU. 9:26 STARK CERAMICS P.03/03

APPENDIX K

OEPA STACK TEST REVIEW SUMMARY FORM

APPLICATION NUMBER 1576060004 P005

FACILITY NAME STARK CERAMICS

SOURCE DESCRIPTION (OR SCC CODE) KILN No. 3

CONTROL EQUIPMENT NONE

DATE(S) OF TEST 9-16-93

FINAL TEST REPORT RECEIVED ON 10-19-93

POLLUTANT(S) TESTED PART. + SO_2

TEST METHOD 5 - PART.; 6 - SO_2

TEST FIRM CSA

EMISSION RATES*:	PART	SO_2		PART	SO_2
ACTUAL (lb(s)/hr)	5.04	22.6	ALLOWABLE**	9.49	46.30

OPERATING RATES*:

DURING TEST** 5842 LBS/HR MAXIMUM** 5842 LBS/HR

EMISSION FACTOR*** ----------

COMMENTS: VISIBLE EMISSIONS DURING THE TEST WERE ALL 5% EXCEPT 2 READINGS AT ZERO

I HEREBY VERIFY THAT THE INFORMATION CONTAINED WITHIN THE STACK TEST REPORT HAS BEEN REVIEWED AND IT HAS BEEN DETERMINED THAT THE TEST PROCEDURES, ANALYSES AND CALCULATIONS ARE;

[X] AN ACCEPTABLE DEMONSTRATION OF CONFORMANCE WITH THE APPROVED TESTING METHODOLOGY.

[ ] AN UNACCEPTABLE DEMONSTRATION OF CONFORMANCE WITH THE APPROVED TESTING METHODOLOGY.

10/20/93
DATE OF REVIEW

Andy Parko
REVIEWED BY

* BASED ON 3 RUN AVERAGE
** SPECIFY APPLICABLE UNITS
*** SPECIFY ... UNITS OF PROCESS INPUT

Stark
Stark Ceramics, Inc.

RECEIVED
SEP 24 1993
CANTON CITY HEALTH DEPT.
AIR POLLUTION DIVISION

September 23, 1993

Mr. Andy Pasko
Air Pollution Control Engineer
Canton City Health Department
420 Market Ave N
Canton, OH 44702

RE: Stack Test - Kiln #3

Dear Mr. Pasko:

As per your request, I am sending you the process weight sheets corresponding to the kiln cars that were in #3 tunnel kiln during the stack testing on September 16, 1993. The average, based on 37 kiln cars (#282 through #321), is 11,859 pounds on dry weight basis.

If you have any questions, please call me.

Sincerely,

STARK CERAMICS, INC.

Surinder K. Maheshwary
Director of Engineering, Maintenance, and QC

SKM/bjb

xc: Ernie Kolm, CSA Co.

9-16-93

going in Dn Kiln 9 AM IN

285, 282, 249, 264 262 370

147 257 346 330 265 372

272 241 304 357 324 116

259 353 352 239 359 278

281 320 302 371 276 277

289 325 343 253 234 308

354 321 37 cars

033

488

FAX

Canton Ceramics

Dry wt in ± 1%

		Shade	Shape	Fcs.			
5							
#142	FTX	516	8WC80D	220	—	9,042	10,046 ✓
(5)		333	8W5	40	—	1,004	
4							
#370	FTX	516	8WC80D	280		11,508	11,508 ✓
3							
#262	FTX	516	8WC80D	244		10,028.4	
		904	8W54L	17		311.1	10,472 ✓
(3)		904	8W54R	4		73.2	
		815	S-453	3	@20#	60.0	
2							
#264	FTX	516	8WC80D	244		10,028.4	10,028 ✓
(2)		815	S-453	36			
1							
#249	FTX	516	8WC80D	232		9,535.2	
		333	8W5	29		792.9	10,324 ✓
(1)		815	S-453	3	@20#	60.0	
7							
#282	FTX	516	8WC80D	244		10,028.4	
		815	S-453	36	@20	720.0	10,748 ✓
285	FTX	516	8WC80D	41		1,685.1	
		1022	412-4	1188	x10.9	12,949.2	15,701
		904	6TT20D-K	84	12.7	1066.8	

		Shade		Shape	P.S.(3)	
	#357 (14)	195		8WCA	880	13,200
3 #304	#304 (13)	195		8WCA	880	13,200
	#245 (12)	127		8WCA	880	13,200
2 #264	#272 (11)	127		8WCA	880	13,200
	#372	195		8WCA	7	105
#249	(10)	127		8WCA	873	13,095
	#265	127		8WCA	472	7,080
#282 F	(9)	FTX	516	8WC80D	112	4,603.2
	#330	FTX	516	8WC80D	220	9,042
#285 FT.	(8)		333	8W5	40	1,004
	#346	FTX	516	8WC80D	220	9,042
	(7)		333	8W5	40	1,004
	#257	FTX	516	8WC80D	220	9,042
	(6)		333	8W5	40	1,004

11683.2

10,046

10,046

10,046

170,947

		Shape	Tons	@	Dev Wt in lbs	
#281	564	8WCV80BT	134	@44.4	5950	
(23)	904	6TT20D-K	30	@12.7	381	12,146
	177	8WCV80BT	131	@44.4	5876	
#278	#177	8WCV80BT	256		11366	
(22)	904	6TT20D-K	30		381	11,747
(21)						
#359	177	8WCV80BT	280			12,432
#239	#177	8WCV80BT	250		11,100	
(20)	904	8W54R	20		366	11,466
#352	177	8WCV80BT	20		888	
(19)	195	8WCA	796		11,940	12,828
#353	195	8WCA	880		13,200	
(18)						
#259	195	8WCA	880		13,200	
(17)						
#116	195	8WCA	880		13,200	
(16)						
#324	195	8WCA	880		13,200	
(15)						

284,316

	Grade	Shape	Pcs.		
343	904	8WCGR	466		10,811-2
	031	4W83-S484	12	@ 31.5	378
(31)	516	8W24AL	20		288 (11,524)
	516	4T58NR	6	@ 7.77	47
#335	564	8WCV80BT	244		10834
(30)	031	4W83-S483	18	@ 31.5	378 11,212
#289	564	8WCV80BT	232		10301
	516	4T58NR	4	@ 7.8	109 10,786
(29)	516	4T58NL	10		
	516	8W24CR	16		376
#277	564	8WCV80BT	232		10301
	516	8W24CR	6		141 10,955
(28)	031	4W83-5484	7	x 31.5	220
	516	8W54L	16		292.8
#276	564	8WCV80BT	244		10834
	516	6T54R	19	@ 10.8	205 11,246
(27)	516	8W54L	8		146.4
	904	8W54L	3		54.9
#371	564	8WCV80BT	256		11366 11,659
(26)	904	8W54L	16		292.8
#302	904	8WCGR	425		9,860
	904	6TT20D-K	46	@ 12.7	584 12,975
(25)	564	8WCV80BT	57		2531
#320	564	8WCV80BT	250		11100 12760
(24)	904	6TT20D-K	52		660

BTG, 477

	Shade	Shape	Pcs.			
#253	904	8WCGR	466	@23.2	10811	11756
(36)	031	4W83-5484	30	@31.5	945	
#254	904	8WCGR	516		11971	12962
(35)	904	6TT20D-K	78	@12.7	991	
#308	904	8WCGR	516		11971	12911
34	904	6TT20D-K	74		940	
#354	904	8WCGR	516		11971	12784
33	904	6TT20D-K	64		813	
#321	904	8WCGR	474		10997	11,893
	772	5W8	40	@13.5	540	
(32)	904	6TT20D-K	28		356	

Total for 37 KCs = 438783

Avg Dry wt per KC = 11,859 lbs

or 5.93 Tons.

Stark
Stark Ceramics, Inc.

September 8, 1994

Mr. Dan Schiltz
Division of Air Pollution Control
Canton City Health Department
218 Cleveland Avenue SW
Canton, OH 44702

RE: August Sulfur %

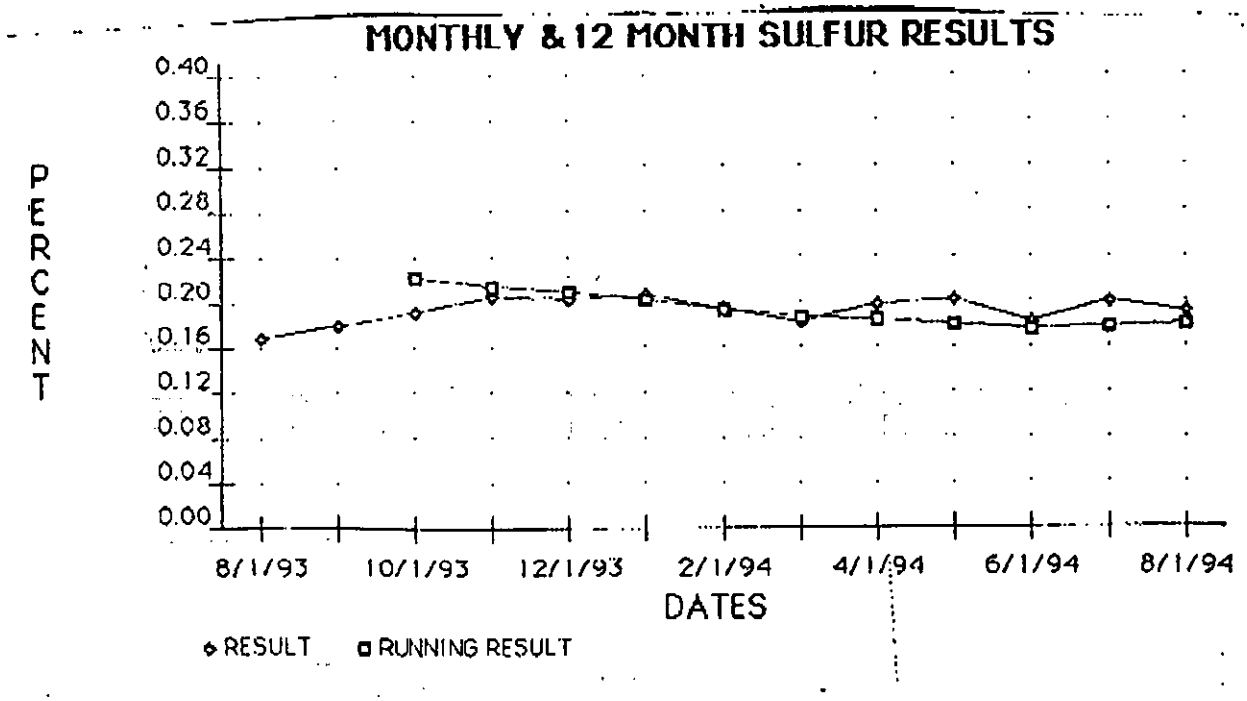
Dear Mr. Schiltz:

The 12 month rolling average % "S" from Stark's kiln operations are being faxed as per instructions. If you have any questions, please call me at 488-1211. Thanks.

Sincerely,

STARK CERAMICS, INC.

Surinder K. Maheshwary
Director of Engineering, Maint., & QC



MONTH	12/1/92	1/1/93	2/1/93	3/1/93	4/1/93	5/1/93	6/1/93	7/1/93	8/1/93	9/1/93	10/1/93	11/1/93	12/1/93	1/1/94	2/1/94
RESULT	0.304	0.271	0.291	0.288	0.269	0.275	0.262	0.221	0.170	0.179	0.190	0.205	0.202	0.206	0.195
RUNNING RESULT											0.275	0.214	0.209	0.202	0.194

3/1/94	4/1/94	5/1/94	6/1/94	7/1/94	8/1/94
0.182	0.195	0.203	0.182	0.199	0.191
0.185	0.189	0.179	0.176	0.178	0.179