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Title:	Report Of Simultaneous Efficiency Tests Conducted On The Orange Kiln And Baghouse At Carolina Stalite, Gold Hill, N.C., Rossnagel & Associates, Charlotte, NC, May 9, 1980.

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Report Sect. Reference 4 14

REPORT

of

SIMULTANEOUS EFFICIENCY TESTS

conducted on the

ORANGE KILN AND BAGHOUSE

at

CAROLINA STALITE

GOLD HILL, N. C.

on

APRIL 29, 1980

TEST REPORT #4341

Prepared by:
kmw

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Distribution:
Mr. Charles Newsome,
Engineer
(3 copies)

REPORT ISSUED: May 9, 1980

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I

INTRODUCTION

Mr. Charles Newsome of Carolina Stalite, requested that ROSSNAGEL & ASSOCIATES perform simultaneous testing on the inlet and outlet of the Orange Kiln and Baghouse system in accordance with ROSSNAGEL & ASSOCIATES' Proposal #80-812.

The testing was scheduled for and performed on April 29, 1980.

The Kiln tested was operated at a production rate of approximately 23 tons/hr. of stone plus 2,100 lb/hr. of coal, which is normal full load conditions.

The Teflon bags in the Fuller Baghouse Collector was a significant change from the previous ROSSNAGEL & ASSOCIATES test on the Purple system.

In Section II are the RESULTS, CONCLUSIONS & RECOMMENDATIONS. Section III contains a complete DESCRIPTION OF TEST. Section IV includes all the CALCULATIONS, and Section V consists of all the DATA SHEETS, including an Events Log.

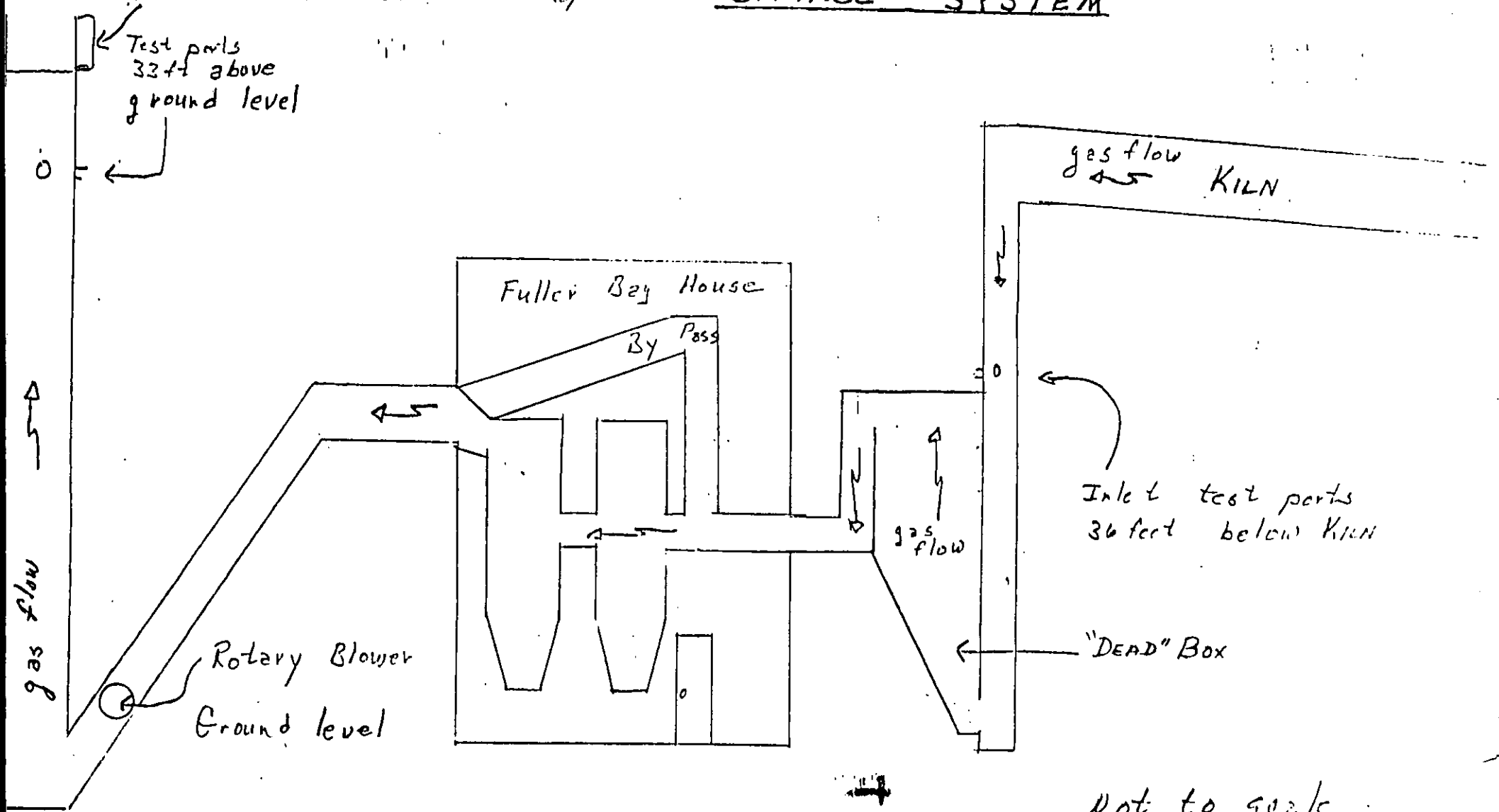
Mr. Mike Landis form the North Carolina Department of Natural Resources & Community Development, Mooresville regional office, observed the test on behalf of the North Carolina Regulatory Agency. Also observing the test was Mr. Frank Clay of the Office of Air Quality Planning Management section of the Environmental Protection Agency, Research Triangle Park, N. C.; Mr. Jeff Shular, Midwest Research Institute; and Mr. Ron Haynes, Environmental Resources, Inc., Granite Falls, N. C.

ROSSNAGEL & ASSOCIATES wishes to thank the following Carolina Stalite personnel who willingly assisted whenever requested:

Mr. Charles Newsome, Engineer
Mr. Fred Drew, Foreman

Note: This report pertains only to the source or sample tested. Information contained herein is not to be reproduced, outside the Buyer's company, in whole or in part, without the prior written approval of ROSSNAGEL & ASSOCIATES or the Buyer.

SKETCH OF CAROLINA STALITE "ORANGE" SYSTEM



Not to scale

11/29/78 WOF

REVISED: 4/30/80

II

RESULTS, CONCLUSIONS & RECOMMENDATIONS

RESULTS

The basic flow, temperature, moisture, visual emission and odor performance results are shown in Table I below:

PERFORMANCE DATA

Run	Location	ACFM @ Temp. F.	SCFM dry	% Moisture by Volume (1)	Visual (2) Emissions Max.	Visual (2) Emissions Avg.	Odor (3)	Remarks
1-I	Inlet	17,286.3@ 344 F.	10,352.6	5.5%	NA	NA	Extreme ✓ ✓	
1-O	Outlet	39,795.9@ 181 F.	30,906.8	2.6%	5%	0%	Extreme ✓ ✓	
2-I	Inlet	17,565.3@ 336 F.	10,479.5	6.6%	NA	NA	Extreme ✓ ✓	
2-O	Outlet	39,528.3@ 173 F.	31,150.8	2.4%	5%	0%	Extreme ✓ ✓	
3-I	Inlet	17,942.4@ 321 F.	10,851.7	7.1%	NA	NA	Extreme ✓ ✓	
3-O	Outlet	40,297.8@ 169 F.	31,697.2	3.2%	5%	0%	Extreme ✓ ✓	
Avg.	Inlet		10,561.3	6.4%				
	Outlet		31,251.6	2.7%				

TABLE I

Notes: 1) Moisture percent in Table I is corrected to stack conditions. It was obtained by the condensate method and is the average for the entire run.

2) Visual emissions expressed as percent Opacity. The allowable limit is 20%.

3) Odor is measured at test ports and is rated as extreme, irritant, excessive, annoying, noticeable, trace or not detectable (N.D.). Odor readings based on the "checked" observations of the test team members. Note this is "test port" odor level - not "property line" odor.

The ACFM and SCFM values in Table I and the flows used in the emission rate calculation in each run are based on simultaneous velocity readings made at the nozzle during the sampling runs.

The flow determined in the traverses is as shown below:

TRAVERSE DATA

	ACFM @ Temp. F.	SCFM dry	% Moisture by Volume*
Inlet	18,401.8 @ 340 F.	11,897.8	7.0%
Outlet	37,307.0 @ 164 F.	30,543.3	3.3%

TABLE IA

* Moisture in Table IA is at stack conditions and is determined by Wet/Dry bulb thermometer measurements.

The particulate emission rates for each of the runs are provided in Table II below:

EMISSION RATES

Run	ACTUAL						ALLOWABLE
	Dry Catch *		Wet Catch**		Total (1)		
	Grains/ scfd	lb/hr	Grains/ scfd	lb/hr	Grains/ scfd	lb/hr	
1-I	8.8718	787.5	.1272	11.3	8.9990	798.8	95% removal efficiency by weight (2)
2-I	7.4953	673.5	.1997	17.9	7.6950	691.4	
3-I	7.6729	713.9	.4472	41.6	8.1201	755.5	
Avg.	8.0133	725.0	.2580	23.6	8.2713	748.6	
1-O	.0210	5.6	.0128	3.4	.0338	9.0	
2-O	.0363	9.7	.0056	1.5	.0419	11.2	
3-O	.0398	10.8	.0165	4.5	.0563	15.3	
Avg.	.0324	8.7	.0116	3.1	.0440	11.8	

TABLE II

scfd = standard cubic foot dry

Please refer to the following page for Notes.

Notes:

* Dry Catch consists of solid particulate and liquid particles (condensed hydrocarbons) with particle sizing generally greater than .3 microns (based on D.O.P. aerosol) or 1.0-1.2 microns (based on particulate). The Dry Catch is obtained from the filter collection, nozzle, probe, cyclone, filter holder, and washes upstream of the filter.

** Wet Catch consists of particulates generally smaller than .3 microns (which passed through the filter), dissolved solids and organics (Non-Volatile Residue) from the impinger collection, Teflon hose, and washes downstream of the filter.

(1) Total consists of the Dry and Wet Catch only. Dry Catch counts toward allowable limit in N. C.

(2) Please refer to Table III for Percent Removal Summary.

GLOSSARY OF TERMS

ROSSNAGEL & ASSOCIATES provides this Glossary of Terms as an aid to having its clients better and more easily understand our test reports. Our firm was the first air pollution testing firm to include all the backup original data and calculations in its comprehensive test reports. We are the only environmental firm in which any computer page also includes a breakdown of all terms and equations (on the same computer sheet) so that an experienced engineer/chemist can manually recheck the computer run-off.

ACFM - Actual Cubic Feet per Minute - corresponds to CFM
SCFM - Standard Cubic Feet per Minute corrected to 70 F. and 760 mm. Hg. EPA uses 68 F.
Dry - moisture has been subtracted
Wet - moisture has been included
Percent Moisture by Volume - means volume of moisture as related to volume of sampled gas
lbs/hr - pounds per hour; same on Dry or Wet basis
LPM - Liters per minute; 28.4 liters = 1 cu. ft.
TLV - Threshold Limit Value - or the maximum concentration of a contaminant that an adult male can be safely exposed to 40 hrs. per week for 50 weeks a year
TWA - Time Weighted Average
T_s - Stack temperature in Rankin (F. + 460)
t_s - Stack temperature in Fahrenheit (F.)
Emission Rate - the actual lb/hr rate of contaminants from a source entering the atmosphere
Concentration - grains/scfd where one grain = 1/7,000 lb, standard cubic foot dry
Concentration corrected to 12% CO_2 - this is done on incinerator tests to correct to a 50% excess air level

1 cu. meter = 35.31 cu. ft. 1 lb = 453.59 grams
1 psi = 2.06 inches Hg 1 gram = 13.3 grains
1 inch Hg = 13.6 inches water
D.I. water - Deionized Distilled Water

Emission Test - consists normally of 1, 2 or 3 test runs
Test Run - a separate complete replicate
Traverse - the prescribed movement of a pitot tube or sampling probe to equal area locations in a duct or stack or doorway or exhaust hood
Sampling - the withdrawing of a quantity of gas to assure a homogenous volume to test
Isokinetic-- the matching of the velocity of the sampled gas entering the nozzle to the actual gas velocity in the duct or stack
ppm. - parts per million (by weight)
ppmV - parts per million by volume
N.V.R. - Non-Volatile Residue
Opacity - the percentage of obstruction of light transmittance through an exhaust plume minus any water vapor effects

Table III below shows the efficiency fo removal of each category of the emissions and the overall removal rate:

EFFICIENCY OF REMOVAL - % BY WEIGHT

Run	Dry Catch	Total *
	% Efficiency	% Efficiency
1	99.3%	98.9%
2	98.6%	98.4%
3	98.5%	98.0%
Avg.	98.8%	98.4%

TABLE III

* Total is calculated based on the Total Catch, Dry Catch, plus the Wet Catch on a lb/hr. basis.

Other pertinent results:

1. The isokinetic sampling rate for each run is shown in Table IV below:

PERCENT ISOKINETICS

Run	Percent Isokinetics	Remarks
1-I	94.8%	All runs were within the 100 ± 10% range requirement
1-O	99.7%	
2-I	99.3%	
2-O	105.2%	
3-I	97.3%	
3-O	105.1%	

TABLE IV

CONCLUSIONS

The average Dry Catch emission rate from the kiln was 713.4 lb/hr. and 8.7 lb/hr. from the bag collector. The percent efficiencies of the collector were 99.3%, 98.6%, and 98.5% for Runs #1, #2, and #3 respectively. The average efficiency for the unit was 98.8%. This exceeds the N. C. regulation for the Lightweight Aggregate Industry of 95% efficiency quite handsomely.

As a matter of note, the efficiency of the collector also exceeded 98% on the Total (Wet Catch and Dry Catch) emission rates.

RECOMMENDATIONS

ROSSNAGEL & ASSOCIATES recommends that this report be submitted to the regulatory agencies as demonstration that on April 29,1980, the Orange Kiln and Baghouse system of Carolina Stalite, Gold Hill, N. C. met the particulate emission code for the Lightweight Aggregate Industry.

III

DESCRIPTION OF TEST

The test van arrived at 4:00 P.M. on Monday, April 28, 1980. The test team consisted of D. Fink, D. McCombs, R. Westbrook, J. Wyatt, and Z. Spratlin, and set up the sampling equipment.

Preliminary velocity traverses and temperature measurements were performed, and the flowrate results reported to Mr. Drew.

On Tuesday, April 29, 1980, the five-man ROSSNAGEL & ASSOCIATES' test team arrived at 7:48 A.M. The five men were distributed as follows:

Location	Control Module Operation	Probe Location Temp. Controls And Bacharach CO_2	Coordination And Clean-Up
Inlet Outlet	D. Fink R. Westbrook	D. McCombs Z. Spratlin	J. Wyatt

The Orange Kiln system was off line while a drive motor was changed. The system was restarted at 9:05 A.M. The test team then performed a second set of traverse measurements. At 10:25 A.M., the damper controls were reset which resulted in the system achieving the initially observed air flows. Please refer to the table on Page 16 for the start and stop times for each run.

During Run #2, the coal mill malfunctioned causing a temporary shutdown of the system. The malfunction was immediately corrected with total system down-time of only two minutes. The sampling

team interrupted the run for this brief period, then resumed testing after the nature of the shutdown was known.

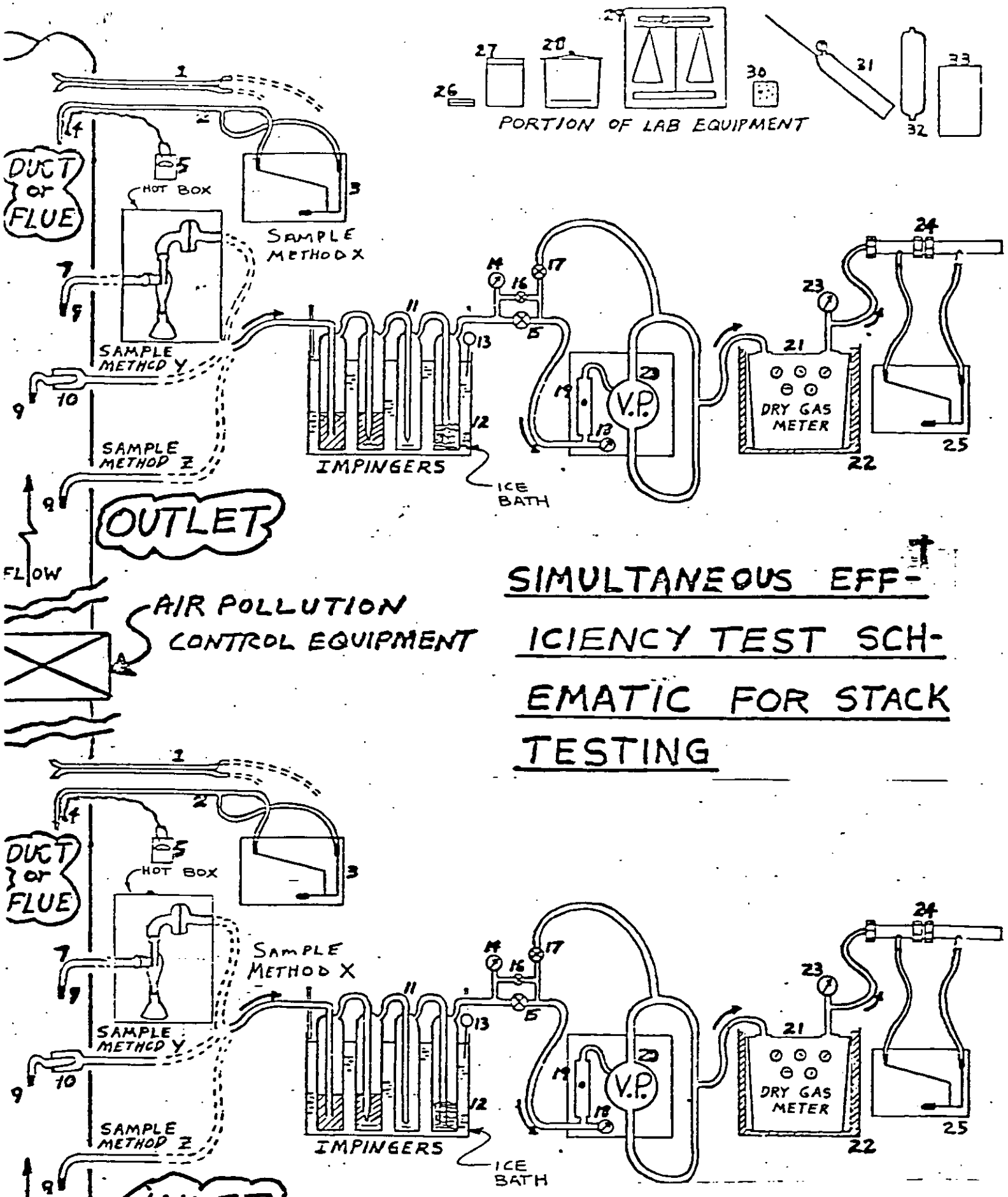
The various start and stop times for each run are shown below:

Run	Start	Stop
1-Inlet	11:10 A.M.	12:13 P.M.
1-Outlet	11:10 A.M.	12:17 P.M.
2-Inlet	1:33 P.M.	2:44 P.M.
2-Outlet	1:30 P.M.	2:47 P.M.
3-Inlet	3:30 P.M.	4:32 P.M.
3-Outlet	3:30 P.M.	4:37 P.M.

At the conclusion of the first run, Mr. Mike Landis reviewed the inlet data because less than 30 cubic feet of gas had been sampled. Upon observing the volume of particulate collected, he instructed the inlet sampling team that similar sample volumes could be used on the subsequent two runs.

At the conclusion of the third run, the sampling team performed the final equipment washings, packed the vans, and left the plant site at 5:45 P.M.

The sampling for the three simultaneous runs was conducted as shown in the method on the following page. The sampled gas was passed through the nozzle tip, through a stainless steel probe, through a heated filter and into an impinger train which was immersed in an ice bath to condense and collect moisture and submicron particles. Teflon hoses and special glass adapters were used to connect the filter holder to the impinger case. The



SIMULTANEOUS EFFICIENCY TEST SCHEMATIC FOR STACK TESTING

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Form #RA-20S-EPA-5

scrubbing agent in Impingers #1 and #2 was 100 cc. of distilled water. Impinger #3 was initially dry, and Impinger #4 contained either 225 grams or 180 grams of silica gel for final absorption of vapors and protection of metering and pump equipment. An inline thermometer following Impinger #4 was used to monitor the temperature of gas exiting the sampling train. The gas temparature exiting the #4 Impinger never exceeded 70 F. as shown on the Temperature Data Sheets in Section V.

The following were checked and changed after each run:

1. Glass Fiber Filter (.3 microns).
2. Scrubbing agent in Impinger #1 was measured and changed. The used agent was retained in individual jars for later lab analysis.
3. Scrubbing agent in Impinger #2 was measured and changed (same as Item #2).
4. Condensate in Impinger #3 was measured and collected separately.
5. Silica gel in Impinger #4.
6. A thorough washing of the stainless steel probe, filter holder, Teflon hoses and all "Hot Box" (Dry Catch) and impinger glass (Wet Catch) was done with acetone.

The filters from the test runs were returned in special containers to the lab for desiccating and weighing to .0001 grams (see Lab Report in Section V).

When removing the filters from the holders, special care was taken to collect all particulates. A nylon brush was used to loosen adhering particulates. Then the sampling train was carefully rinsed with acetone. The acetone washes were then collected in separate containers.

All liquids were evaporated to dryness in order to determine

the Non-Volatile Residue.

A stainless steel shielded Chromel-Alumel thermocouple was used with a calibrated null balancing potentiometer to obtain accurate temperature readings in the stack during the tests.

The sampling train successfully met the leak check requirement of $<.02$ cfm at 15 inches Hg for 60 seconds prior to each run, and $<.02$ cfm at the highest vacuum used during the test run at its conclusion with the exception of Run #1-I. The sample volumes were adjusted as per the allowed procedure in the FEDERAL REGISTER.

At the conclusion of this section is the "Checklist for Isokinetic Stack Testing", which is utilized by the test team.

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PROCEDURE #130-C
9/8/78

CALIBRATION PROCEDURE

ROSSNAGEL & ASSOCIATES uses the following calibration procedures for its field, test van, lab and shop equipment.

As part of its calibration program, ROSSNAGEL & ASSOCIATES built its own pitot tube wind tunnel to A.S.M.E. standards. This is used to calibrate our own pitot tubes plus those brought to us by other firms without such capability. Also, ROSSNAGEL & ASSOCIATES utilizes its uniquely designed and own manufactured precision orifice for field calibration of dry gas meters in its sample trains. This provides for disassembly, cleaning of the orifice and reassembly of the precision stainless steel orifice in less than a minute in the field.

Pitot Tubes: Are cleaned and redressed after each dusty or high temperature test and at least every 90 days. They are then checked for angles of alignment and condition of the face openings to ensure that they meet the specifications described in the FEDERAL REGISTER (Vol. 42, No. 160 - Thursday, August 18, 1977) for the use of a baseline coefficient value of .84. All pitots are serialized.

Dry Gas Meters: Are calibrated against the ROSSNAGEL & ASSOCIATES' primary standard wet gas meter at least every 90 days or more often if used in acid plant tests. Calibration of field test dry gas meters is recorded on Form #RA-181.

Nozzles: Are measured across ten diameters with a vernier caliper before every test. When erosion occurs from a high temperature test, they are measured, redressed in our mechanical shop area and remeasured. All nozzles are serialized.

Thermocouple Bridges: Are purchased with the calibration curve and checked against the lab standard thermocouple bridge at least every 60 days.

Pressure Transducers: Are calibrated at least every 60 days against a micro-manometer, correcting for capillary action effects.

Glass Thermometers: Are calibrated against the ± .5 degree C., lab standard thermometer at least every 60 days. They are checked at body temperature prior to every test.

ISOKINETIC STACK TESTING

CHECKLIST

ROSSNAGEL & ASSOCIATES INC
Engineering & Testing Consultants
3619 S. I-85
CHARLOTTE, NORTH CAROLINA 28208
PHONE (704) 392-1309

A. PRELIMINARY SURVEY AND PRETEST:

1. Determine if upstream and downstream (simultaneous efficiency tests) or only downstream tests are required. What does Purchase Order and/or state application specify? Get copy of state/city application for installation to confirm test requirements.
2. Contact responsible operating personnel at test location.
3. Make survey of site:
   a. Determine location and size of test ports per RA Dwg. #A-0075C.
   b. Will staging be required? Will ports handle standard 3" NPT probe holder? Is E.P.A. train required? If not, what type train? Is wet catch required?
   c. Measure inside dimensions of breech, duct, stack or flue.
   d. Is adequate shop air available if aspirator is to be used?
   e. Is line voltage at site adequate under required load?
   f. Will temperature be too severe for test personnel at sample port at maximum operating conditions? What is maximum sampling temperature? Are radiation shields or asbestos suits required? Are wind screens required? Are any hazardous chemicals being emitted? If so, are special respirators needed?
   g. Will on-site personnel conduct all process loading and operation? Is sufficient and proper on-site refuse available in an incinerator test?
   h. Is a two way communication system required?
   i. Check effects from charging incinerator (temp., flow, smoke, etc.).
   j. On incinerator tests are firebox and secondary temperature indicating equipment available? When were they last calibrated?
   k. Determine if Sampling Method I, Y, Z or a special method will be used per applicable RA series of Form #20's.
   l. Is it safe to leave equipment overnight i.e. high temperature, wind, rain, vandalism or unusual operations?
   m. Is the roof flat enough for sampling train? If not, what can be done? What ladders, scaffolding, railings, etc. are required?
   n. Find out how the test equip. can best be raised to the testing point from the nearest safe parking place. Is a pulley or block & tackle req'd? Estimate time to raise equipment.
   o. Estimate equipment setup and travel time. Determine whether it is feasible to stay overnight?
   p. Take Polaroid photograph of test site if permitted for future reference.
4. Conduct preliminary velocity and temperature traverse. Fill out RA Form #15. Record time, calibration factor and type of pitot tube used. Take Wet Bulb & Dry Bulb check if exhaust is under 400 F.
5. Make Ringelmann/Opacity check (if applicable). Fill out either proper RA Form #17 or #17-O.
6. Determine exact manufacturing and model number of auxiliary equipment being used, such as:
   a. Auxiliary burners (primary, secondary, afterburners, etc.).
   b. Under fire fans? Over fire fans? In fire air blast?
   c. By-pass dampers? Inlet dampers? Static indicators? Temperature limits? Ozone or oxidizing adders?
   d. Is there a separate gas meter for gas burners on incinerator tests?
   e. Scrubbers, dust collectors, electrostatic precipitators, etc.
7. Make basic scaled sketch (with dimensions) of furnace, combustion chamber, vent, hoods, flue, scrubbers, incinerator, inlet and outlets, sampling downstream & upstream distances.
8. Determine height of stack above ground and distance to nearest property line.
9. Notify by phone all applicable government agency personnel of date and details if an Official Test. Confirm with letter and applicable distribution of copies to customer.
10. Check to see all needed supplies are in the test van; such as spare glass parts, sample jars, evacuated cylinders, Orsat, Bacharach, velometer, tachometer and low velocity electronic micromanometer. Use Van Checklist to assure all equipment is ready-to-use.
11. Would it help to pre-label sample jars and put the measured scrubbing agents in jars?
12. Put in writing any special test needs or potential problems such as state test forms needed, calibration data needed, list of tare weighed filters, minimum sampling volume, etc.
13. Make sure on-site gas meter, orifice, pitot, etc. have been properly calibrated and the attached tags reflect it.

B. LAB PREPARATION:

1. Identify, log and dry thimble/filters in oven (at 215 F. for 3 hours) and desiccate thimbles and filters for at least 24 hours before weighing. Follow special procedures on paper thimbles. Take tare weight of filters (to .0001 grams) on analytical balance. Keep weighed reference in desiccator. Record weights on RA Form #26.
2. Weigh drierite (or equivalent) drying agent for impinger train the day before the test. Store drierite in air-tight containers.
3. What other special lab equipment or absorbing solutions are required for the test? During winter months do not leave solutions or liquid samples in test van outdoors overnight.

C. ON DAY OF AN OFFICIAL TEST:

1. Start Events Log Sheet on RA Form #28 upon arrival and then contact operating personnel at test location.
2. Carefully unload and set up equipment unless this is done the day before test. Be sure all ladders and any wind screens are properly secured.
3. Lay out exact probe entry dimension for each sampling point (as related to outer end of test port) per EPA requirements.
4. Mark and/or wire penetration distance on simultaneous reading pitot tube and sample probe. Allow for port, holder, etc. Fasten pitot to probe wherever possible. Mark pitot in relation to probe in order to detect any relative movement between them. When not possible to strap pitot to probe, then take readings at another known reference point in other test port.
5. Make velocity and temperature traverses. Record data on RA Form #15. In turbulent flow check attitude of pitot tube, both rotationally and longitudinally. Also note the type of pitot tube used (i.e. standard or special) on the RA Form #15. Always record time of traverse and process conditions.
6. Record wet and dry bulb readings of stack (up to 400 F.), atmosphere and process inlet air(when req'd). Calculate moisture % by volume per Form #55. Measure P_g, P_m & T_m. Record on Form #16.
7. Calculate flow and then nozzle size to give optimum (near 3/4 cfm.) sampling rate using Fig. 8 and 9 of E.P.A. testing procedure (which is printed on back of ROSSNAGEL & ASSOCIATES' Nomograph Model 81). Measure exact diameter of nozzle with micrometer or vernier caliper and record on Form 16.
8. Verify operating characteristics of equipment and/or process under test: max. or min. temperatures, rate (continuous or batch), input materials, charging cycle of incinerator, chemicals, solvents, etc. Get this information in writing and have it signed by a responsible plant authority.
9. Obtain barometric pressure reading for each run where possible.

10. Install filters from covered containers into filter holders - do not connect filter holder yet. Record filter S/N on RA Form #16.
11. Turn on vacuum pump and allow to warm up at least 15 minutes with bypass valve open.
12. Set up impinger contents as required. ADD ICE FOR CHILLED WATER. Do not connect into sample train yet. Be sure water is added to obtain greater surface area contact on impingers.
13. Connect filter(s) and impingers into train.
14. Make a leak check on sample train up to the nozzle with 15 inches H_g vacuum at V_2 on the pump. The ΔH across the calibrated orifice in RA Form #20 schematic shall be $\leq .01$ inches W.G. On E.P.A. tests leakage to be $\leq .02$ cu. ft. in 60 seconds @15" H_g. On L.A. Air Pollution Control District test system to hold 25 inches H_g (with pump off) for 3 minutes without losing more than 1 inch H_g. Release blockage at inlet end before opening bypass valve or shutting off pump. Remember to read V_m after shutting pump off.
15. Last thing before beginning run verify process is operating and process log is being maintained. Check process during test run.
16. When ready to begin test run, have No. 3 Tester put probe and nozzle in stack at first sample point along with velocity/temperature sensors. At signal from No. 3 Tester that he is in position, start pump and stop watch. Record actual time on log sheet. Adjust for isokinetic conditions. Note stack temperatures, time, pitot readings, orifice adjustment and meter temperature on proper forms.
17. At start of run take complete Ringelmann/Opacity readings on RA Form #17 or 17-0 as required by authorities. Record odors, etc. on RA Form #16. Shutdown pump when changing test ports.
18. The basic test team responsibilities are as follows:
    No.1 Tester (team leader) is responsible for all aspects of test, the team members proficiency and following this checklist. This includes total supervision, proper starting and ending of run plus determination and maintenance of isokinetics and all data. He is to make and record Opacity/Ringelmann observations and leak test. Obtain process information. He is to personally check process.
    No.2 Tester is primarily responsible for proper positioning of probe and adjustment. Communicate probe movements to No. 3 Tester to required isokinetics. He is also responsible for and is to assist No. 3 man as required. He too will maintain a periodic visual emissions check. He will watch instruments for indications of filter clogging or breakage, sticking V_m, leakage, etc. He is responsible for Orsat, Bacharach, evacuated cylinders or other special checks.
    No.3 Tester is stationed at test ports. He will move the probe to the correct sample point per the instructions of the No. 2 Tester. He will communicate loud and clear the time of the point change and the V_p reading immediately upon completion of the change. He will also maintain the stack temperature log and take W.B./D.B. readings, communicating them to the No. 2 Tester. He is responsible for assuring sample point change timing, odor and visual emissions checks.
19. Both the No. 1 & 2 Testers are responsible for communicating test point changes to No. 3 Tester. Insist on a reply when probe is in position.
20. Using ROSSNAGEL & ASSOCIATES' E.P.A. nomograph, correct sampling rate if moisture, temperature or velocity pressure conditions change more than 4%, 100 F. or .02 inches W.G. respectively.
21. Take integrated plus spot CO_2/CO samples in any combustion test as required for Bacharach, Orsat or Gas Chromatography analysis. CO_2 samples must be taken upstream of scrubber.
22. At completion of run, first shut down pump and take probe out of stack stream. Next read V_m and then reconduct the leak test. Be sure to slowly release vacuum in proper direction after leak check. Pour all liquid in hose into Impinger #1. Then flush hose as required (if E.P.A. test, follow E.P.A. procedures) plus inlet nozzle, hose, filter holder and collect residue in separate marked containers. Use bottle brush or rubber policeman to loosen adhering particulates.
23. Measure and record liquid volumes in every impinger on RA Form #54. Condensate collection is critical for a "moisture balance" check on any combustion process. Pour impinger contents into separate marked all glass containers. Keep #1 impinger seperate for pH check. Use pHydrion paper if condensate is too small to collect. Do not mix flushes with original impinger collection in EPA Method 5 test.
24. Pour contents of preweighed drying agent from impinger into container to be weighed in lab (if required). Use rubber policeman as necessary. Seal containers with tape.
25. Carefully put filters and thimbles in proper closed protected and identified containers. Handle filter containers carefully to avoid tipping. Place in holders in test van.
26. Calculate isokinetics for first run to determine if sampling was within the required $\pm$ 10%. If not, find error and reset nomograph.
27. Repeat C-5 through C-25 for each run made. Make three one hour runs or as otherwise specified. Two states allow one run Official Tests.

D. POST TEST LAB WORK (If an E.P.A. Test, follow special E.P.A. procedures):

1. Test team to submit all samples to lab with any special instructions plus responsibility in writing.
2. Transfer liquid samples to beakers for subsequent evaporation. Use a rubber policeman to facilitate the transfer of any adhering particles. For extremely difficult to remove residues use preweighed Gelman Type A glass fiber filters to wipe out the material.
3. Dry all filters and thimbles at 215 F. for three hours. Desiccate, cool and weigh to a constant reading. Follow separate procedure on paper thimbles.
4. Determine micron size of sample or residue when required per separate procedure.
5. Desiccate all filters and thimbles at least 24 hours. Record final weight on ROSSNAGEL & ASSOCIATES Form #26.
6. Label filters and thimbles for permanent record. Save for one year.
7. Passivate probe, nozzle, thimble holder and clean any other equipment (such as impingers required) after this test. Restock equipment in test van.
8. Weigh silica gel to .1 gms. and report promptly to calculation section. Also do Orsat analysis so that velocity calculations and isokinetics may be calculated.
9. Do Orsat Analysis and silica gel weights within 48 hrs. as they are first data items needed by calculation group.

Written by: W.B. Rossnagel, P.E., President

Form #RA-27I

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IV

CALCULATIONS

Allowable Emission Rate Calculations

Percent Isokinetic Calculations

Velocity Calculations

Percent Efficiency Calculations

Gas Flow Computation Sheets

Percent Moisture Calculations

Equal Area Dimension Calculations

Isokinetics by Calculator

RUSSNAGEL & ASSOCIATES

Engineering & Testing Consultants
Air - Water - Noise

STACK TESTING
EMISSION CALCULATION REPORT

PLANT	Carolina Stalite
ADDRESS	Cold Hill, N.C.
STACK	Orange Kiln - Inlet to Bag Collector
CODE/CHAPTER	

DRY CATCH

FIELD & LAB DATA		RUN 1-I	RUN 2-I	RUN 3-I
DATE		4/29/80	4/29/80	4/29/80
VOLUME OF GAS SAMPLE THROUGH DRY GAS METER (METER COND.)	V_m (FT³)	26.02	28.34	28.83
BAROMETRIC PRESS.	P_{bar} (IN. HgA)	28.86	28.86	28.86
GAS METER PRESS.	P_m (IN. HG) $\pm$ (ΔH)	.061	.063	.067
GAS METER TEMP.	T_m (°F)	75.6	89.9	91.6
VOLUME OF GAS SAMPLE THROUGH DRY GAS METER @ STANDARD COND.	$V_{m_{STD}} = \frac{17.71\, V_m (P_{bar}+P_m)}{(T_m+460)}$ (FT³)	24.86	26.40	26.76
TOTAL VOLUME OF LIQUID COLLECTED IN IMPINGERS & SILICA GEL	V_{lc} (ml)	30.4	39	43.2
VOLUME OF WATER VAPOR IN GAS SAMPLE (STD. COND.)	$V_{w_{STD}} = .0474\, V_{lc}$ (FT³)	1.44	1.85	2.05
TOTAL VOLUME OF GAS SAMPLE @ STD. COND.	$V_{TOTAL} = V_{m_{STD}} + V_{w_{STD}}$ (FT³) *	26.30	28.25	28.81
PERCENT MOISTURE BY VOLUME	$B_{wo} = \frac{V_{w_{STD}}}{V_{TOTAL}} \times 100$ *	5.5	6.6	7.1
AMOUNT OF PARTICULATE COLLECTED	M_n (GMS)	14.2938	12.8241	13.3069
AVERAGE STACK GAS VELOCITY	$V_{S_{AVG}}$ (FT/SEC)	20.92	23.29	23.79
CROSS-SECTIONAL AREA OF STACK	A (FT²)	12.57	12.57	12.57
AVERAGE STACK GAS TEMP.	$\bar{t}_{S_{AVG}}$ (°F)	343.75	336.27	321.37
ABSOLUTE STACK GAS STATIC PRESS.	P_S (IN. HgA)	28.71	28.71	28.71
ACTUAL FLOW ACFM	$Q'_{TS} = 60\, V_{S_{AVG}} A$ (FT³/MIN)	17,286.3	17,565.3	17,940.1
FLOW AT STD. CONDITIONS SCFM	$Q'_S = 17.71 \frac{Q'_{TS}\, P_S \left(1-\frac{B_{wo}}{100}\right)}{(\bar{t}_{S_{AVG}}+460)}$	10,352.6	10,479.5	10,851.7
WEIGHT EMISSION RATE OF PARTICULATES	$W_S = \frac{.1323\, M_n\, Q'_S}{V_{M\ STD.}}$ (LB/HR)	758.5	673.5	713.9
CONCENTRATION IN GRAINS/SCF (DRY BASIS)	$C'_S = \frac{15.43\, M_n}{V_{m_{STD}}}$	8.8718	7.4953	7.6779

*When using scrubbing solutions other than H_2O, use Form #RA-55.

To calculate Bwo. the $V_{Total} = \frac{V_{mSTD}}{(1-Bwo./100)} + V_{1c} + V_{wSTD}$

Form #RA-138C

Calculations by WBT

Date 5/7/80

RUSSNOGLE & ASSOCIATES

Engineering & Testing Consultants
Air - Water - Noise

STACK TESTING
EMISSION CALCULATION REPORT

PLANT	Carolina Stalite
ADDRESS	Cold Hill, N.C.
STACK	Orange Kiln - Inlet to Bag Collector
CODE/CHAPTER	

WET CATCH

FIELD & LAB DATA		RUN 1-I	RUN 2-I	RUN 3-I
DATE		4/29/80	4/29/80	4/29/80
VOLUME OF GAS SAMPLE THROUGH DRY GAS METER (METER COND.)	V_m (FT³)	26.02	28.34	28.83
BAROMETRIC PRESS.	P_{bar} (IN. HgA)	28.86	28.86	28.86
GAS METER PRESS.	P_m (IN. Hg) $\pm(\Delta H)$	.061	.063	.067
GAS METER TEMP.	T_m (°F)	75.6	89.9	91.6
VOLUME OF GAS SAMPLE THROUGH DRY GAS METER @ STANDARD COND.	$V_{m_{STD}} = \frac{17.71\, V_m (P_{bar}+P_m)}{(T_m+460)}$ (FT³)	24.86	26.40	26.76
TOTAL VOLUME OF LIQUID COLLECTED IN IMPINGERS & SILICA GEL	V_{lc} (ml)	30.4	39	43.2
VOLUME OF WATER VAPOR IN GAS SAMPLE (STD. COND.)	$V_{w_{STD}} = .0474\, V_{lc}$ (FT³)	1.44	1.85	2.05
TOTAL VOLUME OF GAS SAMPLE @ STD. COND.	$V_{TOTAL} = V_{m_{STD}} + V_{w_{STD}}$ (FT³) *	26.30	28.25	28.81
PERCENT MOISTURE BY VOLUME	$B_{wo} = \frac{V_{w_{STD}}}{V_{TOTAL}} \times 100$ *	5.5	6.6	7.1
AMOUNT OF PARTICULATE COLLECTED	M_n (GMS)	.2049	.3416	.7756
AVERAGE STACK GAS VELOCITY	$V_{S_{AVG}}$ (FT/SEC)	22.92	23.29	23.79
CROSS-SECTIONAL AREA OF STACK	A (FT²)	12.57	12.57	12.57
AVERAGE STACK GAS TEMP.	$t_{S_{AVG}}$ (°F)	343.75	336.87	321.87
ABSOLUTE STACK GAS STATIC PRESS.	P_S (IN. HgA)	28.71	28.71	28.71
ACTUAL FLOW ACFM	$Q'_{fs} = 60\, V_{S_{AVG}} A$ (FT³/MIN)	17,286.3	17,565.3	17,942.1
FLOW AT STD. CONDITIONS SCFM	$Q'_S = 17.71 \frac{Q'_{fs}\, P_S \left(1-\frac{B_{wo}}{100}\right)}{(t_{S_{AVG}}+460)}$	10,352.6	10,479.5	10,851.7
WEIGHT EMISSION RATE OF PARTICULATES	$W_S = \frac{.1323\, M_n\, Q'_S}{V_{m\,STD}}$ (LB/HR)	11.3	17.9	41.6
CONCENTRATION IN GRAINS/SCF (DRY BASIS)	$C'_S = \frac{15.43\, M_n}{V_{m_{STD}}}$	.1272	.1997	.4472

*When using scrubbing solutions other than H_2O, use Form #RA-55.

To calculate Bwo. the $V_{Total} = \frac{V_{mSTD}}{(1-Bwo./100)} + V_{1c} + V_{wSTD}$

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Calculations by WBT

Date 5/7/80

Form #RA-138C

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Air - Water - Noise

STACK TESTING
EMISSION CALCULATION REPORT

PLANT	Carolina Stelite
ADDRESS	Cold Hill, N.C.
STACK	Orange Kiln - Bag Collector Exhaust
CODE/CHAPTER	

DRY CATCH

FIELD & LAB DATA		RUN 1-O	RUN 2-O	RUN 3-O
DATE		4/29/80	4/29/80	4/29/80
VOLUME OF GAS SAMPLE THROUGH DRY GAS METER (METER COND.)	V_m (FT³)	40.04	41.38	42.30
BAROMETRIC PRESS.	P_{bar} (IN. HgA)	28.86	28.86	28.86
GAS METER PRESS.	P_m (IN. HG) (ΔH)	.12	.12	.12
GAS METER TEMP.	T_m (°F)	73	72	75
VOLUME OF GAS SAMPLE THROUGH DRY GAS METER @ STANDARD COND.	$V_{m_{STD}} = \frac{17.71\, V_m (P_{bar}+P_m)}{(T_m+460)}$ (FT³)	38.56	39.92	40.58
TOTAL VOLUME OF LIQUID COLLECTED IN IMPINGERS & SILICA GEL	V_{lc} (ml)	27.7	21.1	28.4
VOLUME OF WATER VAPOR IN GAS SAMPLE (STD. COND.)	$V_{w_{STD}} = .0474\, V_{lc}$ (FT³)	1.037	1.00	1.35
TOTAL VOLUME OF GAS SAMPLE @ STD. COND.	$V_{TOTAL} = V_{m_{STD}} + V_{w_{STD}}$ (FT³) *	39.59	40.92	41.93
PERCENT MOISTURE BY VOLUME	$B_{wo} = \frac{V_{w_{STD}}}{V_{TOTAL}} \times 100$ *	2.6	2.4	3.2
AMOUNT OF PARTICULATE COLLECTED	M_n (GMS)	.0525	.0940	.1048
AVERAGE STACK GAS VELOCITY	$V_{S_{AVG}}$ (FT/SEC)	23.79	23.63	24.09
CROSS-SECTIONAL AREA OF STACK	A (FT²)	27.88	27.88	27.88
AVERAGE STACK GAS TEMP.	$t_{S_{AVG}}$ (°F)	181.14	173	169
ABSOLUTE STACK GAS STATIC PRESS.	P_S (IN. HgA)	28.86	28.86	28.86
ACTUAL FLOW ACFM	$Q'_S = 60\, V_{S_{AVG}} A$ (FT³/MIN)	39,795.9	39,528.3	40,297.8
FLOW AT STD. CONDITIONS SCFM	$Q'_S = 17.71 \frac{Q'_S P_S \left(1-\frac{B_{wo}}{100}\right)}{(t_{S_{AVG}}+460)}$	30,906.8	31,150.8	31,697.2
WEIGHT EMISSION RATE OF PARTICULATES	$W_S = \frac{.1323\, M_n Q'_S}{V_{M\ STD.}}$ (LB/HR)	5.6	9.7	10.8
CONCENTRATION IN GRAINS/SCF (DRY BASIS)	$C'_S = \frac{15.43\, M_n}{V_{m_{STD}}}$	.0210	.0363	.0398

*When using scrubbing solutions other than H_2O, use Form #RA-55.

To calculate Bwo. the $V_{Total} = \frac{V_{mSTD}}{(1-Bwo./100)} + V_{1c} + V_{wSTD}$

Calculations by WDT
Date 5/7/80

RUSSNAGEL & ASSOCIATES
Engineering & Testing Consultants
Air - Water - Noise

STACK TESTING
EMISSION CALCULATION REPORT

PLANT	Carolina Stalite
ADDRESS	Cold Hill, N.C.
STACK	Orange Kiln - Bag Collector Exhaust
CODE/CHAPTER	

WET CATCH

FIELD & LAB DATA		RUN 1-0	RUN 2-0	RUN 3-0
DATE		4/24/80	4/24/80	4/24/80
VOLUME OF GAS SAMPLE THROUGH DRY GAS METER (METER COND.)	V_m (FT³)	40.04	41.38	42.30
BAROMETRIC PRESS.	P_{bar} (IN. HGA)	28.86	28.86	28.86
GAS METER PRESS.	P_m (IN. HG) (ΔH)	.12	.12	.12
GAS METER TEMP.	T_m (°F)	73	72	75
VOLUME OF GAS SAMPLE THROUGH DRY GAS METER @ STANDARD COND.	$V_{m_{STD}} = \frac{17.71\, V_m (P_{bar}+P_m)}{(T_m+460)}$ (FT³)	38.56	39.92	40.58
TOTAL VOLUME OF LIQUID COLLECTED IN IMPINGERS & SILICA GEL	V_{lc} (ml)	21.7	21.1	28.4
VOLUME OF WATER VAPOR IN GAS SAMPLE (STD. COND.)	$V_{W_{STD}} = .0474\, V_{lc}$ (FT³)	1.03	1.00	1.35
TOTAL VOLUME OF GAS SAMPLE @ STD. COND.	$V_{TOTAL} = V_{m_{STD}} + V_{W_{STD}}$ (FT³) *	39.59	40.92	41.93
PERCENT MOISTURE BY VOLUME	$B_{wo} = \frac{V_{W_{STD}}}{V_{TOTAL}} \times 100$ *	2.6	2.4	3.2
AMOUNT OF PARTICULATE COLLECTED	M_n (GMS)	.0320	.0144	.0434
AVERAGE STACK GAS VELOCITY	$V_{S_{AVG}}$ (FT/SEC)	23.79	23.63	24.09
CROSS-SECTIONAL AREA OF STACK	A (FT²)	27.88	27.88	27.88
AVERAGE STACK GAS TEMP.	$t_{S_{AVG}}$ (°F)	181	173	169
ABSOLUTE STACK GAS STATIC PRESS.	P_S (IN. HGA)	28.86	28.86	28.86
ACTUAL FLOW ACFM	$Q'_{fs} = 60\, V_{S_{AVG}} A$ (FT³/MIN)	39,725.9	39,528.3	40,297.8
FLOW AT STD. CONDITIONS SCFM	$Q'_S = 17.71 \frac{Q'_{fs} P_S \left(1 - \frac{B_{wo}}{100}\right)}{(t_{S_{AVG}}+460)}$	30,906.8	31,150.8	31,697.2
WEIGHT EMISSION RATE OF PARTICULATES	$W_S = \frac{.1323\, M_n Q'_S}{V_{M\ STD.}}$ (LB/HR)	3.4	1.5	4.5
CONCENTRATION IN GRAINS/SCF (DRY BASIS)	$C'_S = \frac{15.43\, M_n}{V_{m_{STD}}}$	.0128	.0056	.0165

*When using scrubbing solutions other than H_2O, use Form #RA-55.

To calculate Bwo. the $V_{Total} = \frac{V_{mSTD}}{(1-Bwo./100)} + V_{1c} + V_{wSTD}$

Calculations by WBT
Date 5/22/80

Form #RA-138C

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% ISOKINETIC SAMPLING CALCULATIONS

Plant	Carolina Stalite
Address	Cold Hill, N.C.
Stack	Orange Kiln - Inlet to Bag Collector
Code/Chapter	

Field and Lab Data		Run 1-I	Run 2-I	Run 3-I	Run
Date		4/28/80	4/29/80	4/30/80	
Avg. Stack Gas Temp.	$Ts_{avg.}$, F.	344	336	321	
Total Vol. of Liquid Collected (Imp. & Sil. Gel.)	V_{1c}, ml*	30.4	39.0	43.2	
Vol. of Gas Sampled Thru D.G. Meter @ Meter Cond.	V_m, ft.^{3}	26.02	28.34	28.83	
Gas Meter Temperature	T_m, F.	76	90	93	
Barometric Pressure	P_{bar}, in. HGA	28.86	28.86	28.86	
Gas Meter Pressure	P_m, in. HG (ΔH)	.06	.06	.07	
Barometric Pressure Minus Meter Pressure	$P_{bar} + P_m$, in. HG	28.92	28.92	28.93	
Average Stack Gas Velocity	$(V_s)_{avg.}$, ft./sec.	22.92	23.29	23.79	
Absolute Stack Gas Static Pressure	P_s, in. HGA	28.71	28.71	28.71	
Sampling Nozzle Diameter	d_n, inches	.312	.312	.312	
Sampling Time	Θ, minutes	60	60	60	
% Isokinetic Sampling	I, %	94.8	99.3	97.3	

Run →	1	2	3	4
T_s + 460	804	796	781	
T_m + 460	536	550	552	

* When using scrubbing solutions other than H_2O, use V_{mSTD} and Bwo from F138 and calculate equipment:

$$V_{1c} = 21.097\left(\frac{Bwo\ V_{mSTD}}{100-Bwo}\right)$$

$$I = \frac{305.6\ (Ts_{avg.} + 460)\left[.00267\ V_{1c}(T_m+460) + V_m(P_{bar}+P_m)\right]}{\Theta(T_m+460)\ (Vs)_{avg.} P_s (d_n)^2}$$

Calculated by: WDT
Date: 5/7/80
Checked by: WDT
Date: 5/7/80

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% ISOKINETIC SAMPLING CALCULATIONS

Plant	Carolina Stelite
Address	Gold Hill, N.C.
Stack	Orange Kiln – Bag Collector Exhaust
Code/Chapter	

Field and Lab Data		Run 1-C	Run 2-C	Run 3-C	Run
Date		4/29/80	4/29/80	4/29/80	
Avg. Stack Gas Temp.	$Ts_{avg.}$, F.	181	173	169	
Total Vol. of Liquid Collected (Imp. & Sil. Gel.)	V_{1c}, ml*	21.7	21.1	28.4	
Vol. of Gas Sampled Thru D.G. Meter @ Meter Cond.	V_m, $ft.^3$	40.04	41.38	42.30	
Gas Meter Temperature	T_m, F.	73	72	75	
Barometric Pressure	P_{bar}, in. HGA	28.86	28.86	28.86	
Gas Meter Pressure	P_m, in. HG (ΔH)	.12	.12	.12	
Barometric Pressure Minus Meter Pressure	$P_{bar} + P_m$, in. HG	28.98	28.98	28.98	
Average Stack Gas Velocity	$(V_s)_{avg.}$, ft./sec.	23.79	23.63	24.09	
Absolute Stack Gas Static Pressure	P_s, in. HGA	28.86	28.86	28.86	
Sampling Nozzle Diameter	d_n, inches	.312	.312	.312	
Sampling Time	Θ, minutes	64	64	64	
% Isokinetic Sampling	I, %	99.7	105.2	105.1	

Run →	1	2	3	4
T_s + 460	641	633	629	
T_m + 460	533	532	535	

* When using scrubbing solutions other than H_2O, use V_{mSTD} and Bwo from F138 and calculate equipment:

$$V_{1c} = 21.097\left(\frac{Bwo\ V_{mSTD}}{100-Bwo}\right)$$

$$I = \frac{305.6\ (Ts_{avg.} + 460)\left[.00267\ V_{1c}(T_m+460) + V_m(P_{bar}+P_m)\right]}{\Theta(T_m+460)\ (Vs)_{avg.} P_s (d_n)^2}$$

Calculated by: WDT
Date: 5/7/80
Checked by: WDT
Date: 5/7/80

Form #RA-139D

Lab # [illegible]
Job Name Carolina Stelitc

Date 3/8/85
Made By WDT
Checked By WDT

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Description Run #1 Dry Gas Meter Volume Correction

$$V_{m\,(corrected)} = V_{m\,(measured)} - (L_i - L_a)\,\theta$$

where L_i = Observed Leak rate
L_a = Maximum Allowable Leak rate
θ = Time in Minutes

$V_{m\,(corrected)} = 27.22 - (.04 - .02)60$

$V_m = 27.22 - 1.20$

$V_m = 26.02$

VELOCITY (Vs) CALCULATION

ROSSNAGEL & ASSOCIATES INC.

Engineering & Testing Consultants

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Job Carolina Stalite

Test Orange Kiln - Inlet

Calculations by WDT

Approved by WDT

Date 5/7/80

Run No.	Pos. No.	ΔP	$\sqrt{\Delta P}$	θ (Min.)	Weighted $\sqrt{\Delta P}$
1-I	6E	.12	.346 x		=
	5E	.12	.346 x		=
	4E	.12	.346 x		=
	3E	.09	.300 x		=
	2E	.08	.283 x		=
	1E	.10	.316 x		=
	6S	.11	.332 x		=
	5S	.11	.332 x		=
	4S	.13	.361 x		=
	3S	.09	.300 x		=
	2S	.08	.283 x		=
	1S	.11	.332 x		=
			x		=
			x		=
			x		=
			x		=
			x		=
			x		=
			x		=
			x		=
			$(\sqrt{\Delta P})_{avg.}$ = .323		

$Md = .44(\%CO_2) + .32(\%O_2) + .28(\%N_2 + \%CO)$

$.44(\%CO_2) = .44 \times (4.1) = 1.80$

$.32(\%O_2) = .32 \times (15.6) = 4.99$

$.28(\%N_2 + \%CO) = .28 \times (80.3 + 0) = 22.48$

$\therefore Md = 29.27 \frac{lb}{lb\text{-mole dry}}$

$Bwo = 5.5 \%$

$Ms = Md\ (1 - Bwo/100) + .18\ Bwo$

$\frac{lb}{lb\text{-mole}}$ (wet)

$Ms = 28.65 \frac{lb}{lb\text{-mole}}$ (wet)

$Ts_{avg.} = \frac{544}{+460}$ F

$Ts_{avg.} = 804$ R

Ps 28.71 in. Hg

Notes: 1) Md = Mol. Wt. Dry
2) Md = 28.967 lb/lb-mole for std. dry air
3) Ms = Mol. Wt. corrected for moisture

1) For combustion and high moisture processes:

$$(Vs)_{avg.} = 85.48\ Fs\ (\sqrt{\Delta P})_{avg.} \sqrt{\frac{ts_{avg.} + 460}{Ps\ Ms}}$$

Where: Fs = 1 for std. pitot
Fs = .84 for special pitot (Type S)

$\therefore (Vs)_{avg.} = 22.92$ ft/sec.

2) For normal exhausts:

For standard pitot $(Vs)_{avg.} = 2.90 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460} =$ ft/sec

For special pitot $(Vs)_{avg.} = 2.46 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460} =$ ft/sec

VELOCITY (Vs) CALCULATION

ROSSNAGEL & ASSOCIATES INC.

Engineering & Testing Consultants

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Job Carolina Stalite

Test Orange Kiln - Inlet

Calculations by WDF

Approved by WDF

Date 5/7/80

Run No.	Pos. No.	ΔP	$\sqrt{\Delta P}$	θ (Min.)	Weighted $\sqrt{\Delta P}$
2-I	6E	.11	.332 x	=	
	5E	.12	.346 x	=	
	4E	.11	.332 x	=	
	3E	.05	.224 x	=	
	2E	.09	.300 x	=	
	1E	.09	.300 x	=	
	6S	.13	.361 x	=	
	5S	.13	.361 x	=	
	4S	.13	.361 x	=	
	3S	.13	.361 x	=	
	2S	.11	.332 x	=	
	1S	.11	.332 x	=	
			x	=	
			x	=	
			x	=	
			x	=	
			x	=	
			x	=	
			x	=	
			x	=	
			$(\sqrt{\Delta P})_{avg.}$ =		.339

$Md = .44(\%CO_2) + .32(\%O_2) + .28(\%N_2 + \%CO)$

$.44(\%CO_2) = .44 \times (\quad) =$

$.32(\%O_2) = .32 \times (\quad) =$

$.28(\%N_2 + \%CO) = .28 \times (\quad + \quad) =$

$\therefore Md = 29.27$ lb / lb-mole dry

$Bwo = 6.6$ %

$Ms = Md\ (1 - Bwo/100) + .18\ Bwo$

lb / lb-mole (wet)

$Ms = 28.53$ lb / lb-mole (wet)

$Ts_{avg.} = 336$ F + 460

$Ts_{avg.} = 796$ R

Ps 28.71 in. Hg

Notes: 1) Md = Mol. Wt. Dry
2) Md = 28.967 lb/lb-mole for std. dry air
3) Ms = Mol. Wt. corrected for moisture

1) For combustion and high moisture processes:

$$(Vs)_{avg.} = 85.48\ Fs\ (\sqrt{\Delta P})_{avg.} \sqrt{\frac{ts_{avg.} + 460}{Ps\ Ms}}$$

Where: Fs = 1 for std. pitot
Fs = .84 for special pitot (Type S)

$\therefore (Vs)_{avg.} = 23.29$ ft/sec.

2) For normal exhausts:

For standard pitot $(Vs)_{avg.} = 2.90 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460} =$ ft/sec

For special pitot $(Vs)_{avg.} = 2.46 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460} =$ ft/sec

VELOCITY (Vs) CALCULATION

ROSSNAGEL & ASSOCIATES INC.

Engineering & Testing Consultants

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Southeastern Division
250 Arizona Avenue N.E.
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Job Carolina Stalite

Test Orange Kiln-Inlet

Calculations by WDT

Approved by WDT

Date 5/7/80

Run No.	Pos. No.	ΔP	$\sqrt{\Delta P}$	θ (Min.)	Weighted $\sqrt{\Delta P}$
3-I	6E	.12	.346 x	=	
	5E	.13	.361 x	=	
	4E	.13	.361 x	=	
	3E	.11	.332 x	=	
	2E	.08	.283 x	=	
	1E	.09	.300 x	=	
	6S	.14	.374 x	=	
	5S	.14	.374 x	=	
	4S	.13	.361 x	=	
	3S	.10	.316 x	=	
	2S	.11	.332 x	=	
	1S	.11	.332 x	=	
			x	=	
			x	=	
			x	=	
			x	=	
			x	=	
			x	=	
			x	=	
			x	=	

$(\sqrt{\Delta P})_{avg.}$ = .339

$Md = .44(\%CO_2) + .32(\%O_2) + .28(\%N_2 + \%CO)$

$.44(\%CO_2) = .44 \times (\quad) =$

$.32(\%O_2) = .32 \times (\quad) =$

$.28(\%N_2 + \%CO) = .28 \times (\quad + \quad) =$

$\therefore Md =$ 24.27 lb/lb-mole dry

$Bwo =$ 7.1 %

$Ms = Md\,(1 - Bwo/100) + .18\,Bwo$

lb/lb-mole (wet)

$Ms =$ 28.47 lb/lb-mole (wet)

$Ts_{avg.} =$ 321 F + 460

$Ts_{avg.} =$ 781 R

Ps 28.71 in. Hg

Notes: 1) Md = Mol. Wt. Dry
2) Md = 28.967 lb/lb-mole for std. dry air
3) Ms = Mol. Wt. corrected for moisture

1) For combustion and high moisture processes:

$$(Vs)_{avg.} = 85.48\ Fs\ (\sqrt{\Delta P})_{avg.} \sqrt{\frac{ts_{avg.} + 460}{Ps\ Ms}}$$

Where: Fs = 1 for std. pitot
Fs = .84 for special pitot (Type S)

$\therefore (Vs)_{avg.} =$ 23.79 ft/sec.

2) For normal exhausts:

For standard pitot $(Vs)_{avg.} = 2.90 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460} =$ ft/sec

For special pitot $(Vs)_{avg.} = 2.46 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460} =$ ft/sec

VELOCITY (Vs) CALCULATION

ROSSNAGEL & ASSOCIATES INC.

Engineering & Testing Consultants

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Job Carolina Stalite

Test Orange Kiln - Exhaust

Calculations by WDT

Approved by WDT

Date 5/7/80

Run No.	Pos. No.	ΔP	$\sqrt{\Delta P}$	θ (Min.)	Weighted $\sqrt{\Delta P}$
1-0	S1	.09	.300 x		=
	S2	.12	.346 x		=
	S3	.16	.400 x		=
	S4	.16	.400 x		=
	S5	.15	.387 x		=
	S6	.15	.387 x		=
	S7	.18	.424 x		=
	S8	.15	.387 x		=
	S9	.15	.387 x		=
	S10	.14	.374 x		=
	S11	.12	.346 x		=
	S12	.12	.346 x		=
	S13	.12	.346 x		=
	S14	.12	.346 x		=
	S15	.13	.361 x		=
	S16	.13	.361 x		=
	E1	.08	.283 x		=
	E2	.13	.361 x		=
	E3	.15	.387 x		=
	E4	.15	.387 x		=
					=

$(\sqrt{\Delta P})_{avg}$

$Md = .44(\%CO_2) + .32(\%O_2) + .28(\%N_2 + \%CO)$

$.44(\%CO_2) = .44 \times (2.3) = 1.01$

$.32(\%O_2) = .32 \times (17.1) = 5.47$

$.28(\%N_2 + \%CO) = .28 \times (30.6 + 0.0) = 23.6$

$\therefore Md = 29.05$ lb / lb-mole dry

$Bwo =$ _____ %

$Ms = Md(1 - Bwo/100) + .18\,Bwo$

lb/lb-mole (wet)

$Ms =$ _____ lb/lb-mole (wet)

$Ts_{avg.} =$ _____ F

$+ 460$

$Ts_{avg.} =$ _____ R

Ps _____ in. Hg

Notes: 1) Md = Mol. Wt. Dry
2) Md = 28.967 lb/lb-mole for std. dry air
3) Ms = Mol. Wt. corrected for moisture

1) For combustion and high moisture processes:

$$(Vs)_{avg.} = 85.48\ Fs\ (\sqrt{\Delta P})_{avg.} \sqrt{\frac{ts_{avg.} + 460}{Ps\ Ms}}$$

Where: Fs = 1 for std. pitot
Fs = .84 for special pitot (Type S)

$\therefore (Vs)_{avg.} =$ _____ ft/sec.

2) For normal exhausts:

For standard pitot $(Vs)_{avg.} = 2.90 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460} =$ _____ ft/sec

For special pitot $(Vs)_{avg.} = 2.46 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460} =$ _____ ft/sec

VELOCITY (Vs) CALCULATION

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Engineering & Testing Consultants
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Job Carolina Stalite

Test Orange Kiln - Exhaust

Calculations by WDT

Approved by WDT

Date 5/7/80

Run No.	Pos. No.	ΔP	$\sqrt{\Delta P}$	θ (Min.)	Weighted $\sqrt{\Delta P}$
10	E 5	.16	.400 x		=
	E 6	.16	.400 x		=
	E 7	.16	.400 x		=
	E 8	.18	.424 x		=
	E 9	.15	.387 x		=
	E10	.17	.412 x		=
	E11	.16	.400 x		=
	E12	.16	.400 x		=
	E13	.15	.387 x		=
	E14	.14	.374 x		=
	E15	.16	.400 x		=
	E16	.13	.361 x		=
			x		=
			x		=
			x		=
			x		=
			x		=
			x		=
			x		=
			x		=
			$(\sqrt{\Delta P})_{avg.}$ =		.377

$Md = 44(\%CO_2) + 32(\%O_2) + 28(\%N_2 + \%CO)$

$.44(\%CO_2) = 44 \times (\quad) =$

$.32(\%O_2) = .32 \times (\quad) =$

$.28(\%N_2 + \%CO) = .28 \times (\quad) =$

$\therefore Md = 29.05 \ \frac{lb}{lb\text{-mole dry}}$

Bwo = 2.6 %

$Ms = Md\ (1 - Bwo/100) + .18\ Bwo$

$\frac{lb}{lb\text{-mole}}$ (wet)

$Ms = 28.76 \ \frac{lb}{lb\text{-mole}}$ (wet)

$Ts_{avg.} = \frac{181}{+460}$ F

$Ts_{avg.} = 641$ R

Ps 28.86 in. Hg

Notes: 1) Md = Mol. Wt. Dry
2) Md = 28.967 lb/lb-mole for std. dry air
3) Ms = Mol. Wt. corrected for moisture

1) For combustion and high moisture processes:

$$(Vs)_{avg.} = 85.48\ Fs\ (\sqrt{\Delta P})_{avg.} \sqrt{\frac{ts_{avg.} + 460}{Ps\ Ms}}$$

Where: Fs = 1 for std. pitot
Fs = .84 for special pitot (Type S)

$\therefore (Vs)_{avg.} =$ 23.79 ft/sec.

2) For normal exhausts:

For standard pitot $(Vs)_{avg.} = 2.90 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460} =$ ft/sec

For special pitot $(Vs)_{avg.} = 2.46 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460} =$ ft/sec

VELOCITY (Vs) CALCULATION

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3619 INTERSTATE 85 SOUTH
CHARLOTTE, N. C. 28208
704/392-1300

Job Carolina Stalite

Test Orange Kiln - Exhaust

Calculations by WDT

Approved by WDT

Date 5/7/80

Run No.	Pos. No.	ΔP	$\sqrt{\Delta P}$	θ (Min.)	Weighted $\sqrt{\Delta P}$
0-0	S1	.12	.346x		=
	S2	.15	.387x		=
	S3	.16	.400x		=
	S4	.16	.400x		=
	S5	.18	.424x		=
	S6	.16	.400x		=
	S7	.17	.412x		=
	S8	.16	.400x		=
	S9	.14	.374x		=
	S10	.06	.245x		=
	S11	.06	.245x		=
	S12	.13	.361x		=
	S13	.13	.361x		=
	S14	.14	.374x		=
	S15	.12	.346x		=
	S16	.12	.346x		=
	E1	.12	.346x		=
	E2	.14	.374x		=
	E3	.14	.374x		=
	E4	.16	.400x		=
					=

$(\sqrt{\Delta P})_{avg.}$

$Md = .44(\%CO_2) + .32(\%O_2) + .28(\%N_2 + \%CO)$

$.44(\%CO_2) = .44 \times (\quad) =$

$.32(\%O_2) = .32 \times (\quad) =$

$.28(\%N_2 + \%CO) = .28 \times (\quad + \quad) =$

$\therefore Md = \_\_\_\_\_ \frac{lb}{lb\text{-mole dry}}$

$Bwo = \_\_\_\_\_ \%$

$Ms = Md\ (1 - Bwo/100) + .18\ Bwo$

$\frac{lb}{lb\text{-mole}}$ (wet)

$Ms = \_\_\_\_\_ \frac{lb}{lb\text{-mole}}$ (wet)

$Ts_{avg.} = \_\_\_\_\_ F$

$+ 460$

$Ts_{avg.} = \_\_\_\_\_ R$

Ps _____ in. Hg

Notes: 1) Md = Mol. Wt. Dry
2) Md = 28.967 lb/lb-mole for std. dry air
3) Ms = Mol. Wt. corrected for moisture

1) For combustion and high moisture processes:

$$(Vs)_{avg.} = 85.48\ Fs\ (\sqrt{\Delta P})_{avg.} \sqrt{\frac{ts_{avg.} + 460}{Ps\ Ms}}$$

Where: Fs = 1 for std. pitot
Fs = .84 for special pitot (Type S)

$\therefore (Vs)_{avg.} = \_\_\_\_\_$ ft/sec.

2) For normal exhausts:

For standard pitot $(Vs)_{avg.} = 2.90 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460} =$ _____ ft/sec

For special pitot $(Vs)_{avg.} = 2.46 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460} =$ _____ ft/sec

VELOCITY (Vs) CALCULATION

RUSSNAGEL & ASSOCIATES INC.

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MID-ATLANTIC DIVISION
3619 INTERSTATE 85 SOUTH
CHARLOTTE, N. C. 28208
704/392-1300

Job Carolina Stalite

Test Orange Kiln - Exhaust

Calculations by WDT

Approved by WDT

Date 5/7/80

Run No.	Pos. No.	ΔP	$\sqrt{\Delta P}$	θ (Min.)	Weighted $\sqrt{\Delta P}$
20	E5	.16	.400 x		=
	E6	.16	.400 x		=
	E7	.18	.424 x		=
	E8	.18	.424 x		=
	E9	.16	.400 x		=
	E10	.16	.400 x		=
	E11	.16	.400 x		=
	E12	.16	.400 x		=
	E13	.15	.387 x		=
	E14	.16	.400 x		=
	E15	.14	.374 x		=
	E16	.12	.346 x		=
			x		=
			x		=
			x		=
			x		=
			x		=
			x		=
			x		=
			x		=
			$(\sqrt{\Delta P})_{avg.}$		= .377

$Md = .44(\%CO_2) + .32(\%O_2) + .28(\%N_2 + \%CO)$

$.44(\%CO_2) = 44 \times (\quad) =$

$.32(\%O_2) = .32 \times (\quad) =$

$.28(\%N_2 + \%CO) = .28 \times (\quad) =$

$\therefore Md = 29.05 \frac{lb}{lb\text{-mole dry}}$

$Bwo = 2.4 \%$

$Ms = Md\ (1 - Bwo/100) + .18\ Bwo$

$\frac{lb}{lb\text{-mole}}$ (wet)

$Ms = 28.79 \frac{lb}{lb\text{-mole}}$ (wet)

$Ts_{avg.} = \frac{173}{+\ 460}$ F

$Ts_{avg.} = 633$ R

Ps 28.86 in. Hg

Notes: 1) Md = Mol. Wt. Dry
2) Md = 28.967 lb/lb-mole for std. dry air
3) Ms = Mol. Wt. corrected for moisture

1) For combustion and high moisture processes:

$$(Vs)_{avg.} = 85.48\ Fs\ (\sqrt{\Delta P})_{avg.} \sqrt{\frac{ts_{avg.} + 460}{Ps\ Ms}}$$

Where: Fs = 1 for std. pitot
Fs = .84 for special pitot (Type S)

$\therefore (Vs)_{avg.} = 23.63$ ft/sec.

2) For normal exhausts:

For standard pitot $(Vs)_{avg.} = 2.90 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460} =$ ____ ft/sec

For special pitot $(Vs)_{avg.} = 2.46 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460} =$ ____ ft/sec

VELOCITY (Vs) CALCULATION

ROSSNAGEL & ASSOCIATES INC.

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704/392-1300

Job Caroline Stalite

Test Orange Kiln - Exhaust

Calculations by WDF

Approved by WDF

Date 6/7/80

Run No.	Pos. No.	ΔP	$\sqrt{\Delta P}$	θ (Min.)	Weighted $\sqrt{\Delta P}$
3-0	S1	.10	.316 x	=	
	S2	.14	.374 x	=	
	S3	.16	.400 x	=	
	S4	.18	.424 x	=	
	S5	.18	.424 x	=	
	S6	.19	.436 x	=	
	S7	.18	.424 x	=	
	S8	.17	.412 x	=	
	S9	.15	.387 x	=	
	S10	.15	.387 x	=	
	S11	.13	.361 x	=	
	S12	.14	.374 x	=	
	S13	.13	.361 x	=	
	S14	.12	.346 x	=	
	S15	.12	.346 x	=	
	S16	.13	.361 x	=	
	E1	.12	.346 x	=	
	E2	.14	.374 x	=	
	E3	.15	.387 x	=	
	E4	.15	.387 x	=	
			$(\sqrt{\Delta P})_{avg.}$	=	

$Md = .44(\%CO_2) + .32(\%O_2) + .28(\%N_2 + \%CO)$

$.44(\%CO_2) = .44 \times (\quad) =$

$.32(\%O_2) = .32 \times (\quad) =$

$.28(\%N_2 + \%CO) = .28 \times (\quad + \quad) =$

$\therefore Md = $ _____ $\frac{lb}{lb\text{-mole dry}}$

Bwo = _____ %

$Ms = Md\ (1 - Bwo/100) + .18\ Bwo$

$\frac{lb}{lb\text{-mole}}$ (wet)

Ms = _____ $\frac{lb}{lb\text{-mole}}$ (wet)

$Ts_{avg.}$ = _____ F

+ 460

$Ts_{avg.}$ = _____ R

Ps _____ in. Hg

Notes: 1) Md = Mol. Wt. Dry
2) Md = 28.967 lb/lb-mole for std. dry air
3) Ms = Mol. Wt. corrected for moisture

1) For combustion and high moisture processes:

$$(Vs)_{avg.} = 85.48\ Fs\ (\sqrt{\Delta P})_{avg.} \sqrt{\frac{ts_{avg.} + 460}{Ps\ Ms}}$$

Where: Fs = 1 for std. pitot
Fs = .84 for special pitot (Type S)

$\therefore (Vs)_{avg.}$ = _____ ft/sec.

2) For normal exhausts:

For standard pitot $(Vs)_{avg.} = 2.90 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460}$ = _____ ft/sec

For special pitot $(Vs)_{avg.} = 2.46 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460}$ = _____ ft/sec

VELOCITY (Vs) CALCULATION

ROSSNAGEL & ASSOCIATES INC.

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704/392-1300

Job Carolina Stalite

Test Orange Kiln - Exhaust

Calculations by WDT

Approved by WDT

Date 5/17/88

Run No.	Pos. No.	ΔP	$\sqrt{\Delta P}$	θ (Min.)	Weighted $\sqrt{\Delta P}$
3-0	E5	.16	.400x		=
	E6	.16	.400x		=
	E7	.16	.400x		=
	E8	.17	.412x		=
	E9	.15	.387x		=
	E10	.15	.387x		=
	E11	.15	.387x		=
	E12	.15	.387x		=
	E13	.17	.412x		=
	E14	.15	.387x		=
	E15	.15	.387x		=
	E16	.12	.346x		=
				x	=
				x	=
				x	=
				x	=
				x	=
				x	=
				x	=
				x	=
				$(\sqrt{\Delta P})_{avg.}$	= .385

$Md = .44(\%CO_2) + .32(\%O_2) + .28(\%N_2 + \%CO)$

$.44(\%CO_2) = .44 \times (\quad) =$

$.32(\%O_2) = .32 \times (\quad) =$

$.28(\%N_2 + \%CO) = .28 \times (\quad + \quad) =$

$\therefore Md = 29.05 \frac{lb}{lb\text{-mole dry}}$

$Bwo = 3.2\ \%$

$Ms = Md\ (1 - Bwo/100) + .18\ Bwo$

$\frac{lb}{lb\text{-mole}}$ (wet)

$Ms = 28.70 \frac{lb}{lb\text{-mole}}$ (wet)

$Ts_{avg.} = 169 + 460 = 629\ R$

Ps 28.86 in. Hg

Notes: 1) Md = Mol. Wt. Dry
2) Md = 28.967 lb/lb-mole for std. dry air
3) Ms = Mol. Wt. corrected for moisture

1) For combustion and high moisture processes:

$$(Vs)_{avg.} = 85.48\ Fs\ (\sqrt{\Delta P})_{avg.} \sqrt{\frac{ts_{avg.} + 460}{Ps\ Ms}}$$

Where: Fs = 1 for std. pitot
Fs = .84 for special pitot (Type S)

$\therefore (Vs)_{avg.} = 24.09$ ft/sec.

2) For normal exhausts:

For standard pitot $(Vs)_{avg.} = 2.90 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460} =$ _____ ft/sec

For special pitot $(Vs)_{avg.} = 2.46 \sqrt{\Delta P_{avg.}} \times \sqrt{ts + 460} =$ _____ ft/sec

Job # 4341
Lab #
Job Name Caroline Stolite

Date 5/7/80
Made By WDT
Checked By WDT

ROSSNAGEL & ASSOCIATES INC.
Engineering & Testing Consultants
MID-ATLANTIC DIVISION
3619 INTERSTATE 85 SOUTH
CHARLOTTE, N. C. 28208
704/392-1300

Description Per Cent Efficiency Calculation

$$\%\,Efficiency = \frac{lb/hr\ Inlet - lb/hr\ Outlet}{lb/hr\ Inlet} \times 100$$

DRY CATCH

Run #	lb/hr Inlet	lb/hr Outlet	%E
1	787.5	5.6	99.3
2	673.5	9.7	98.6
3	713.9	10.8	98.5

Total

Run #	lb/hr Inlet	lb/hr Outlet	%E
1	798.8	9.0	98.9
2	691.4	11.2	98.4
3	755.5	15.3	99.0

ROSSNAGEL & ASSOCIATES INC
Engineering & Testing Consultants
MID-ATLANTIC DIVISION
3619 INTERSTATE 85 SOUTH
CHARLOTTE, N. C. 28208
704/392-1300

Customer Carolina Stalite
Location Gold Hill N.C.
Unit Orange - Inlet
Sketch (if applicable)

GAS FLOW COMPUTATION SHEET

Test No. 0 Test Team Flint / McCombs
Date 4/25/80
Barometer 29.35 in. Hg.

Dry Bulb ___ F.	Time 5:20 AM/PM	Pitot Type S
Wet Bulb ___ F.	SP ± 2.1 in WG / in Hg	Fs for Pitot .84

	INLET			OUTLET	
	SAMPLING POINT	V_p in. W.G.	$\sqrt{V_p}$	Temp. t_s F.	Velocity fpm
1.	6E	.13	.36	—	
2.	5I	.14	.37	340	
3.	4E	.13	.36	—	
4.	3E	.12	.35	340	
5.	2E	.12	.35	341	
6.	1E	.10	.32	—	
7.	6S	.11	.33	339	
8.	5S	.12	.35	340	
9.	4S	.12	.35	—	
10.	3S	.12	.35	342	
11.	2S	.11	.33		
12.	1S	.12	.35	340	
					Total
			.35	340	Avg.

Form #RA-15S

Formulae & Calculations:

1. t_s (Avg.) = 340 + 460 = 800 T_s (Rankin)
2. Duct Area = A = $\frac{(5)^2\pi}{}$ = 10.57 sq. ft.
3. P_s = Barometer ± SP = 29.30 in. Hg.
4. * G. D. = $\rho_s \left(\frac{530}{T_s}\right)\left(\frac{P_s}{29.92}\right)$ = .048 lbs./cu. ft
5. * K = Constant = $\frac{1096.5}{\sqrt{G.D.}}$ = 4979.4
6. * V = Velocity = $K.F_s\sqrt{V_{PAVG.}}$ 1146919 ft/min.
7. * VOLUME average = AV = 18,401.8 ACFM
8. SCFM = Volume $\left(\frac{530}{T_s}\right)\left(\frac{P_s}{2992}\right)$ = 11,897.8 SCFM

* Continuous calculation, do not clear calculator

Dry Bulb ___ F.	Time ___ AM/PM	Pitot Type ___
Wet Bulb ___ F.	SP ± ___ in WG / in Hg	Fs for Pitot ___

	INLET			OUTLET	
	SAMPLING POINT	V_p in. W.G.	$\sqrt{V_p}$	Temp. t_s F.	Velocity fpm
					Total
					Avg.

1. t_s (Avg.) = ___ + 460 = ___ T_s (Rankin)
2. Duct Area = A = ___ = ___ sq. ft.
3. P_s = Barometer ± SP = ___ in. Hg.
4. * G. D. = $\rho_s \left(\frac{530}{T_s}\right)\left(\frac{P_s}{29.92}\right)$ = ___ lbs/cu. ft.
5. * K = Constant = $\frac{1096.5}{\sqrt{G.D.}}$ ___
6. * V = Velocity = $K F_s \sqrt{V_{PAVG.}}$ ___ ft/min.
7. * VOLUME average = AV = ___ ACFM
8. SCFM = Volume $\left(\frac{530}{T_s}\right)\left(\frac{P_s}{29.92}\right)$ = ___ SCFM

ρ_s = Spec. Wt. of Air = .075 lbs/ft³

ROSSNAGEL & ASSOCIATES Southeastern Division
234 Route 70 250 Arizona Avenue N.E.
Medford, N. J. 08055 Atlanta, Georgia 30307
(609) 654-1441

Calculated by WHF Approved by ___ Date 4/28/80

Customer Carolina Stalite
Location Gold Hill, N.C.
Unit Orange System
Sketch (if applicable)
Outlet $B_a = 3.25$

GAS FLOW COMPUTATION SHEET

Test No. #2 Test Team Westland
Date 4/29/80 Weather Sunny
Barometer 28.84 in. Hg.

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Southeastern Division
250 Arizona Avenue N.E.
Atlanta, Georgia 30307

Form #RA-15S Page 40

	INLET				OUTLET				
Dry Bulb 166 F.	Time 5:00 AM/PM	Pitot Type Spec.		Dry Bulb ___ F.	Time ___ AM/PM	Pitot Type ___			
Wet Bulb 96 F.	SP ± .04 in WG / in Hg	F_s for Pitot .84		Wet Bulb ___ F.	SP ± ___ in WG / in Hg	F_s for Pitot ___			
	SAMPLING POINT	V_p in. WG	$\sqrt{V_p}$	Temp. t_s F.	Velocity fpm	SAMPLING POINT	V_p in. WG	$\sqrt{V_p}$	Temp. t_s F.	Velocity fpm
1.	51	.118	.346	1153		513	.111	.1332	167	
2.	2	.113	.360	1153		14	.112	.1346	166	
3.	3	.115	.387	158		15	.110	.1316	166	
4.	4	.116	.400	161		16	.110	.1316	166	
5.	5	.116	.400	162		E1	.109	.1300	155	
6.	6	.119	.436	164		2	.110	.1316	156	
7.	7	.117	.412	165		3	.112	.1346	159	
8.	8	.118	.424	165		4	.115	.1387	161	
9.	9	.113	.360	166		5	.113	.1346	163	
10.	10	.112	.346	166		6	.116	.1400	164	
11.	11	.111	.332	167		7	.116	.1400	165	
12.	12	.112	.1346	167		8	.115	.1387	166	
		11.540	5242	Total						Total
		.360	164	Avg.						Avg.

Formulae & Calculations:

1. t_s (Avg.) = 164 + 460 = 624 T_s (Rankin)
2. Duct Area = A = $\frac{71.5 \times 71.5 \times \pi}{4 \times 144}$ = 27.88 sq. ft.
3. P_s = Barometer ± SP = 28.84 in. Hg.
4. * G. D. = $\rho_s \left(\frac{530}{T_s}\right)\left(\frac{P_s}{29.92}\right)$ = .0614 lbs./cu. ft
5. * K = Constant = $\frac{1096.5}{\sqrt{G.D.}}$ ← .12478 = .4425
6. * V = Velocity = $K F_s \sqrt{V_{P_{AVG.}}}$ 1338 ft/min.
7. * VOLUME average = A×V = 37,307 ACFM
8. SCFM = Volume $\left(\frac{530}{T_s}\right)\left(\frac{P_s}{29.92}\right)$ = 37,307 SCFM

* Continuous calculation, do not clear calculator.

1. t_s (Avg.) = ___ + 460 = ___ T_s (Rankin)
2. Duct Area = A = ___ = ___ sq. ft.
3. P_s = Barometer ± SP = ___ in. Hg.
4. * G. D. = $\rho_s \left(\frac{530}{T_s}\right)\left(\frac{P_s}{29.92}\right)$ = ___ lbs/cu. ft.
5. * K = Constant = $\frac{1096.5}{\sqrt{G.D.}}$ ← ___ = ___
6. * V = Velocity = $K F_s \sqrt{V_{P_{AVG.}}}$ ___ ft/min.
7. * VOLUME average = A×V = ___ ACFM
8. SCFM = Volume $\left(\frac{530}{T_s}\right)\left(\frac{P_s}{29.92}\right)$ = ___ SCFM

ρ_s = Spec. Wt. of Air = .075 lbs/ft³

Calculated by AW Approved by ___ Date 4/29/80

Customer Guilford Shelter
Location Chapel Hill, N.C.
Unit Orange unit
Sketch (if applicable)
Outlet

GAS FLOW COMPUTATION SHEET

Test No. 02 Test Team Westbrook
Date 4/28/80 Wynn
Barometer ____ in. Hg. Spruill

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Charlotte, N. C. 28204
Southeastern Division
250 Arizona Avenue N.E.
Atlanta, Georgia 30307

Form #RA-15S

	Dry Bulb ___ F. / Wet Bulb ___ F.	Time ___ : ___ AM PM	SP + ___ in WG / ___ in Hg	Pitot Type ___ / Fs for Pitot ___

	INLET				OUTLET				
	SAMPLING POINT	V_p in. W.G.	$\sqrt{V_p}$	Temp. t_s F.	Velocity fpm	SAMPLING POINT	V_p in. W.G.	$\sqrt{V_p}$	Temp. t_s F.	Velocity fpm
1.	E 9	.115	.387	167						
2.	10	.115	.387	168						
3.	11	.117	.412	168						
4.	12	.115	.387	168						
5.	13	.117	.412	168						
6.	14	.115	.387	168						
7.	15	.116	.400	167						
8.	16	.115	.387	167						
9.										
10.										
11.										
12.					Total					Total
					Avg.					Avg.

Formulae & Calculations:

1. t_s (Avg.) = ____ + 460 = ____ T_s (Rankin)
2. Duct Area = A = ____ = ____ sq. ft.
3. P_s = Barometer ± SP = ____ in. Hg.
4. * G. D. = $\rho_s \left(\frac{530}{T_s}\right)\left(\frac{P_s}{29.92}\right)$ = ____ lbs./cu. ft.
5. * K = Constant = $\frac{1096.5}{\sqrt{G.D.}}$ = ____
6. * V = Velocity = $K F_s \sqrt{V_{P AVG.}}$ = ____ ft/min.
7. * VOLUME average = AV = ____ ACFM
8. SCFM = Volume $\left(\frac{530}{T_s}\right)\left(\frac{P_s}{29.92}\right)$ = ____ SCFM

* Continuous calculation; do not clear calculator

ρ_s = Spec. Wt. for Air = .075 lbs/ft³

Calculated by ____ Approved by ____ Date 4/29/80

Page 4/1

ROSSNAGEL & ASSOCIATES INC.
Engineering & Testing Consultants
MID-ATLANTIC DIVISION
3619 INTERSTATE 85 SOUTH
CHARLOTTE, N. C. 28208
704/392-1300

Customer Carolina Stalite
Location Red Hill, NC.
Unit Orange Toilet
Sketch (if applicable)
Damper Not Set

GAS FLOW COMPUTATION SHEET

Test No. 2 Test Team Fink
Date 4/29/80 M Combs
Barometer _____ in. Hg.

	INLET			OUTLET	
	Dry Bulb ___ F.	Time ___ AM PM	Pitot Type S		
	Wet Bulb ___ F.	SP ± 1.1 in WG in Hg	F_s for Pitot .84		
	SAMPLING POINT	V_p in. W.G.	$\sqrt{V_p}$	Temp. t_s F.	Velocity fpm
1.	6 E	.05	.22	380	
2.	5	.05	.22	381	
3.	4	.05	.22	383	
4.	3	.04	.20	383	
5.	2	.04	.20	—	
6.	1	.00	0	—	
7.	6	.05	.22	390	
8.	5	.06	.24	393	
9.	4	.06	.24	388	
10.	3	.06	.24	380	
11.	2	.06	.24	—	
12.	1	.05	.22		
					Total
		.055	380		Avg.

	INLET			OUTLET	
	Dry Bulb ___ F.	Time ___ AM PM	Pitot Type ___		
	Wet Bulb ___ F.	SP ± ___ in WG in Hg	F_s for Pitot ___		
	SAMPLING POINT	V_p in. W.G.	$\sqrt{V_p}$	Temp. t_s F.	Velocity fpm
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
					Total
					Avg.

Formulae & Calculations:

1. t_s (Avg.) = 380 + 460 = 840 T_s (Rankin)
2. Duct Area = A = $12^2\pi$ = 1.57 sq.ft.
3. P_s = Barometer ± SP = 29.80 in. Hg.
4. * G. D. = $\rho_s \left(\frac{530}{T_s}\right)\left(\frac{P_s}{29.92}\right)$ = .1046 lbs./cu.ft
5. * K = Constant = $\frac{1096.5}{\sqrt{G.D.}}$ = 585.6
6. * V = Velocity = $K F_s \sqrt{V_{P AVG.}}$ 877.1 ft/min.
7. * VOLUME average = AxV = 11,025.1 ACFM
8. SCFM = Volume $\left(\frac{530}{T_s}\right)\left(\frac{P_s}{29.92}\right)$ = _____ SCFM

* Continuous calculation, do not clear calculator

1. t_s (Avg.) = _____ + 460 = _____ T_s (Rankin)
2. Duct Area = A = _____ = _____ sq. ft.
3. P_s = Barometer ± SP = _____ in. Hg.
4. * G. D. = $\rho_s \left(\frac{530}{T_s}\right)\left(\frac{P_s}{29.92}\right)$ = _____ lbs/cu. ft.
5. * K = Constant = $\frac{1096.5}{\sqrt{G.D.}}$ = _____
6. * V = Velocity = $K F_s \sqrt{V_{P AVG.}}$ _____ ft/min.
7. * VOLUME average = AxV = _____ ACFM
8. SCFM = Volume $\left(\frac{530}{T_s}\right)\left(\frac{P_s}{29.92}\right)$ = _____ SCFM

ρ_s = Spec. Wt. of Air = .075 lbs/ft³

Calculated by WHT Approved by _____ Date 4/29/80

Form #RA-15S Page 42

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Atlanta, Georgia 30307

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Engineering & Testing Consultants
Air - Water - Noise
234 Rt. 70 • Medford, N.J. 08055

JOB Carolina Stalite
LOCATION Gold Hill, N.C.
DATE 4/28/80

% MOISTURE CALCULATION

Form #Rt-55 F

	CONDENSATE METHOD #									WET & DRY BULB METHOD					REMARKS
	V_m (ft^3)	t_m (°F)	P_b ("Hg)	$P_b - P_m$ ("Hg)	V.P. of WATER @ t_m ("Hg)	V_w CONDEN-SATE (ml)	$V_v = .00267 \frac{V_w \times T_m}{P_b - P_m}$ (T_m = 460 + °F)	$M_m = \frac{V.P. \times V_m}{P_b - P_m}$	Q % MOISTURE $= \frac{V_v + M_m}{V_v + V_m} \times 100$	t_{DRY} (°F)	t_{WET} (°F)	V.P. of WATER @ t_{DRY} ("Hg)	% RELATIVE HUMIDITY ##	% MOISTURE $\frac{V.P. \times \%R.H}{P_s}$	
1										166	96	11.12	8.5	3.3	orange system
2															
3															
4															
5															
6															
7															
8															
9															

Data by _____ Calculations by _____

Approved by _____

Pb = Barometric Pressure ("Hg) ABS.
Pm = Suction at Meter ("Hg)
With EPA train use $P_b + \Delta H/13.6$
$V_{lc} = V_w$
# = WP-50 Method
V.P. = Vapor Pressure
= From Psychometric chart, R.H. = % Vapor Pressure
Q = % Moisture by Volume
Do not use Mm when water is used in impingers and silica gel is used

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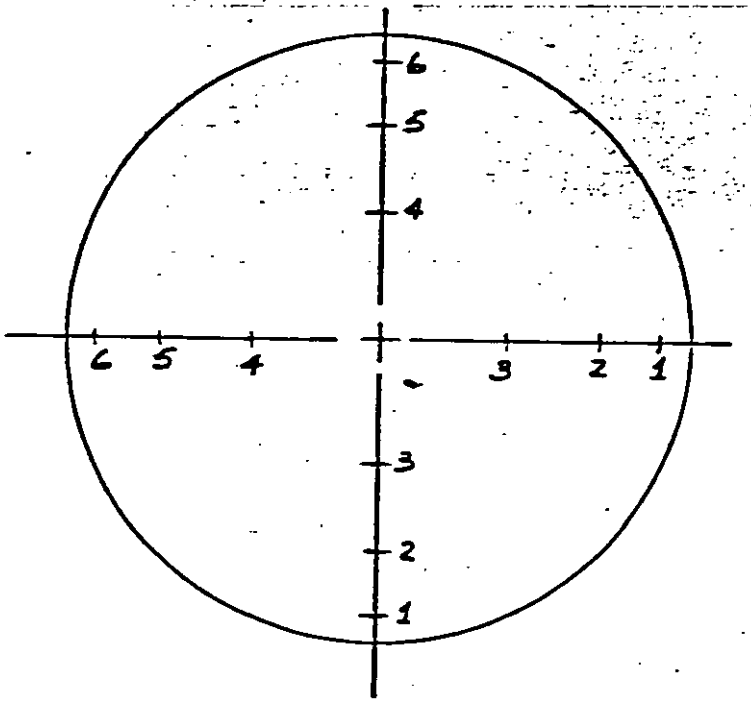
Engineering & Testing Consultants
MID-ATLANTIC DIVISION
3619 INTERSTATE 85 SOUTH
CHARLOTTE, N. C. 28208
704/392-1300

Job Name Carolina Stalite
Location Gold Hill, N.C.
Unit Orange - Inlet

Date 4/28/80
Made by WDF
Checked by _____

Description EQUAL AREA CALCULATIONS

ROUND DUCT - SIX POINT TRAVERSE PER DIAMETER



Stack I.D.= 48 In.		
Point No.	% of Diameter	Distance (Inches)
1	4.4	2.1
2	14.7	7.1
3	29.5	14.2
4	70.6	33.8
5	85.3	40.9
6	95.6	45.9

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South Euclid, Ohio

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Southeastern Division
250 Arizona Avenue N.E.
Atlanta, Georgia 30307

ROSSNAGEL & ASSOCIATES INC.
Engineering & Testing Consultants
MID-ATLANTIC DIVISION
3619 INTERSTATE 85 SOUTH
CHARLOTTE, N. C. 28208
704/392-1300

ISOKINETICS BY CALCULATOR

Company: Carolina Stalite
Unit: Orange - Inlet

Made by: WDT
Date: 4/28/80

$$\Delta H = KV_p$$

$$K = 599.6188\ \Delta H@\ D_n^4\ (1-Bwo)\left(\frac{T_m}{T_s}\right)\left(\frac{P_s}{P_m}\right)$$

Run #	1			
ΔH@	2.25	2.25	2.25	2.25
D_n, in.	.25	.375	.3125	.3125
D_n^4	.004	.0198	.0095	.0095
Bwo $\left(\frac{\%H_2O}{100}\right)$	.07	.07	.07	.07
T_m(R)	540	540	540	530
T_s(R)	800	800	800	~~980~~ 1020
P_s/P_m	1	1	1	1
K	3.4	16.8	8.0	6.2

.375
.0198
460
540
980
1020
460
380
840
6
15.7

ΔH@ = Calibration factor for orifice
D_n = Diameter of nozzle
Bwo = Assumed % H_2O
T_m = Assumed meter temperature, R.
T_s = Assumed stack temperature, R.
$\frac{P_s}{P_m}$ = Assumed pressure correction factor (usually 1.0).

Form #RA-292

V

DATA SHEETS

Events Logs

Sampling Data Sheets

Temperature Data Sheets

Impinger Data Sheets

Orsat-Gas Analysis Reports

Calibration Data Sheets

Lab Reports

Carolina Stalite JOB

Cowhill N.C. LOCATION

DAY Monday

DATE 4/28/80

Recorded by [illegible]

EVENTS LOG

TIME	EVENT
4:00	Test Team arrived at site and began equipment set-up on Outlet
5:00	Traverse
6:00	leak check
7:30	secured Equipment & left site

ISOKINETIC PARAMETE

t_m = ____
$\%H_2O$ = ____ } C = ____
P_s/P_M = ____

t_s = ____ THEO. = ____
NOZZLE = ____ PITOT = ____

t_m = ____
$\%H_2O$ = ____ } C = ____
P_s/P_M = ____

t_s = ____ THEO = ____
NOZZLE = ____ PITOT = ____

VISITORS LOG

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Danto Enviro. Consultants
4022 Stonehaven Rd.
South Euclid, Ohio

ROSSNAGEL & ASSOCIATES
Engineering & Testing Consultants
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Form #RA-28-1B

Carolina Stalite JOB
Cold Hill, S.C. LOCATION

DAY Tuesday
DATE 4/29/80
RECORDED BY WDT

EVENTS LOG

TIME	EVENT
7:48AM	Test team arrive @ plt site
	Fink, McCombs, Westbrook, Wyatt, Spratlin.
8:10	Recheck sampling parameters
8:30	Kiln off line - Change Drive Motor
9:05	Restart Kiln
9:40	2nd set of traverse measurements
10:25	Fred Drew set system Damper
11:10	Begin Run 1
12:13 PM	End Run #1. Leak Rate = .043 cfm @ 15"
1:33	Begin Run 2
2:44	End Run 2 Leak CK OK
3:20	Begin Run 3
4:32	End Run #3. Leak check OK
4:45	Pack Equipment in Van
5:00	Talk w/ Mr. Newsome
5:50	Leave plt. site

VISITORS LOG
Charles Newsome
Frank Clay EPA OAQPS
Jeff Shular MidWest Research Inst
Mike Landis
Ron Haynes

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3619 INTERSTATE 85 SOUTH
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704/392-1300

Carolina Stalite JOB

Gold Hill N.C. LOCATION

DAY Tuesday

DATE 4/20/83

Recorded by JRT

EVENTS LOG

TIME	EVENT
7:50	Test team arrived at site and completed equiptment set-up.
8:05	leak check O.K. - Ready to test. Drum not Running
9:00	Drum Running w/ 1 30min. to stabalize
9:30	Retraverse - low flow - approx ½ flow of day before.
10:30	Decision made by stalite to test.
11:10	START Run # 1-0
12:17	END Run # 1-0
1:30	START Run # 2-0
1:52	STOP Run - process down - coal Feed to burner blocked
2:02	Resume Run # 2-0
2:47	END Run # 2-0
3:30	START Run # 3-0
4:37	END Run # 3-0
	Clean equiptment, packed + left site

ISOKINETIC PARAMETE

t_m = ____
$\%H_2O$ = ____ } C = ____
P_s/P_m = ____

t_s = ____ THEO. = ____
NOZZLE = ____ PITOT = ____

t_m = ____
$\%H_2O$ = ____ } C = ____
P_s/P_m = ____

t_s = ____ THEO = ____
NOZZLE = ____ PITOT = ____

VISITORS LOG

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Medford, NJ - Atlanta, GA - Charlotte, NC

SAMPLING DATA SHEET

Data by: WOF

JOB: Carolina Stalite DATE: 4/29/80 TEST NO. 02

UNIT SAMPLED Orange - Inlet

PROCESS OPERATING CONDITIONS See Seperate Log

Run 1-3

Time	Sampling Point	Line V_1 in. Hg	t_m Dry Gas Meter t_1	t_m Dry Gas Meter ✓	t_s Stack Temp.	V_p Pitot Rdg.	ΔH_{pm} Orifice Rdg.	V_m Dry Gas Meter Rdg.	Remarks
11:10	6E	4	70		320	.12	.96	000.5	Begin Run
:15	5	4	70		341	.12	.96	2.55	
:20	4	4	70		350	.12	.96	4.57	
:25	3	3	72		332	.09	.72	7.08	
:30	2	3	73		—	.08	.64	9.26	
:35	1	4	74		—	.10	.80	11.25	
:40	—	Shut down - Change Port						13.41	
11:43	6S	4	76		343	.11	.88	13.41	
:48	5S	4	77		352	.11	.88	15.82	
:53	4S	5	79		379	.13	1.0	18.25	
:58	3S	4	81		333	.09	.72	20.83	
12:03	2S	4	82		—	.08	.64	23.04	
:08	1S	4	83		—	.11	.88	25.11	
:13	—	Shut down - End Run						27.52	
Δt= 40							ΔV_m=	27.22	

Barometric Pressure: ___ in. Hg.A
Static Pressure: ___ in. Hg.
Static Pressure: ___ in. W.G.
Dry Gas Meter S/N MAO-2
Orifice S/N ___
Vacuum Pump S/N ___
Filter, ~~Thimble~~ S/N: MAO 1089

Sample Train Used

■ EPA Method 5 ☐ ASTM
☐ EPA Method 6/8 ☐ Other

Pre-Test Leak Check

< .005 ft.^{3} @ 15 "Hg. for 60 secs.

Post-Test Leak Check

< .043 ft.^{3} @ 12 "Hg. for 60 secs.

Opacity/Ringlemann: Max. NA
Avg. NA

Odor: Extreme

Orsat # 231 @ 11:56 AM

Evac. Cyl. # — @ —

Isokinetic Parameters

Calib. Factor ___
t_m= ___ F
% H_2O= ___
P_s/P_m= ___
C = ___
K: 8.0
Nozzle Dia. ___
t_s = ___
Theo. Pitot= ___

Notes:

* indicates change in isokinetics

Note: Avg. t_1 and t_2 to determine Avg. t_m

Avg. t_m = ___ = 75.6 F

Avg. P_m (ΔH) = ___ = .8367 W.G. ÷ 13.6 = .061 "Hg.

V_m = V_m x 1.00 = 27.22 cu.ft.

ROSSNAGEL & ASSOCIATES

Engineering & Testing Consultants

Medford, NJ - Atlanta, GA - Charlotte, NC

SAMPLING DATA SHEET

Data by: WJF

JOB: Carolina Stalite DATE: 4/29/80 TEST NO. 2

UNIT SAMPLED Orange - Inlet

PROCESS OPERATING CONDITIONS See Seperate log (23 ton/hr product) 7100 lbs coal

Run 2-I

Time PM	Sampling Point	Line V_l in. Hg	t_m Dry Gas Meter t_i	t_m Dry Gas Meter t_2	t_s Stack Temp.	V_p Pitot Rdg.	ΔH_{pm} Orifice Rdg.	V_m Dry Gas Meter Rdg.	Remarks
1:38	1E	2	86		375	.11	.88	29.06	Begin Run
:38	5E	2	85		384	.12	.96	31.44	
:43	4E	2	87		329	.11	.88	33.97	
:48	3E	1	88		324	.05	.40	36.38	
1:53	—	Shut down	Process					39.86	
2:01	2E	1	88		325	.09	.72	37.46	Remove
2:07	1E	1	89		318	.09	.72	40.09	
:12	—	Shut down	Change Point				1.8	42.22	
2:14	6S	2	90		308	.13	1.8	43.22	
:19	6S	2	91		329	.13	1.0	44.82	
:24	4S	2	92		328	.13	1.0	47.41	
:29	3S	2	94		329	.13	1.0	50.00	
:34	2S	2	94		333	.11	.88	52.60	
:39	1S	2	95		—	.11	.88	55.00	
:44	—	Shut down	End Run					57.40	
Std	6D						ΔH_m=	28.34	

5 min/pt

Barometric Pressure: ___ in. Hg.A
Static Pressure: ___ in. Hg.
Static Pressure: ___ in. W.G.
Dry Gas Meter S/N MAO-2
Orifice S/N ___
Vacuum Pump S/N ___
Filter, ~~Thimble~~ S/N: SEO 31135

Sample Train Used

- [x] EPA Method 5
- [ ] ASTM
- [ ] EPA Method 6/8
- [ ] Other: ___

Pre-Test Leak Check

<.02 ft.^{3} @ 12 "Hg. for 60 secs.

Post-Test Leak Check

<.02 ft.^{3} @ 5 "Hg. for 60 secs.

Opacity/Ringlemann: Max. NA
Avg. NA

Odor: Eyetum

Orsat # 234 @ 2:27

Evac. Cyl. # NA @ —

Isokinetic Parameters

Calib. Factor ___
t_m= ___ F
% H_2O= ___
P_s/P_m= ___
C = ___
K= 8.0
Nozzle Dia. ___
t_s = ___
Theo. Pitot= ___

Notes: Rain + Hail

* indicates change in isokinetics

Note: Avg. t_1 and t_2 to determine Avg. t_m

Avg. t_m = ___ = 89.9 F

Avg. P_m (ΔH) = ___ = .86 W.G. ÷ 13.6 = .063 "Hg.

V_{std} = V_m x ___ = ___ cu.ft.

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SAMPLING DATA SHEET

Data by: WDT

JOB: Carolina Stalite DATE: 4/29/80 TEST NO. 02

UNIT SAMPLED Orange - Inlet

PROCESS OPERATING CONDITIONS See separate log

Run 3-I

Time PM	Sampling Point	Line V_l in. Hg	t_m Dry Gas Meter t_1	t_m Dry Gas Meter ~~t_2~~	t_s Stack Temp	V_p Pitot Rdg.	ΔH_{pm} Orifice Rdg.	V_m Dry Gas Meter Rdg.	Remarks
3:30	6E	3	86		318	.12	.96	57.94	Begin Run
:35	5E	3	88		323	.13	1.0	60.39	
:40	4E	3	89		322	.13	1.0	62.90	
:45	3E	3	90		315	.11	.88	65.50	
:50	2E	2	91		—	.08	.64	67.88	
:55	1E	3	91		—	.09	.72	69.84	
4:00	—	Shutdown	Change Probe					71.93	
:02	6S	3	92		324	.14	1.1	71.93	Resume
:07	5S	4	93		324	.14	1.1	74.58	
:12	4S	4	94		325	.13	1.0	77.22	
:17	3S	3	95		320	.10	.72	79.82	
:22	2S	3	95		—	.11	.88	81.98	
:27	1S	3	96			.11	.88	84.35	
:32	—	Shutdown - End Run						86.77	
Δt=	60						ΔV_m=	28.83	

5 min/pt

Barometric Pressure: ___ in. Hg.A
Static Pressure: ___ in. Hg.
Static Pressure: ___ in. W.G.
Dry Gas Meter S/N MAO-2
Orifice S/N ___
Vacuum Pump S/N ___
Filter, ~~Thimble~~ S/N: ___

Sample Train Used

■ EPA Method 5 ☐ ASTM
☐ EPA Method 6/8 ☐ Other

Pre-Test Leak Check

< .015 ft.^{3} @ 12 "Hg. for 60 secs.

Post-Test Leak Check

< .005 ft.^{3} @ 6 "Hg. for 60 secs.

Opacity/Ringlemann: Max. NA
Avg. NA

Odor: Extreme

Orsat # 261 @ 4:05 pm

Evac. Cyl. # NA @ ___

Isokinetic Parameters

Calib. Factor ___
t_m= ___ F
% H_2O= ___
P_s/P_m= ___
C = ___
Nozzle Dia. ___
t_s = ___
Theo. Pitot= ___
K = 8.0

Notes:

* indicates change in isokinetics

Note: Avg. t_1 and t_2 to determine Avg. t_m

Avg. t_m = ___ = 91.5 F

Avg. $P_m(\Delta H)$ = ___ = .91 W.G. ÷ 13.6 = .067 Hg.

V_E = V_m × ___ = ___ cu.ft.

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SAMPLING DATA SHEET

Data by: [illegible]

JOB: Carolina Stalite DATE: 4/29/80 TEST NO. 01

UNIT SAMPLED Orange System

PROCESS OPERATING CONDITIONS - SEE SEPARATE LOG

Run 1-0

Time	Sampling Point	Line V_l in. Hg	t_m Dry Gas Meter t_1	t_m Dry Gas Meter t_2	t_s Stack Temp.	V_p Pitot Rdg.	ΔH / P_m Orifice Rdg.	V_m Dry Gas Meter Rdg.	Remarks
11:10	S1	3.5	62	/	173	.09	1.02	723.93	START R.=22
11:12	S2	4.0	62	/	181	.12	1.35	724.94	
11:14	S3	5.5	62	/	184	.16	1.78	725.14	
11:16	S4	5.5	63	/	185	.16	1.78	726.38	
11:18	S5	5.5	64	/	187	.15	1.68	727.73	
11:20	S6	6.5	64	/	187	.15	1.68	729.06	
11:22	S7	6.5	66	/	187	.18	1.99	730.36	
11:24	S8	5.5	67	/	186	.15	1.68	731.78	
11:26	S9	5.5	68	/	187	.15	1.68	733.10	
11:28	S10	5.0	70	/	186	.14	1.57	734.42	
11:30	S11	4.5	70	/	185	.12	1.35	735.69	
11:32	S12	4.5	71	/	184	.12	1.35	736.88	
11:34	S13	4.5	72	/	184	.12	1.35	738.04	
11:36	S14	4.5	73	/	183	.12	1.35	739.22	
11:38	S15	5.0	75	/	182	.13	1.46	740.39	
11:40	S16	5.0	76	/	181	.13	1.46	741.61	
11:42	SHUT DOWN		CHANGE PORTS					742.83	STOP
11:45	E1	3.0	75	/	171	.08	.91	742.83	RESUME
11:47	E2	5.0	76	/	174	.13	1.46	743.76	
11:49	E3	5.5	77	/	178	.15	1.68	744.95	

Continued on next page

* indicates change in isokinetics

Note: Avg. t_1 and t_2 to determine Avg. t_m

Barometric Pressure: 28.68 in. Hg.A
Static Pressure: ___ in. Hg.
Static Pressure: -.04 in. W.G.
Dry Gas Meter S/N SEO [illegible]
Orifice S/N [illegible]
Vacuum Pump S/N [illegible]
Filter, Thimble S/N: SEO 31195

Sample Train Used

☒ EPA Method 5 ☐ ASTM
☐ EPA Method 6/8 ☐ Other

Pre-Test Leak Check
<.005 ft.³ @ 15.5 "Hg. for 60 secs.
p.h.f - o.k.

Post-Test Leak Check
< ___ ft.³ @ ___ "Hg. for ___ secs.

Opacity/Ringlemann: Max. ___
Avg. ___

Odor: Noticeable

Orsat # NO @ 11:52

Evac. Cyl. # ___ @ ___

Isokinetic Parameters

Calib. Factor .995
t_m = 70 F
% H_2O = 3
P_s/P_m = 1.0
C = .131
Nozzle Dia. = 5/16-2
t_s = 170
..Theo. Pitot = .965

Notes: t_s = 181.1875

Avg. t_m = 73.1/1 = 73.1563 F

Avg. P_m (ΔH) = 1.6003 W.G. ÷ 13.6 = .1177 "Hg.

V_m = V_m x ___ = ___ cu. ft.

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SAMPLING DATA SHEET

Data by: BHT

JOB: Carolina Stalite DATE: 4/29/80 TEST NO. 01

UNIT SAMPLED Orange System

PROCESS OPERATING CONDITIONS: SEE SEPARATE LOG

Run 1-0

Time	Sampling Point	Line V_i in. Hg	t_m Dry Gas Meter t_1	t_m Dry Gas Meter t_2	t_s Stack Temp.	V_p Pitot Rdg.	ΔH Orifice Rdg.	V_m Dry Gas Meter Rdg.	Remarks
11:51	E4	5.5	78	/	179	.15	1.68	746.27	
11:53	E5	6.0	79	/	180	.16	1.78	747.60	
11:55	E6	6.0	79	/	180	.16	1.78	748.98	
11:57	E7	6.0	79	/	181	.16	1.78	750.35	
11:59	E8	6.5	79	/	180	.18	1.99	751.79	
12:01	E9	5.5	79	/	180	.15	1.68	753.17	
12:03	E10	6.0	79	/	180	.17	1.89	754.53	
12:05	E11	6.0	79	/	179	.16	1.78	755.73	
12:07	E12	6.0	79	/	179	.16	1.78	757.31	
12:09	E13	5.5	79	/	179	.15	1.68	758.69	
12:11	E14	5.0	79	/	179	.14	1.57	760.09	
12:13	E15	6.0	80	/	180	.16	1.78	761.35	
12:15	E16	5.0	80	/	177	.13	1.46	762.70	
12:17	SHUTDOWN - END RUN							763.97	END RUN
.64	$=\Delta T$	/	/	/	/	/	/	90.09	$=\Delta V_m$

Barometric Pressure: 28.88 in. Hg.A
Static Pressure: ____ in. Hg.
Static Pressure: -.04 in. W.G.
Dry Gas Meter S/N SEO-12
Orifice S/N ____
Vacuum Pump S/N ____
Filter, ~~Thimble~~ S/N: SEO-31195

Sample Train Used

☒ EPA Method 5 ☐ ASTM
☐ EPA Method 6/8 ☐ Other

Pre-Test Leak Check

< ___ ft.^{3} @ ___ "Hg. for ___ secs.

Post-Test Leak Check

< .001 ft.^{3} @ 11 "Hg. for 60 secs.
pitot - o.k.

Opacity/Ringlemann: Max. ____
Avg. ____

Odor: ____

Orsat # NO # @ 11:52

Evac. Cyl. # ___ @ ___

Isokinetic Parameters

Calib. Factor ____
t_m = ____ F
% H_2O = ____
P_s/P_m = ____
Nozzle Dia. ____
t_s = ____
..Theo. Pitot = ____

C = ____

Notes:

* indicates change in isokinetics

Note: Avg. t_1 and t_2 to determine Avg. t_m

Avg. t_m = ____ = ____ F

Avg. P_m (ΔH) = ____ = ____ W.G. ÷ 13.6 = 29.77 "Hg.

V_m ____ = V_m ____ x ____ = ____ cu.ft.

Form #RA-16N Page 5-5

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ROSSNAGEL & ASSOCIATES

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SAMPLING DATA SHEET

Data by: BMD

JOB: Conlin Static DATE: 4/29/80 TEST NO. 01

UNIT SAMPLED Orange System

PROCESS OPERATING CONDITIONS SEE SEPARATE 206

Run 2-0

Time	Sampling Point	Line V_l in. Hg	t_m Dry Gas Meter t_1	t_m Dry Gas Meter t_2	t_s Stack Temp.	V_p Pitot Rdg.	ΔH Orifice P_m Rdg.	V_m Dry Gas Meter Rdg.	Remarks
1:30	S1	5.5	68	/	162	.12	1.35	766.14	START Run
1:32	S2	6.5	68	/	165	.15	1.68	767.32	
1:34	S3	7.0	67	/	168	.16	1.78	768.60	
1:36	S4	7.0	67	/	170	.16	1.78	769.93	
1:38	S5	8.0	68	/	172	.18	1.99	771.28	
1:40	S6	7.0	69	/	173	.16	1.78	772.70	
1:42	S7	7.5	70	/	173	.17	1.89	774.10	
1:44	S8	7.0	71	/	174	.16	1.78	775.48	
1:46	S9	6.5	72	/	171	.14	1.57	776.85	
1:48	S10	3.0	73	/	168	.06	.68	778.15	
1:50	S11	3.0	73	/	168	.06	.68	779.11	
1:52	SHUT	DOWN-	Process	Down				779.93	STOP
2:02	S12	6.0	70	/	167	.13	1.46	779.93	Resume
2:04	S13	6.0	70	/	173	.13	1.46	781.14	
2:06	S14	6.0	71	/	173	.14	1.57	782.36	
2:08	S15	5.5	71	/	172	.12	1.35	783.62	
2:10	S16	5.5	72	/	171	.12	1.35	784.83	STOP
2:12	SHUT	DOWN-	CHANGE	PARTS				786.00	STOP-
2:15	E1	5.5	70	/	163	.12	1.35	786.00	Resume
2:17	E2	6.0	70	/	170	.14	1.57	787.19	

page 1 of 2

Barometric Pressure: 28.82 in. Hg. A

Static Pressure: ___ in. Hg.

Static Pressure: -.04 in. W.G.

Dry Gas Meter S/N SED-M

Orifice S/N

Vacuum Pump S/N

Filter, Thimble S/N: 3115

Sample Train Used

☒ EPA Method 5 ☐ ASTM

☐ EPA Method 6/8 ☐ Other

Pre-Test Leak Check

< .02 ft.^{3} @ 16 "Hg. for 60 secs.

p.d - O.K.

Post-Test Leak Check

< ___ ft.^{3} @ ___ "Hg. for ___ secs.

Opacity/Ringlemann: Max. ___

Avg. ___

Odor: none detected

Orsat # A @ 1.42

Evac. Cyl. # ___ @ ___

Isokinetic Parameters

Calib. Factor 2.25

t_m = 90 F

% H_2O = 3

P_s/P_m = 1.0

C = 1.34

Nozzle Dia. 5/16 - 2

t_s = 180

Theo. Pitot = .165

Notes: t_s = 172.7188

Continued on next page

* indicates change in isokinetics

Note: Avg. t_1 and t_2 to determine Avg. t_m

Avg. t_s = 171.5312 F

Avg. P_m (ΔH) = 1.6081 W.G. ÷ 13.6 = .1182 "Hg.

$V_{m_{std}} = V_m \times$ ___ = ___ cu. ft.

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Medford, NJ - Atlanta, GA - Charlotte, NC

SAMPLING DATA SHEET

Data by: BD

JOB: Carolina Stalite DATE: 4/29/80 TEST NO. 01

UNIT SAMPLED Orange System

PROCESS OPERATING CONDITIONS SEE SEPARATE LOG

Run 2-0

Time	Sampling Point	Line V_l in. Hg.	t_m Dry Gas Meter t_1	t_m Dry Gas Meter t_2	t_s Stack Temp.	V_p Pitot Rdg.	ΔH P_m Orifice Rdg.	V_m Dry Gas Meter Rdg.	Remarks
2:19	E3	6.0	70	/	173	.14	1.57	788.46	766.14
2:21	E4	7.0	70	/	175	.16	1.78	789.72	
2:23	E5	7.0	71	/	176	.16	1.78	791.06	
2:25	E6	7.0	71	/	177	.16	1.78	792.43	
2:27	E7	8.0	72	/	178	.18	1.99	793.80	
2:29	E8	8.0	72	/	178	.18	1.99	795.23	
2:31	E9	7.0	73	/	178	.16	1.78	796.69	
2:33	E10	7.0	74	/	178	.16	1.78	798.06	
2:35	E11	7.0	74	/	178	.16	1.78	799.44	
2:37	E12	7.0	75	/	178	.16	1.78	800.80	
2:39	E13	7.0	76	/	178	.15	1.68	802.18	
2:41	E14	7.0	76	/	177	.16	1.78	803.52	
2:43	E15	6.5	77	/	176	.14	1.57	804.90	
2:45	E16	6.0	78	/	174	.12	1.35	806.20	
2:47	SHUT DOWN - END RUN							807.92	END RUN
64	ΔT	/	/	/	/	/	/	41.38	$=\Delta V_m$

page 2 of 2

Barometric Pressure: 28.82 in. Hg.A
Static Pressure: ___ in. Hg.
Static Pressure: -.04 in. W.G.
Dry Gas Meter S/N SCD-12
Orifice S/N
Vacuum Pump S/N
Filter, ~~Thimble~~ S/N: 31155

Sample Train Used

☒ EPA Method 5 ☐ ASTM
☐ EPA Method 6/8 ☐ Other

Pre-Test Leak Check

< ___ ft.^{3} @ ___ "Hg. for ___ secs.

Post-Test Leak Check

< .01 ft.^{3} @ 9 "Hg. for 60 secs.
pitot-ok.

Opacity/Ringlemann: Max. ___
Avg. ___

Odor: noticeable

Orsat # A @ 1:42

Evac. Cyl. # ___ @ ___

Isokinetic Parameters

Calib. Factor ___
t_m = ___ F
% H_2O = ___
P_s/P_m = ___
Nozzle Dia. ___
t_s = ___
Theo. Pitot = ___
C = ___

Notes:

* indicates change in isokinetics

Note: Avg. t_1 and t_2 to determine Avg. t_m

Avg. t_m = ___ = ___ F

Avg. P_m (ΔH) = ___ = ___ W.G. ÷ 13.6 = ___ "Hg.

V_m = V_m x ___ = ___ cu.ft.

Form #RA-16N

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SAMPLING DATA SHEET

Data by: MD

JOB: Conlon Stadium DATE: 4/20/80 TEST NO. 01

UNIT SAMPLED Orange System

PROCESS OPERATING CONDITIONS SET SEPARATE LOG

Run 3-C

Time	Sampling Point	Line V_l in. Hg	t_m Dry Gas Meter t_1	t_m Dry Gas Meter t_2	t_s Stack Temp.	V_p Pitot Rdg.	ΔH / P_m Orifice Rdg.	V_m Dry Gas Meter Rdg.	Remarks
3:30	S1	4.0	65	/	156	.10	1.12	807.68	start run
3:32	S2	5.0	66	/	165	.14	1.57	808.75	
3:34	S3	6.0	66	/	167	.16	1.78	809.98	
3:36	S4	6.5	67	/	169	.18	1.99	811.33	
3:38	S5	6.5	68	/	170	.18	1.99	812.77	
3:40	S6	7.0	68	/	170	.19	2.08	814.22	
3:42	S7	6.5	69	/	170	.18	1.99	815.73	
3:44	S8	6.0	70	/	170	.17	1.89	817.15	
3:46	S9	5.5	70	/	170	.15	1.68	818.56	
3:48	S10	5.5	71	/	170	.15	1.68	819.90	
3:50	S11	4.5	71	/	170	.13	1.46	821.24	
3:52	S12	5.0	72	/	169	.14	1.57	822.47	
3:54	S13	4.5	72	/	169	.13	1.46	823.76	
3:56	S14	4.5	73	/	168	.12	1.35	824.98	
3:58	S15	4.5	74	/	168	.12	1.35	826.19	
4:00	S16	4.5	75	/	167	.13	1.46	827.37	
4:02	SHUT DOWN - CHANGE PORTS							828.59	stop
4:05	E1	4.5	74	/	163	.12	1.35	828.58	Resume
4:07	E2	5.0	75	/	166	.14	1.57	829.75	
4:09	E3	5.5	76	/	168	.15	1.68	831.03	

Continued on next page

* indicates change in isokinetics

Note: Avg. t_1 and t_2 to determine Avg. t_m

Barometric Pressure: 28.82 in. Hg.A
Static Pressure: ____ in. Hg.
Static Pressure: -.04 in. W.G.
Dry Gas Meter S/N SED-12
Orifice S/N ____
Vacuum Pump S/N ____
Filter, ~~Thimble~~ S/N: SED 3116

Sample Train Used

☒ EPA Method 5 ☐ ASTM
☐ EPA Method 6/8 ☐ Other

Pre-Test Leak Check
< .015 ft.^{3} @ 15 "Hg. for 60 secs.
p.t.f. - o.k.

Post-Test Leak Check
< ___ ft.^{3} @ ___ "Hg. for ___ secs.

Opacity/Ringlemann: Max. ____
Avg. ____

Odor: ____

Orsat # 238 @ 3.98

Evac. Cyl. # ____ @ ____

Isokinetic Parameters

Calib. Factor 2.25
t_m = 70 F
% H_2O = 3
P_s/P_m = 1.0
C = 7.37
Nozzle Dia. 5/16-1
t_s = 170
∴ Theo. Pitot = .16

Notes: t_s = 169.1250

Avg. t_m = ____ = 79.7813

Avg. P_m (ΔH) = ____ = 1.6641 W.G. ÷ 13.6 = 1224 "Hg.

V_m = V_m x ____ = ____ cu.ft.

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ROSSNAGEL & ASSOCIATES

Engineering & Testing Consultants

Medford, NJ - Atlanta, GA - Charlotte, NC

SAMPLING DATA SHEET

Data by: RJR

JOB: Carolina Stalite DATE: 4/21/80 TEST NO. 01

UNIT SAMPLED Orange System

PROCESS OPERATING CONDITIONS SEE SEPARATE LOG

Run 3-0

Time	Sampling Point	Line V_i in. Hg	t_m Dry Gas Meter t_1	t_m Dry Gas Meter t_2	t_s Stack Temp	V_p Pitot Rdg.	ΔH Orifice Rdg.	V_m Dry Gas Meter Rdg.	Remarks
4:11	E4	5.5	77	/	169	.15	1.68	832.35	807.68
4:13	E5	6.0	78	/	169	.16	1.78	833.40	
4:15	E6	6.0	78	/	169	.16	1.78	835.06	
4:17	E7	6.0	79	/	170	.16	1.78	836.44	
4:19	E8	6.0	80	/	170	.17	1.89	837.82	
4:21	E9	5.5	80	/	171	.15	1.68	839.25	
4:23	E10	5.5	81	/	172	.15	1.68	840.60	
4:25	E11	5.5	82	/	172	.15	1.68	841.94	
4:27	E12	5.5	82	/	173	.15	1.68	843.35	
4:29	E13	6.0	83	/	173	.17	1.89	844.63	
4:31	E14	5.5	83	/	174	.15	1.68	846.03	
4:33	E15	5.0	84	/	173	.15	1.68	847.40	
4:35	E16	4.5	84	/	172	.12	1.35	848.75	
4:37	SHUT DOWN-		END		RUN			849.98	END run
64-DT	/	/	/	/	/	/	/	42.30	=ΔV_m

Barometric Pressure: 28.82 in. Hg. A
Static Pressure: ____ in. Hg.
Static Pressure: -.04 in. W.G.
Dry Gas Meter S/N 5600-12
Orifice S/N "
Vacuum Pump S/N "
Filter, ~~Thimble~~ S/N: 31165

Sample Train Used

☒ EPA Method 5 ☐ ASTM
☐ EPA Method 6/8 ☐ Other

Pre-Test Leak Check
< ___ ft.^{3} @ ___ "Hg. for ___ secs.

Post-Test Leak Check
< .001 ft.^{3} @ 9 "Hg. for 60 secs.
pitot -0.4.

Opacity/Ringlemann: Max. ____
Avg. ____

Odor: ____

Orsat # 238 @ 3.14B

Evac. Cyl. # — @ ____

Isokinetic Parameters

Calib. Factor ____
t_m = ____ F
% H_2O = ____
P_s/P_m = ____
Nozzle Dia. ____
t_s = ____
Theo. Pitot = ____

C = ____

Notes:

* indicates change in isokinetics

Note: Avg. t_1 and t_2 to determine Avg. t_m

Avg. t_m = ____ = ____ F

Avg. P_m (ΔH) = ____ = ____ W.G. ÷ 13.6 = ____ "Hg.

V_{mc} = V_m x ____ = ____ cu. ft.

Job Name Caroina Stalure

ROSSNAGEL & ASSOCIATES

Date April 29

Location Gold Hill NC.

Engineering & Testing Consultants
Air - Water - Noise
234 Rt. 70 • Medford, N.J. 08055

Made by CES

Unit Orange

Checked by WDF

Description -TEMPERATURE DATA-

Run # 2B	Time or Pt.	% CO_2	Hot Box Temp. F.	Exit Gas Temp. F.	Run # 3	Time or Pt.	% CO_2	Hot Box Temp. F.	Exit Gas Temp. F.	Run # 3B	Time or Pt.	% CO_2	Hot Box Temp. F.	Exit Gas Temp. F.
1	2:15	1.5	255	60	1	3:30	1.5	275	56	1	4:05	1.5	300	60
2	2:17		255	60	2	3:32		275	58	2	4:07		300	60
3	2:19	1.5	260	60	3	:34	1.5	280	58	3	:09	2.0	300	59
4	:21		270	58	4	:36		285	58	4	:11		300	58
5	:23	1.5	280	59	5	:38	1.5	285	60	5	:13	2.0	300	58
6	:25		290	60	6	:40		295	60	6	:15		300	58
7	:27	1.5	290	60	7	:42	1.5	290	63	7	:17	2.0	300	58
8	:29		290	60	8	:44		290	62	8	:19		300	58
9	:31	1.5	295	60	9	:46	2.0	290	63	9	:21	2.0	290	58
10	:33		295	61	10	:48		290	63	10	:23		290	58
11	:35	1.5	290	61	11	:50	1.5	295	61	11	:25	2.0	290	58
12	:37		290	61	12	:52		295	59	12	:27		280	58
13	:39	1.5	295	61	13	:54	1.5	290	60	13	:29	2.0	275	58
14	:41		295	61	14	:56		295	60	14	:31		275	58
15	:43	1.5	295	61	15	:58	1.5	300	60	15	:33	2.0	275	58
16	2:45		295	61	16	4:00		300	58	16	4:35		275	58
	:					:					:			
	:					:					:			
	:					:					:			
	:					:					:			
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	:					:					:			
	:					:					:			

Job Name Carolina Stalite — ROSSNAGEL & ASSOCIATES — Date April 29

Location Gold Hill, NC — Made by ZS

Unit ORANGE — Checked by WDF

Engineering & Testing Consultants
Air - Water - Noise
234 Rt. 70 • Medford, N.J. 08055

Description -TEMPERATURE DATA-

2 minutes

Run # 1A	Time or Pt.	% CO_2	Hot Box Temp. F.	Exit Gas Temp. F.	Run # 1B	Time or Pt.	% CO_2	Hot Box Temp. F.	Exit Gas Temp. F.	Run # 2	Time or Pt.	% CO_2	Hot Box Temp. F.	Exit Gas Temp. F.
1	11:25	1.5	275	42	1	11:45	2.0	280	40	1	1:30	1.5	260	54
2	11:32	"	275	42	2	11:47	"	285	40	2	1:32	"	260	54
3	:34	1.5	275	40	3	11:49	2.0	285	40	3	:34	1.5	260	54
4	:36	"	275	40	4	:51	ORSAT	285	40	4	:36	"	260	53
5	:38	2.0	275	40	5	:53	2.0	280	40	5	:38	1.5	265	54
6	:40	"	275	40	6	:55	"	275	40	6	:40	ORSAT	275	56
7	:42	1.5	275	40	7	:57	1.5	275	39	7	:42	1.5	280	58
8	:44	"	275	40	8	:59	"	270	39	8	:44	"	280	58
9	:46	2.0	275	40	9	12:01	1.5	265	38	9	:46	2.0	280	60
10	:48	"	275	40	10	:03	"	265	39	10	:48	"	280	60
11	:50	2.0	275	40	11	:05	1.5	265	38	11	:50	1.5	280	60
12	:52	"	275	40	12	:07	"	260	39	12	:	STOP	270	60
13	:54	1.5	275	40	13	:09	2.0	260	39	13	:	2.0	280	60
14	:56		280	40	14	:11		280	39	14	:		275	58
15	11:38	1.5	280	41	15	:13	2.0	275	40	15	:	2.0	275	60
16	11:40		280	42	16	12:15		275	41	16	:		275	60

Job Name Catlin State [illegible] Date 4/29/80

Location Cold H. 11

Unit ORIMDE - Inlet

Made by DTT

Checked by WDF

Engineering & Testing Consultants

MID-ATLANTIC DIVISION

3619 INTERSTATE 85 SOUTH

CHARLOTTE, N. C. 28208

704/392-1300

Description -TEMPERATURE DATA-

Run # 1	Time or Pt.	% CO_2	Hot Box Temp. F.	Exit Gas Temp. F.	Run # 3	Time or Pt.	% CO_2	Hot Box Temp. F.	Exit Gas Temp. F.	Run #	Time or Pt.	% CO_2	Hot Box Temp. F.	Exit Gas Temp. F.
1	=	—	300	68	E1	:	—	278	68		=			
2	=	—	290	69	2	:	—	250	67		=			
3	=	0	275	68	3	:		255	67		=			
4	=	0	274	66	4	:		255	65		=			
5	=	0	275	65	5	:		258	65		=			
6	=	—	269	67	6	=		259	65		=			
	=	CHANGE NOZ+			S1	=		260	70		=			
S1	=	—	270	69	2	=		255	70		=			
2	=	—	273	67	3	=		245	68		=			
3	=	0	268	67	4	:		245	67		=			
4	=	0	260	68	5	:		247	67		=			
5	=		262	68	6	:		250	67		=			
1 2	=		260	69		=					=			
	=					=					=			
#2	=	—		68		=					=			
1	=	—	240	68		=					=			
2	=	—	245	69		=					=			
3	=	0	250	68		=					=			
4	=	—	255	67		=					=			
5	=	—	240	70		=					=			
2	=	—	245	68		=					=			
1	=		240	70		=					=			
2	=		245	71		=					=			
3	=		245	69		=					=			
4	=		255	67		=					=			
5	=		260	67		=					=			
	=		260	69		=					=			
	=					=					=			
	=					=					=			

LOCATION Gold Hill, NC

UNIT ORANGE

IMPINGER DATA SHEET

Engineering & Testing Consultants

MID-ATLANTIC DIVISION

3619 INTERSTATE 85 SOUTH

CHARLOTTE, N. C. 28208

704/392-1300

RUN #		DATE	CYCLONE	CONTENTS OF IMPINGERS 1	2	3	4 (cc)	TOTAL CONDENSATE V_{lc} EPA	(OR V_w) WP-50	LOCATION & REMARKS
1-I	START	4/29/80	—	100 ml Dist H_2O	100 ml Dist H_2O	Dry	225 g SILGEL			
	END	—	—	120	94	1	246.4			
	Δ	—	—	+20	-6	+1	15.4	30.4	ml	
2-I	START	4/29/80	—	100 ml Dist H_2O	100 ml Dist H_2O	Dry	~~225~~ 180 SILGEL			
	END	—	—	126	98	1	174.0			
	Δ	—	—	+26	-2	+1	14.0	39	ml	
3-I	START	4/29/80	—	100 ml Dist H_2O	100 ml Dist H_2O	Dry	225 g silgel			
	END	—	—	129	99	1	239.2			
	Δ	—	—	+29	-1	+1	14.2	43.2	ml	
	START									
	END									
	Δ								ml	
	START									
	END									
	Δ								ml	

Data by _____ Approved by _____

JOB Carolina Stalite

LOCATION Gold Hill N.C.

UNIT Orange System

ROSSNAGEL & ASSOCIATES

Engineering & Testing Consultants
Air - Water - Noise
234 Rt. 70 • Medford, N.J. 08055

IMPINGER DATA SHEET

RUN #		DATE	CYCLONE	CONTENTS OF IMPINGERS 1	2	3	4 (cc)	TOTAL CONDENSATE V_{lc} EPA	(OR V_w) WP-50	LOCATION & REMARKS
1-0	START	4/20/80	—	100 ml Dist. H_2O	100 ml Dist. H_2O	Dry	180 gm sil Gel			
	END		—	108	102	0	191.7			
	Δ		—	+8	+2	0	11.7	21.7	ml	
2-0	START	4/20/80	—	100 ml Dist. H_2O	100 ml Dist. H_2O	Dry	180 gm sil Gel			
	END		—	106	100	0	195.1			
	Δ		—	+6	0	0	15.1	21.1	ml	
3-0	START	4/20/80	—	100 ml Dist. H_2O	100 ml Dist. H_2O	Dry	180 gm sil Gel			
	END		—	112	100	0	196.4			
	Δ		—	12	0	0	16.4	28.4	ml	
	START									
	END									
	Δ								ml	
	START									
	END									
	Δ								ml	

Data by _____ Approved by _____

ROSSNAGEL & ASSOCIATES INC.
Engineering & Testing Consultants
MID-ATLANTIC DIVISION
3619 INTERSTATE 85 SOUTH
CHARLOTTE, N. C. 28208
704/392-1300

ORSAT-GAS ANALYSIS REPORT (DRY BASIS)

Laboratory Report No. _____ Test Date 4/29/80

Test Report No. 4341 Job Name Carolina Stelite
Analyzed by ED Date 4/29/80
Checked by WDT Date WDT

LAB RECORD	RESULTS			REMARKS
	Reading	Difference	Percent	Run # 1-I
CYL. 251 TIME*				
Volume of sample	250			
Total volume measured	100			
Carbon dioxide	4.4	4.4	4.4	
Oxygen	19.4	15.0	15.0	
Carbon monoxide (by absorption)	19.4	0.0	0.0	
Nitrogen (by difference)	100	80.6	80.6	
CYL. 234 TIME*				Run # 2-I
Volume of sample	250			
Total Volume measured	100			
Carbon dioxide	2.6	2.6	2.6	
Oxygen	20.4	17.8	17.8	
Carbon monoxide (by absorption)	20.4	0.0	0.0	
Nitrogen (by difference)	100	79.6	79.6	
CYL. 261 TIME*				Run # 3-I
Volume of sample	250			
Total volume measured	100			Avgs.
Carbon dioxide	5.4	5.4	5.4	CO_2 = 4.1%
Oxygen	19.4	14.0	14.0	O_2 = 15.6%
Carbon monoxide (by absorption)	19.4	0.0	0.0	CO = 0.0%
Nitrogen (by difference)	100	80.6	80.6	N_2 = 80.3%

• Time sample taken in field

Midwestern Division
Danto Enviro. Consultants
4022 Stonehaven Rd.
South Euclid, Ohio.

Southeastern Division
250 Arizona Avenue N.E.
Atlanta, Georgia 30307

RUSSNAGEL & ASSOCIATES INC.

Engineering & Testing Consultants

MID-ATLANTIC DIVISION
3619 INTERSTATE 85 SOUTH
CHARLOTTE, N. C. 28208
704/392-1300

ORSAT-GAS ANALYSIS REPORT (DRY BASIS)

Laboratory Report No. _____ Test Date 4/29/80

Test Report No. 4341 Job Name Carolina Stalite
Analyzed by WDH/LED Date 4/29/80
Checked by WDH Date 5/2/80

LAB RECORD	RESULTS			REMARKS
	Reading	Difference	Percent	Run 1-0
CYL. 1-0 TIME*				
Volume of sample	250			
Total volume measured	100			
Carbon dioxide	21.8	21.8	21.8	
Oxygen	19.0	17.2	17.2	
Carbon monoxide (by absorption)	19.0	0.0	0.0	
Nitrogen (by difference)	100	81.0	81.0	
CYL. 2-0 TIME*				2-0
Volume of sample	250			
Total Volume measured	100			
Carbon dioxide	2.6	2.6	2.6	
Oxygen	19.2	16.6	16.6	
Carbon monoxide (by absorption)	19.2	0.0	0.0	
Nitrogen (by difference)	100	80.8	80.8	
CYL. 3-0 TIME*				3-0
Volume of sample	250			
Total volume measured	100			Avg.
Carbon dioxide	2.4	2.4	2.4	CO_2 = 2.3%
Oxygen	19.8	17.4	17.4	O_2 = 17.1 %
Carbon monoxide (by absorption)	19.8	0.0	0.0	CO = 0.0 %
Nitrogen (by difference)	100	80.2	80.2	N_2 = 80.6 %

* Time sample taken in field

Midwestern Division
Dante Enviro. Consultants
4022 Stonehaven Rd.
South Euclid, Ohio

Southeastern Division
250 Arizona Avenue N.E.
Atlanta, Georgia 30307

Lab # [illegible]
Job Name Carolina Stalite

Date 4/28/80
Made By RW/WJ
Checked By WJ

ROSSNAGEL & ASSOCIATES INC.

Engineering & Testing Consultants

MID-ATLANTIC DIVISION
3619 INTERSTATE 85 SOUTH
CHARLOTTE, N. C. 28208
704/392-1300

Description Nozzle Tip Calibration

Outlet 5/16 - SED-1	Inlet 5/16 - MAD-1
.312	.311
.312	.311
.313	.312
.312	.312
.312	.312
.313	.312
.312	.314
.311	.312
.312	.313
.312	.312
Avg = .312 inches	Avg = .312 inches

Lab # [illegible]
Job Name Carolina Stalite

Date
Made By Measurement Co
Checked By

ROSSNAGEL & ASSOCIATES INC.

Engineering & Testing Consultants

MID-ATLANTIC DIVISION
3619 INTERSTATE 85 SOUTH
CHARLOTTE, N. C. 28208
704/392-1300

Description Gas Meter Calibration

L-30-80 DATE

Company Meter Number	C	D	E (#1 Repair)	F (#2 Repair)	G (#3 Repair)	H (#4 Repair)	I (#5 Repair)	J (IN PROOF OPEN)	K (IN PROOF CHECK)	L (OUT PROOF OPEN)	M (OUT PROOF CHECK)	PURCHASE OR.	
S-190 Rockwell													
29753			✓	(3ED-12)						0	0	100.0	Y = 1.00
S-110 Rockwell													
10183411			✓							0	0	100.0	
9253165			✓	(MAD-2)						0	0	100.0	Y = 1.00

Measurement Control Gas Meter Repair Co.
875-2034
P.O. BOX 677
102 Main St.
HUNTERSVILLE, NORTH CAROLINA 28078

Job # 4341
Lab #
Job Name
Caroline Stelite

Date 4/30/80
Made By DM
Checked By WDT

ROSSNAGEL & ASSOCIATES INC.
Engineering & Testing Consultants
MID-ATLANTIC DIVISION
3619 INTERSTATE 85 SOUTH
CHARLOTTE, N. C. 28208
704/392-1300

Description Stack Temp. Thermocouple Calibration

Omega SE8-1 °F	Ω Labs °F	Omega MA0-2 °F
66	66	66
203	200	202
319	317	318
395	394	395

Calibrated in Drying Oven
Vs. Fisher 14-990-5E

Lab # [illegible]
Job Name Caroline Stelite

Date 7/30/80
Made By RS
Checked By WDT

ROSSNAGEL & ASSOCIATES INC.

Engineering & Testing Consultants

MID-ATLANTIC DIVISION
3619 INTERSTATE 85 SOUTH
CHARLOTTE, N. C. 28208
704/392-1300

Description Outlet gas thermometer Calibration

SEO-3	Glass	MAO-1
65°	64°	65°

Calibrated vs Fisher 14-990-5E

Lab #
Job Name
Carolina Stalite

Date 7/30/80
Made By RS
Checked By WDT

ROSSNAGEL & ASSOCIATES INC.
Engineering & Testing Consultants
MID-ATLANTIC DIVISION
3619 INTERSTATE 85 SOUTH
CHARLOTTE, N. C. 28208
704/392-1300

Description Meter Temp Calibration

SED-12 °F	@ less °F	MAD-1 °F
58	58	59
70	70	70
82	82	82
96	95	96
130	132	131

Calibration Vs. glass Thermometer
Fisher 14-990-5E

Lab # [illegible]
Job Name Caroline Stalite

Date 7/30/80
Made By DM
Checked By WDF

ROSSNAGEL & ASSOCIATES INC.
Engineering & Testing Consultants
MID-ATLANTIC DIVISION
3619 INTERSTATE 85 SOUTH
CHARLOTTE, N. C. 28208
704/392-1300

Description Hot Box Thermometer Calibration

Glass °F	Outlet SED-1 °F	Inlet SED-2 °F	Inlet MAD-2 °F
64	64	65	64
220	224	219	225
317	320	315	320

Calibrated vs. Fisher 14-990-5E

Customer Caroline Stalite
Cold Hill, NC

ROSSNAGEL & ASSOCIATES

Engineering & Testing Consultants
Air - Water - Noise

Job # 4341
Lab Report #
Sheet ___ of ___

Date Submitted: 4/30/80
Date Completed:

Results to be:
Phoned in
Written report ✓

Type and Number of Samples Submitted for Analysis:
6 Filters
6 Dry Catch

Specific Analysis Information (ie G.C. or THC Analysis):
NVA

Results:

Run #	Filter #	Final, g	Initial, g	Net gain, g
1-I	MAD 1069	1.5032	1.1037	.3995
2-I	SED 31135	2.8019	1.0654	1.7365
3-I	MAD 1093	2.8533	1.0986	1.7547
1-O	SED 31145	1.0329	1.0263	.0066
2-O	SED 31155	1.0426	1.0164	.0262
3-O	SED 31165	1.0176	1.0210	-.0034 *

Dry Catch

Run#	Beaker #	Final, g	Initial, g	Net gain, g
1-I	1-I	94.2421	77.3478	13.8943
2-I	2-I	88.7053	77.6177	12.0876
3-I	3-I	91.9304	80.3782	11.5522
1-O	1-O	81.5987	81.5528	.0459
2-O	2-O	79.9962	79.9284	.0678
3-O	3-O	79.6461	79.5379	.1082
Blank	BD	79.8671	79.8673	-.0002

* Section of filter in Dry Catch Wash

Notebook No. and Page:
SEE PROCEDURE #

The liability of ROSSNAGEL & ASSOCIATES and its divisions, with respect to the services charged for herein, shall in no event exceed the amount of the invoice.

Analyst: BM/WDT
Approved: WDT

Customer Caroline Stalite
Goldhill, N.C.

ROSSNAGEL & ASSOCIATES
Engineering & Testing Consultants
Air - Water - Noise

Job # 4341
Lab Report #
Sheet ___ of ___

Date Submitted: 4/30/80
Date Completed:

Results to be:
Phoned in
Written report V

Type and Number of Samples Submitted for Analysis:

6 Wet Catch

Specific Analysis Information (ie G.C. or THC Analysis):

NVR

Results:

Wet Catch

Run#	Beaker#	Final, g	Initial, g	Net gain, g
1-I	1-IW	81.6480	81.4431	.2049
2-I	2-IW	78.6856	78.3440	.3416
3-I	3-IW	79.5253	78.7497	.7756
1-O	3-O	79.6781	79.6461	.0320
2-O	2-OW	79.3780	79.3636	.0144
3-O	3-OW	77.7219	77.6785	.0434
Blank	BW	79.2163	79.2162	.0001

Notebook No. and Page:

SEE PROCEDURE #

Analyst: ED/WDF
Approved: WDF

Midwestern Division
Danto Enviro. Consultants
4022 Stoneybrook Rd
Mid-Atlantic Division
1217 Central Avenue
Southeastern Division
250 Arizona Avenue N.E.

APPENDIX

Copy of Notification Letter

Copy of N. C. Code, Paragraph .0511

New England Division
Gifford Precision Eng., Inc.
P. O. Box 1017
Middletown, Conn. 06457
(203) 346-1223
(603) 632-7567
Headquarters Division
234 Route 70
Medford, N. J. 08055
(609) 654-1441

ROSSNAGEL & ASSOCIATES INC.

Engineering & Testing Consultants

MID-ATLANTIC DIVISION
3619 INTERSTATE 85 SOUTH
CHARLOTTE, N. C. 28208
704/392-1300

Midwestern Division
Danto Enviro. Consultants
4022 Stonehaven Rd.
South Euclid, Ohio
(216) 382-1719

Southeastern Division
250 Arizona Avenue N.E.
Atlanta, Georgia 30307
(404) 377-4248

AIR - WATER - NOISE - INDUSTRIAL HYGIENE - ENERGY - WASTE

- STACK & EXHAUST TESTING
- DESIGN OF AIR / WATER / NOISE POLLUTION CONTROL SYSTEMS
- BACTERIA STUDIES
- SPECIFICATIONS / DRAWINGS
- WATER / WASTE WATER / BIOASSAYS
- CHEMICAL ANALYSES
- GAS CHROMATOGRAPHY & I.R.
- INDUSTRIAL HYGIENE (O.S.H.A.)

April 4, 1980

Mr. Mike Landis
North Carolina Department Economic Resources
Concord, NC 28025

Dear Mr. Landis:

This letter is to notify your office that ROSSNAGEL & ASSOCIATES, Mid-Atlantic Division, plans to conduct an Official Air Pollution Particulate Emission Test at Carolina Stalite in Gold Hill, NC. This test will be made on Tuesday, April 22, 1980. Our contact at the plant is Mr. Charles Newsome.

We will be making simultaneous determinations for particulates as per EPA Method 5 on the inlet and outlet of the Orange Kiln system.

You or members of your staff are invited to witness part or all of this test. Our test team will be arriving at the plant site on April 21, 1980 for equipment setup and should be ready to begin testing by 8:30 A.M. Tuesday, April 22, 1980.

Yours truly,

W. Dan Fink/kmw

W. Dan Fink
Division Manager

WDF/kmw
C: Mr. Charles Newsome, Carolina Stalite
Mr. W. B. Rossnagel, ROSSNAGEL & ASSOCIATES President
Mr. Richard Westbrook, Testing Manager, Southeastern Division, ROSSNAGEL & ASSOCIATES

For process rates between 1 and 30 tons per hour, excluding 10 tons per hour, maximum allowable emissions of particulate matter shall be calculated by the equation E = 4 times P to the 0.677 power where E = maximum allowable rate of emission of particulate matter in lbs./hour and P = actual process weight rate in tons/hour. For process rates between 30 and 1,000 tons per hour, excluding 100 tons per hour, maximum allowable emissions of particulate matter shall be calculated by the equation E = 20.421 times P to the 0.1977 power where E = maximum allowable rate of emission of particulate matter in lbs./hour and P = actual process weight rate in tons/hour. For process rates between 1,000 and 3,000 maximum allowable emissions for particulate matter shall be calculated by the equation E = 38.147 times P to the 0.1072 power where E = maximum allowable rate of emission of particulate matter in lbs./hour and P = actual process weight rate in tons/hour.

(b) The owner or operator of the plant shall maintain dust control of the plant premises and access roads by paving, oil treatment, or other suitable measures.

(c) All stone crushing operations shall employ a water spray over the crusher or other dust control devices as may be approved by the commission.

History Note: Statutory Authority G.S. 143-215.3(a)(1); 143-215.107(a)(5); Eff. February 1, 1976.

.0510 PARTICULATES: SAND, GRAVEL, CRUSHED STONE OPERATIONS

(a) No person shall cause, suffer, allow, or permit any material to be produced, handled, transported or stockpiled without taking measures to reduce to a minimum any particulate matter from becoming airborne, and in no case shall established ambient air-quality standards be exceeded at the property line.

(b) The owner or operator of the plant shall maintain dust control of the plant premises and access roads by paving, oil treatment, or other suitable measures.

(c) All stone crushing operations shall employ a water spray over the crusher.

History Note: Statutory Authority G.S. 143-215.3(a)(1); 143-215.107(a)(5); Eff. February 1, 1976.

.0511 PARTICULATES, SO(2) FROM LIGHTWEIGHT AGGREGATE PROCESSES

(a) No person shall cause, suffer, allow, or permit any material to be produced, handled, transported or stockpiled without taking measures to reduce to a minimum any particulate

matter from becoming airborne.

(b) The owner or operator of the plant shall maintain dust control of the plant premises and access roads by paving, oil treatment, or other suitable measures.

(c) All stone crushing operations shall employ a water spray over the crusher.

(d) All stacks serving kilns or dryers shall be equipped with air pollution control devices capable of collecting a minimum of 95 percent by weight of particulate matter and controlling the emission of sulfur dioxide to not more than 2.3 pounds per million BTU input.

History Note: Statutory Authority G.S. 143-215.3(a)(1); 143-215.107(a)(5); Eff. February 1, 1976; Amended Eff. April 1, 1977.

.0512 PARTICULATES FROM WOOD PRODUCTS FINISHING PLANTS

No person shall cause, suffer, allow, or permit particulate matter caused by the working, sanding, or finishing of wood to be discharged from any stack, vent, or building into the atmosphere without providing, as a minimum for its collection, adequate duct work and properly designed collectors, or such other devices as approved by the commission, and in no case shall established ambient air quality standards be exceeded at the property line.

History Note: Statutory Authority G.S. 143-215.3(a)(1); 143-215.107(a)(5); Eff. February 1, 1976.

.0513 CONTROL OF PARTICULATES FROM PORTLAND CEMENT PLANTS

All cement kilns shall be equipped with gas cleaning devices to reduce the particulate matter in the gas discharged to the atmosphere to not less than 99.7 percent of the particulate matter entering the gas cleaning device. However, particulate matter discharged to the atmosphere shall not exceed 0.327 pounds/barrel.

History Note: Statutory Authority G.S. 143-215.3(a)(1); 143-215.107(a)(5); Eff. February 1, 1976.

.0514 CONTROL OF PARTICULATES FROM FERROUS JOBBING FOUNDRIES

(a) No person shall cause, suffer, permit, or allow the emission of particulate matter which will exceed the limits specified in the following table from any ferrous jobbing foundry cupola in operation on or prior to January 1, 1972. Any foundry

DRAFT/WP
d3006-4/971130
03/30/92 1

DATA RATING : B
REF. 14 (AP-42)
REF. 4-14

Emission Test Report Review Checklist

Reviewer: R. MARINSHAW
Review Date: 11/18/92

A. Background Information

1. Facility name: CAROLINA STALITE
   Location: GOLD HILL, NC
2. Source category: LIGHTWEIGHT AGGREGATE
3. Test date: 4/29/80
4. Test sponsor: PLANT
5. Testing contractor: TOSSNAGEL & ASSOC
6. Purpose of test: COMPLIANCE
7. Pollutants measured

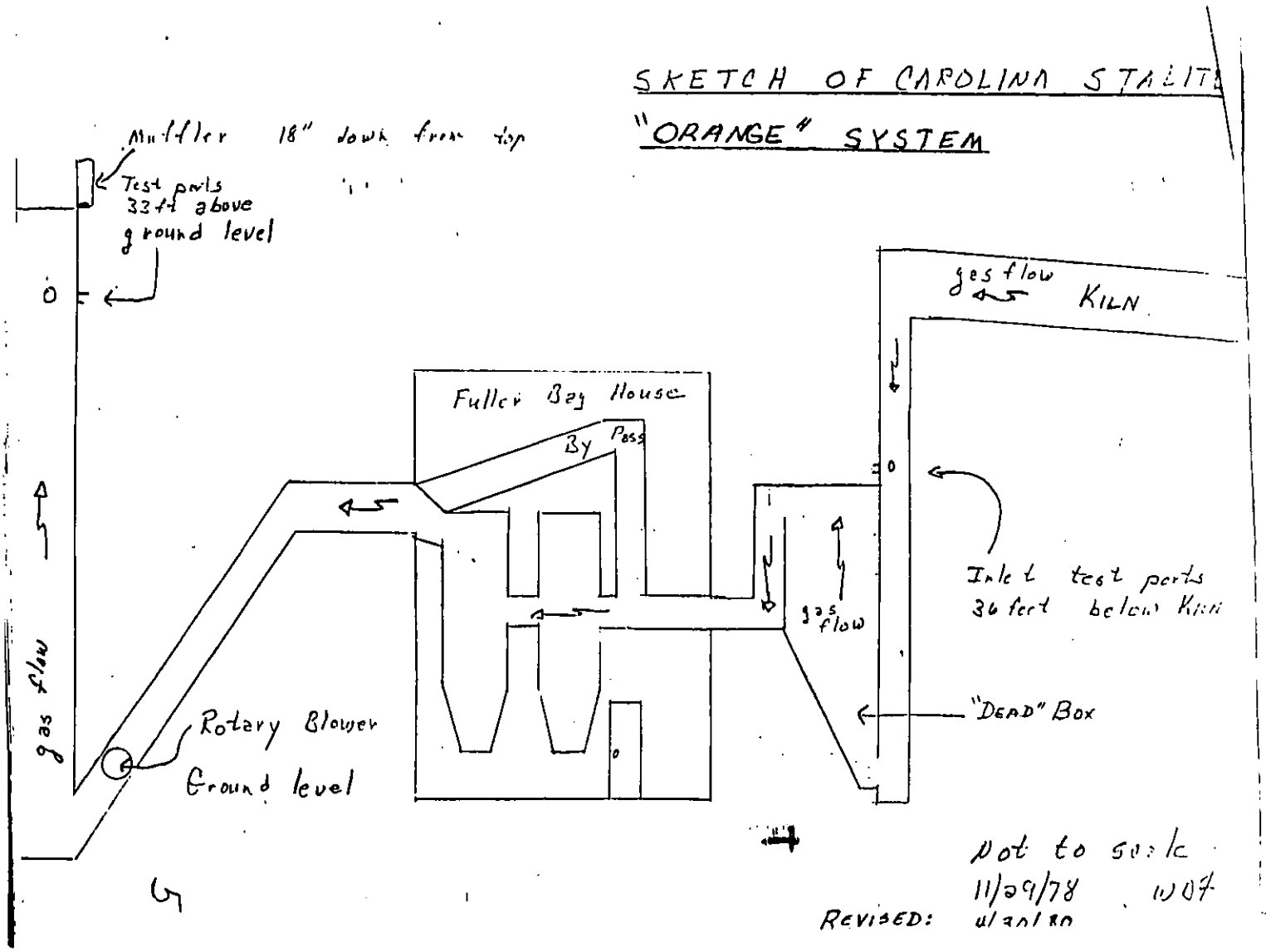
   (PM) PM-10 CO SO_2 NO_x VOC Pb (CO_2)

   Others (list):
8. Process overview: On an attached page provide a block diagram of the unit operations and associated air pollution control systems at the facility. Identify process tested with letters from the beginning of the alphabet (A, B, C, etc.) and APC systems with letters from end of alphabet (V, W, X, etc.). Also identify test locations with Arabic numerals (1,2,3, ...). Using the ID symbols from that sketch complete the table below that identifies processes or unit operations tested.

Test ID	Process	Process ID	Emissions tested		APCD (controlled emissions only)
			Uncontrolled	Controlled	
1	KILN (CONC)	A	✓		
2	KILN (CONC)	A		✓	BAGHOUSE

B. Process Information

1. Provide a brief narrative description of the process. With as much detail as possible, (e.g., if a furnace or conveyor system is used, identify the type of unit) describe the equipment used for those operations tested. (Note: If process description provided in test report is adequate, attach copy or reproduce here.)



2. For each process tested list feedstock materials and products. Indicate if activity factors are for feed (F) rate or product (P) rate.

Process ID	Feedstock materials	Products	Basis for activity factor	F/P
A	CLAY, COAL	LWA	CLAY	P/F

UNCLEAR

Basis for data: PG 3
(Indicate page/table Nos. in test report)

3. For each process or operation tested and each test run note process capacity and operating rate during test.

Process ID	Capacity	Units	Test run	Process rate	Units
A			1	23	tons/hr
			2	23	tons/hr
			3	23	tons/hr
			4		
			1		
			2		
			3		
			4		
			1		
			2		
			3		
			4		
			1		
			2		
			3		
			4		

1.05 tons/hr (COAL)
"
"

Basis for data: Pg. 3

C. Air Pollution Control Systems Tested

1. For each air pollution control system pollution control system identified in A.8, note the following

ID	Type of APCD	Manufacturer	Model No.

Note: Be as specific as possible in identifying APCD. For example, indicate "pulse jet fabric filter" rather than simply "fabric filter."

NO DATA

2. For each system identified above, provide a narrative description. For fugitive systems describe capture techniques as well as the removal techniques (use a separate page if necessary)

3. Using the attached parameter list for guidance complete the table below. (Use additional pages as needed.)

APCD ID	Parameter	Units	Readings			
			Run 1	Run 2	Run 3	Run 4
Type of APCD:						
Type of APCD:						
Type of APCD:						

NO DATA

D. Sampling and Analysis Methods

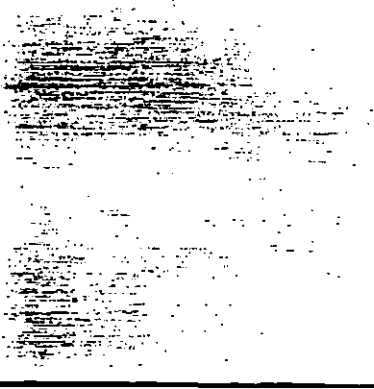
1. Complete the following table

Test location	Pollutant	S & A method	Reference/ conditional method	Deviations noted
1	PM	5	Y/N	Y/N
	CO2	ORSAT	Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
2	PM	5	Y/N	Y/N
	CO2	ORSAT	Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N

2. If a method used was not a reference or conditional method, provide a narrative discussion including any data manipulation needed to make results correspond to reference or conditional method results.

NO DATA

3. Describe any deviations identified above.



E. Emission Data Documentation

1. Tabulate the following stack gas data from the test report. (Use additional pages as needed.)

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	°F	344	336	321	
	Moisture	%	5.5	6.6	7.1	
	Oxygen		15	17.8	14	
	Volumetric flow, actual		17286	17565	17942	
	Volumetric flow, standard		10352	10479	10851	
	Percent isokinetic					
	Pollutant concentration:					
	PM (FILT)	gr SCFD	8.87	7.80	7.67	
	PM (COND. INORG)	"	0.127	0.200	0.447	
	CO_2	%	4.4	2.6	5.4	
2	Stack temperature	°F	181	173	169	
	Moisture		2.6	2.4	3.2	
	Oxygen		17.2	16.6	17.4	
	Volumetric flow, actual		39796	39528	40298	
	Volumetric flow, standard		30907	31150	31607	
	Percent isokinetic					
	Pollutant concentration:					
	PM (FILT)	gr/SCFD	0.0210	0.0363	0.0398	
	PM (COND. INORG.)	"	0.0128	0.0056	0.0165	
	CO_2	%	1.8	2.6	2.4	
	Stack temperature					
	Moisture					
	Oxygen					
	Volumetric flow, actual					
	Volumetric flow, standard					
	Percent isokinetic					
	Pollutant concentration:					

2. Tabulate pollutant mass flux rates

Test ID	Pollutant	Units	Mass flux rates			
			Run 1	Run 2	Run 3	Run 4
1	PM (FILT	lbs/hr.	788	674	714	
	PM (CON. INORG	"	11.3	17.9	41.6	
	CO_2	"	3140	1878	4040	
2	PM (FILT)	lbs/hr	5.6	9.7	16.8	
	PM (COND. INORG	"	3.4	1.5	41.5	
	CO_2	"	3835	5583	5244	

3. Present example emission factor calculations below.

	UNCONTROLLED	CONTROLLED
PM (FILTERABLE		
	788/23 = 34.3	5.6/23 = 0.24
	674/23 = 29.3	9.7/23 = 0.42
	714/23 = 31.0	10.8/23 = 0.89
	AVERAGE = 31.5	AVE = 0.52
PM (COND. INORG.)		
	11.3/23 = 0.49	3.4/23 = 0.15
	17.9/23 = 0.79	1.5/23 = 0.065
	41.6/23 = 1.81	4.5/23 = 0.20
	AVERAGE = 1.03	= 0.14
CO_2		
	3140/23 = 137	
	1878/23 = 82	
	4040/23 = 176	
	3835/23 = 167	
	5583/23 = 243	
	5244/23 = 228	
	AVERAGE = 172	

4. Tabulate emission factors

Process	Pollutant	Units	Average emission factor	
			Uncontrolled	Controlled
KILN	PM (FILT)	lbs/ton	31.5	0.52
	PM (COND. INOR)	"	1.03	0.4
	CO_2	"	172	

ATTACHMENT A
APCD PARAMETERS

Type of APCD	Parameters
Fabric filter	Cleaning mechanism Bag type Cleaning frequency Air to cloth ratio (A/C) Pressure drop Inlet temperature
ESP	Type (wet or dry) Number of fields Rapping cycle (if dry) Specific Collection Area (SCA) Particulate resistivity (if known) Spark rate Current and power levels
Venturi (or other high energy) scrubber	Pressure drop Liquid/gas (L/G) ratio Mist eliminator type
Packed-bed scrubber	Packing depth L/G ratio Caustic use (Y/N) pH Mist eliminator type
Carbon absorber	Bed depth Superficial gas velocity Bed temperature Desorption mechanism (media) Flue-gas moisture Cycle length Time-on-line after breakthrough