PARTICULATE EMISSIONS TEST
AND
AN OPACITY OF EMISSIONS DETERMINATION
FOR THE
CAR SHREDDING OPERATION

SOUTHERN SCRAP MATERIAL CO., LTD.
Port Allen Plant
Port Allen, Louisiana 70892-3069

Prepared By:

The Environmental Sciences and Engineering Department

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Incorporated
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Project No. 87011

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LIST OF ABBREVIATIONS

ACS	American Chemical Society
SS-P-1	(SS) Southern Scrap Material Co., Ltd: (P) Particulates; (1) Run #1
EPA	Environmental Protection Agency
NSPS	New Source Performance Standard
PSD	Prevention of Significant Deterioration

MEASUREMENT SYMBOLS

Deg. C	Degrees Centigrade
dcf	Dry cubic feet
DGM	Dry gas meter
DSCF	Dry standard cubic foot
dscf/min (DSCFM)	Dry standard cubic feet per minute
DSCF/MMBTU	Dry standard cubic feet per million British Thermal Units
Deg. F	Degrees Fahrenheit
fpm	Feet per minute
ft	Foot
gr/ACF	Grains per actual cubic foot
gr/dscf (gr/DSCF)	Grains per dry standard cubic foot
ID	Internal diameter
in	Inches
lb/dscf (lb/DSCF)	Pounds per dry standard cubic foot
lb/hr	Pounds per hour

lb/MMBTU	Pounds per million British Thermal Units
UG	Micrograms
Um	Micrometer
m	Meter
M	Thousand
mg	Milligram
min	Minute
mL	Milliliter
mm	Millimeter
MM	Million
nm	Nanometer
N/A	Non applicable
N	Normality, quatitative method for expressing the concentration of solutions
ppm	Parts per million
SES	Steam Electric Station
SS	Stainless Steel

CHEMICAL SYMBOLS

Ag	Silver
As	Arsenic
Ba	Barium
BaCl2*2H2O	Barium chloride dihydrate
Be	Beryllium
Cd	Cadmium
(CH3)2CHOH	Isopropanol
Cr	Chromium
Fe	Iron
Hg	Mercury
H2O	Distilled, deionized water
H2O2	Hydrogen peroxide
H2SO4	Sulfuric acid
KI	Potassium iodide
KMNO4	Potassium permanganate
KNO3	Potassium Nitrate
Mo	Molybdenum
Mn	Manganese
NaOH	Sodium Hydroxide
NaAsO2	Sodium Arsenite
Ni	Nickel
NOx	Nitrogen oxides
Pb	Lead
PDS	Phenoldisulfonic acid

CHEMICAL SYMBOLS
(continued)

Sb	Antimony
Se	Selenium
SO2	Sulfur dioxide
SO3	Sulfur trioxide
Tl	Thallium
V	Vanadium

1.0 INTRODUCTION

This study was performed pursuant to a request by Southern Scrap Material Company, Ltd.

Mr. B. J. Hunter, Jr. coordinated onsite tests with process operations.

The unit tested was a car shredding operation with a single stack which included a water scrubbing system to minimize the amount of particles being exhausted from Southern Scrap's facility in Port Allen, Louisiana. EPA Method 5 tests for particulates and EPA Method 9 for opacity of emissions determinations were utilized to quantify emissions. The data reported herein are intended to represent actual operating rates for the subject facility.

This final report was authored by Messrs. Lawrence R. Schumer, Senior Environmental Scientist, and Jeffrey M. Pujol, Scientific Technician, of Waldemar S. Nelson and Company, Incorporated.

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2.0 SUMMARY OF RESULTS

2.1 Particulate

The particulate tests, analyses and calculations conducted for this compliance determination were conducted utilizing EPA Method 5 (40 CFR 60, Appendix A) as a guideline. The results are intended to quantify normal operating emissions.

A single EPA Method 5 test was conducted on the stack exhausting emissions from a car shredding operation. The test consisted of three sample runs (SS-P-1, SS-P-2, and SS-P-3). A summary of results is presented in Table 2-1. The isokinetic rate for each run was within the 100 +/-10% allowable range. The emission rates were within the expected range and no test equipment malfunctions occurred which might render the data suspect. The test results provided good repeatability.

TABLE 2-1

SUMMARY OF RESULTS
PARTICULATE TEST
CAR SHREDDER

DATE	RUN NO.	PERCENT ISOKINETIC	METHOD 5 CONC. GR/DSCF
05-05-87	SS-P-1	93	0.016
05-06-87	SS-P-2	98	0.017
05-06-87	SS-P-3	98	0.018
AVERAGE:		96	0.017

2.2 Opacity of Emissions Determination

The opacity of emissions determinations and calculations were conducted utilizing EPA Method 9 (40 CFR 60, Appendix A) as a guideline.

Mr. R. Javier Acuna, a certified visible emissions observer, conducted the test. The common stack exhausting emissions was observed for fifteen (15) minutes on May 5, 1987 with observations recorded each fifteen (15) seconds, and was also observed for thirty-two (32) minutes on May 6, 1987 with observations recorded each fifteen (15) seconds.

The results are presented in Table 2-2.

TABLE 2-2

RESULTS
OPACITY OF EMISSIONS DETERMINATION
CAR SHREDDER

DATE	TIME (0000-2400)	DURATION (MIN.)	NUMBER OF OBSERVATIONS	AVERAGE OPACITY (%)
05-05-87	1522-1528	7	28	4.80
05-05-87	1530-1537	8	32	3.30
05-06-87	1555-1626	32	128	0.12
AVERAGE:				2.74

3.0 REGULATORY HISTORY

At the time of emissions testing, there was no existing permit for the subject facility.

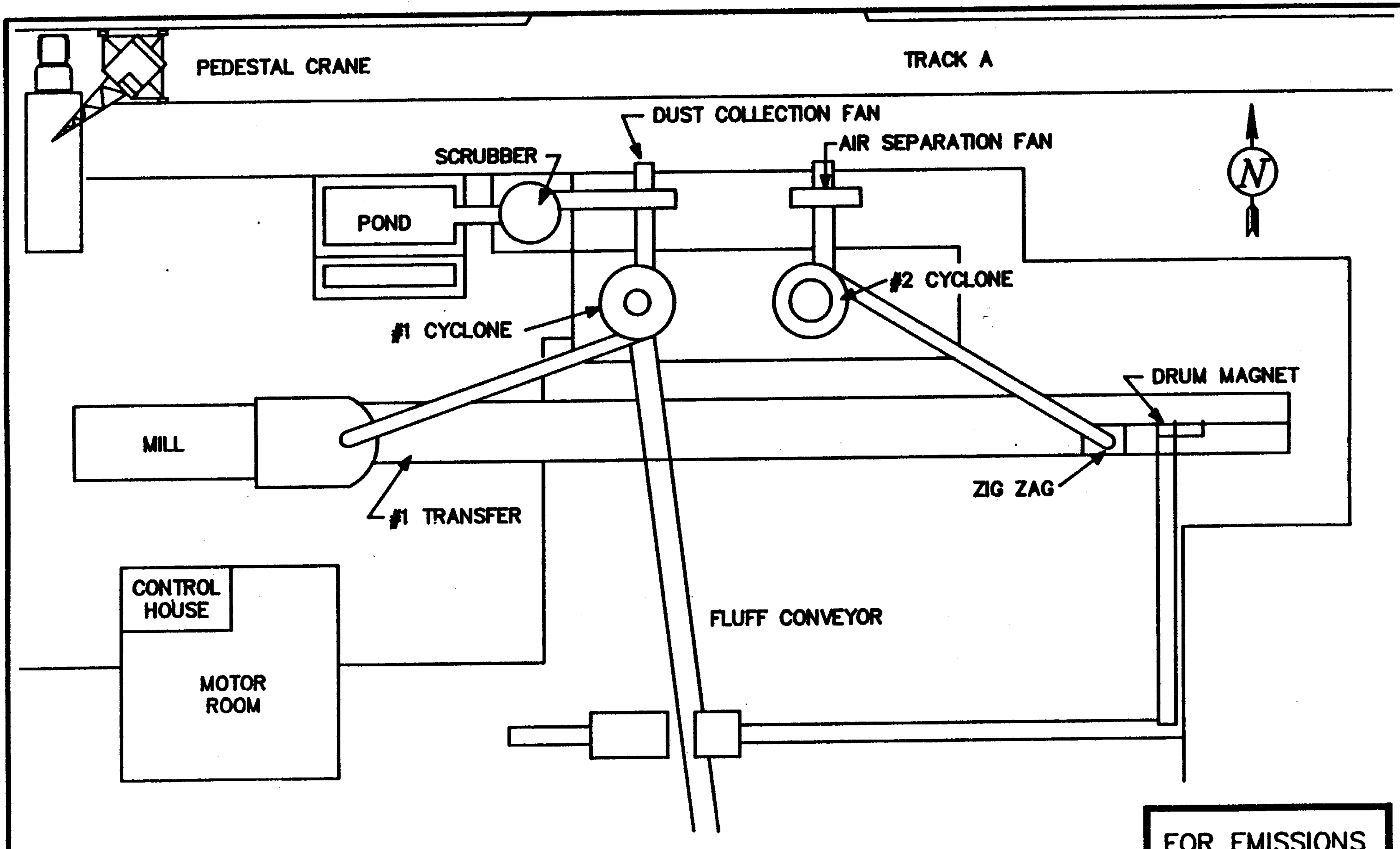
4.0 PROCESS DESCRIPTION

The unit tested at Southern Scrap Material Company, Ltd. was an automobile shredding operation that consisted of numerous conveyors which transferred shredded material to its desired location. Automobiles and loose material were fed into the mill. Dust and light material were removed from the mill by a dust collection fan. Dust and light particles then entered the scrubber and were washed down into the settling pond. Heavier particles settled in the No. 1 cyclone. Particulates that were not washed into the pond exited the scrubber through the stack.

When the material was shredded to the required size, it passed out of the mill on to the No. 1 transfer conveyor. Material transferred from the No. 1 transfer conveyor into the "zig zag" where heavier particles, rags, foam rubber, and any other dust is removed by an air separation fan. Dust material then passed through the No. 2 cyclone and on to the fluff conveyor where it was removed for storage.

Material that had been cleaned by this air system then passed over a drum magnet. The non-ferrous material passed over a screen and picking conveyor to upgrade quality, then to a storage container. Ferrous material was hand-picked and stored.

Refer to site plan (Drawing R-001) and control equipment flow diagram (Drawing R-002).



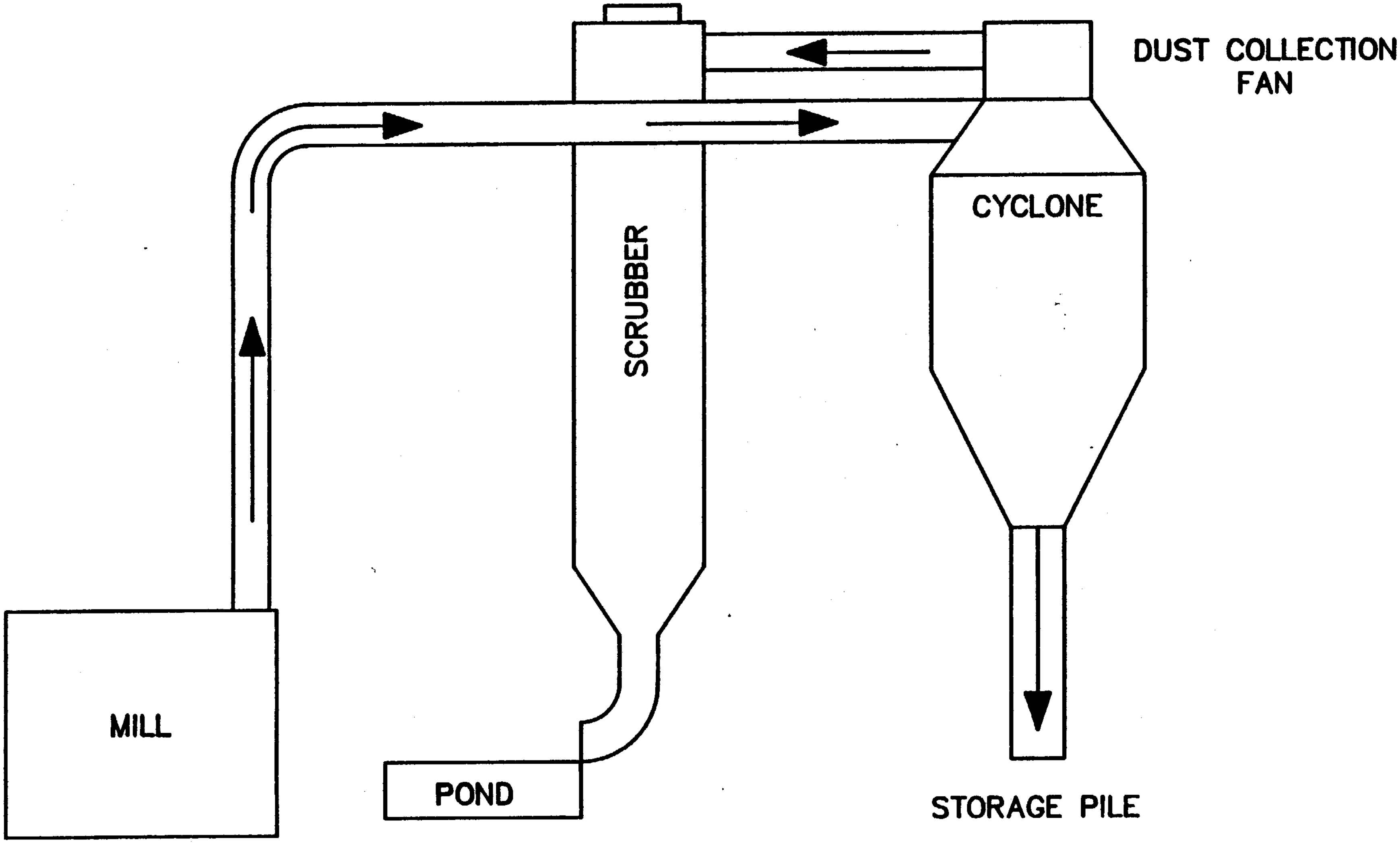
ON BEHALF OF: SOUTHERN SCRAP MATERIAL CO., LTD.

FOR EMISSIONS REPORT ONLY

WALDEMAR S. NELSON AND COMPANY
INCORPORATED
ENGINEERS AND ARCHITECTS
1200 ST. CHARLES AVE. NEW ORLEANS, LA.

PORT ALLEN FACILITY
SITE PLAN

DATE	SCALE	JOB NO.	DWG.NO.	REV.
5/15/87	NONE	87011	R-001	0



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ON BEHALF OF: SOUTHERN SCRAP MATERIAL CO., LTD.

WALDEMAR S. NELSON AND COMPANY
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1200 ST. CHARLES AVE. NEW ORLEANS, LA.

PORT ALLEN FACILITY
FLOW DIAGRAM

DATE	SCALE	JOB NO.	DWG.NO.	REV.
5/15/87	NONE	87011	R-002	0

5.0 TEST PROCEDURES

5.1 Particulate - EPA Method 5

5.1.1 Particulate Sampling

The particulate emissions test utilized the procedures of 40 CFR 60, Appendix A, as a guideline.

Dimensions of the stack and test location along with sample points are presented in Drawing R-003.

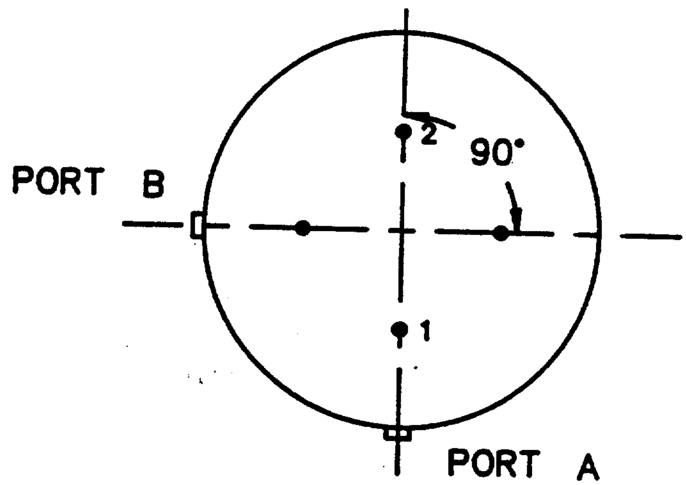
Three "runs" (SS-P-1, SS-P-2, and SS-P-3) constituted one test.

Stack emissions were measured by traversing through two ports using a four and one-half-foot (4.5) probe with a heated stainless steel liner. A total of four points (two per traverse) were sampled during each run for a period of fifteen minutes for run SS-P-1, twenty minutes each for runs SS-P-2 and SS-P-3.

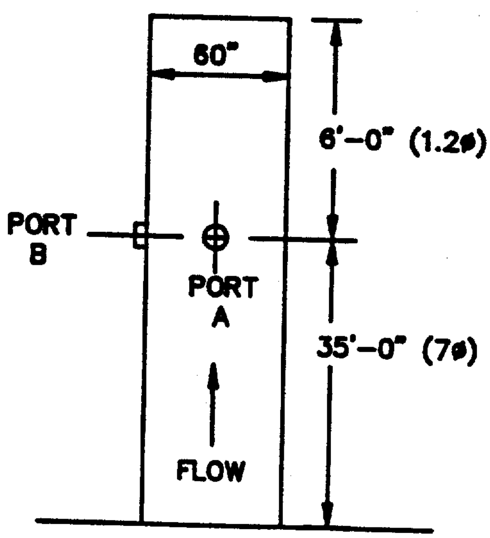
The sampling train used was a NAPP, Inc. Model 31 Manual Stack Sampler. The sampling train consisted of a buttonhook type nozzle, the 4.5-foot stainless steel probe, a 2-section sample box, a 50-foot umbilical cord, and a control console.

The control console contained a leak-free diaphragm pump, a dry gas meter, coarse and fine adjust valves, a dual inclined manometer, a selectable pyrometer, a vacuum gauge, and umbilical cord connections.

AUTOMOBILE SHREDDER



PLAN VIEW: EXHAUST STACK



NUMBER OF TRAVERSE POINTS: 4

DISTANCE OF SAMPLE POINTS FROM INSIDE STACK WALL:

1. 15"
2. 45"

ELEVATION: EXHAUST STACK

FOR EMISSIONS REPORT ONLY

ON BEHALF OF: SOUTHERN SCRAP MATERIAL CO., LTD.

WALDEMAR S. NELSON AND COMPANY
INCORPORATED
ENGINEERS AND ARCHITECTS
1200 ST. CHARLES AVE. NEW ORLEANS, LA.

PORT ALLEN FACILITY
SAMPLE PORT/POINT LOCATION

DATE	SCALE	JOB NO.	DWG.NO.	REV.
5/15/87	NONE	87011	R-003	0

The diaphragm pump moved the stack gases through the sampling system while the dry gas meter measured the volume of gas sampled. Gas flow through the system was controlled with the coarse and fine flow valves.

The range of the dual inclined manometer was 0-10 inches H20 graduated in 0.01 inch H20 divisions from 0-1 inch and 0.1 inch H20 from 1-10 inches. The manometer provided for simultaneous measurement of the pressure drop across the orifice in the control console and the differential pressure of the stack gas velocity at the sampling point. The umbilical cord and connectors united the metering/control console with the sample box. One portion of the sample box held a heating element which maintained the temperature in the filter holder compartment at approximately 250 degrees F. The other compartment of the sample box contained an ice bath with four glass impingers connected in series by glass U-tubes. The first and second impingers contained 100 mL of deionized distilled water. The third impinger was dry and the fourth contained approximately 200 g of indicating silica gel. The ice bath-impinger combination cooled and dried the flue gases sampled to prevent damage to either the pump or dry gas meter, while allowing a determination of the stack gas moisture content for each run.

For schematic of the Method 5 sample train and a detailed view of the Method 5 probe is presented in the Appendices.

The control console, pitot tubes, and nozzles were calibrated prior to testing. All calibration data is contained in the Appendices. Upon completion of the tests, the control console was recalibrated as required by reference methods. The resulting data showed insignificant deviation from the original calibration, within acceptable limitations. Close visual inspection of the pitot tubes and nozzle revealed no damage or misalignment, so no recalibration was required for these components.

As required, the pitots and the sampling trains were leak checked before and after each test run. In all instances, the vacuum on the pitot system remained stable for at least fifteen seconds at 3 inches H20 (or more). The sampling train leaked less than 0.02 CFM at a vacuum of 15 inches Hg in the pretest checks and at the maximum test vacuum in the post test checks at the nozzle inlet.

Prior to the first run, preliminary velocity and temperature data were acquired from previous test data. Similarly, moisture content data was also taken from previous tests. Subsequent runs were based on acquired data. A barometer taken to the field laboratory was used to record barometric pressure.

5.1.2 Particulate Sample Recovery and Analysis

A temporary field laboratory was established on site. The equipment needed was transferred from Waldemar S. Nelson and Company, Inc.'s laboratory in New Orleans, Louisiana.

The field laboratory was used for all clean-up operations. A quasi-dust-free area was maintained for glassware clean-up and probe cleaning. A probe cleaning brush, consisting of a 12-foot-long teflon rod with a nylon brush, was used to clean the probe. A small nylon brush was used to clean the inlet tip and glass tubing up to the filter using reagent grade acetone. The probe,

probe tip, and all sample-exposed surfaces prior to the filter were rinsed after each test with reagent grade acetone. The capture from each run was retained in a clean sample bottle (glass with teflon-lined cap). The liquid level of the captures was marked clearly on each sample bottle so that they could be checked for loss of volume due to evaporation or spillage during transport.

A blank of the acetone used for the probe and glassware clean-up was also retained in a clean sample bottle. This allowed any bias in weight added by the acetone itself to be subtracted from the total weight of captured particulate, in accordance with the procedures outlined in 40 CFR 60, Appendix A.

Upon return to Waldemar S. Nelson and Company, Inc.'s laboratory in New Orleans, the acetone samples and blanks were measured volumetrically, then evaporated, desiccated, and weighed in accordance with Method 5 procedures. The complete analytical results are presented in the Appendices.

The 4-inch-diameter filters were desiccated, tared, and stored in new, clean petri dishes prior to beginning the tests. After each test run, the soiled filter was carefully removed from the filter holder, along with all remnants which had adhered to the holder gasket, and returned to the original petri dish. The filters were subsequently desiccated and reweighed at Waldemar S. Nelson and Company, Inc.'s New Orleans laboratory. Copies of the filter weight log are located in the Appendices. The weight gained by each filter was added to the corresponding acetone rinse weight (less blank correction) and reported as total particulate weight for that test.

6.0 QUALITY ASSURANCE PROCEDURES - EPA METHOD 5

A Model 31 Manual Stack Sampling System was purchased from NAPP, Inc. of Austin, Texas, for the sampling of particulate and S02 emissions. A schematic of the sampling train and a detail of the probe are illustrated in the Appendices. The sample train was operated, maintained and calibrated in accordance with procedures outlined in APTD-0576.

6.1 Sampling Apparatus

Probe - The sampling probe was constructed of stainless steel tubing with an outside diameter of about 16mm (0.625 in.), encased in a stainless steel sheath with an outside diameter of 25.4mm (1.0 in.). Quartz liners were used if stack temperatures were less than 480 degrees C (900 deg. F). The probe was constructed according to APTD-0581 specifications, thus calibration was not necessary. Instead, calibration curves from APTD-0581 were used. The heating system utilized is capable of maintaining an exit gas temperature of 120 degrees +/-14 degrees C (248 +/-25 deg. F).

Upon receiving the probe from the manufacturer, it was visually checked for breaks or cracks, and checked for leaks while connected to the sampling train. This included a proper nozzle to the probe connection with an asbestos string. The probe heating system was checked in accordance with the Quality Assurance Handbook for Air Pollution Measurement Systems; Vol. III, (EPA 600/4-77-027b).

Probe Nozzle - The probe nozzle has a sharp, tapered leading edge and is constructed of seamless 316 stainless steel tubing, formed in a buttonhook.

The tapered angle is less than or equal to 30 degrees with the taper on the outside to preserve a constant inside diameter.

A range of nozzle ID's (0.163 to 0.5 in.) was available for isokinetic sampling.

Upon receipt of the nozzles from the manufacturer, they were inspected for roundness and for damage to the tapered edge such as nicks, dents, and burrs. The diameter was checked with a micrometer; in accordance with calibration procedures. Each nozzle was engraved with an identification number by the manufacturer for inventory and calibration purposes.

Pitot Tube - The pitot tubes, type "S," design, meet the requirements of EPA Method 2. The pitot tube is permanently attached to the probe as specified.

The pitot tube was visually inspected for both vertical and horizontal tip alignments. Calibration data for the pitot tubes was provided by the manufacturer.

Differential Pressure Gauge - The differential pressure gauge used was a dual inclined manometer. One was utilized to monitor the stack velocity pressure, and the other to measure the orifice pressure differential.

Filter Holder - A filter holder of borosilicate glass with a glass mesh frit filter support and a silicone rubber gasket was used. The holder design provided a positive seal against leakage from the outside and around the filter. It was positioned immediately following the probe, with the filter placed toward the flow.

Filter Heating System - The heating system used was capable of maintaining the filter holder of 120 degrees +/-14 degrees C (248 deg. +/-25 deg. F) during sampling. A gauge capable of measuring temperatures to within 3 degrees C (5.4 deg. F) was used to monitor the temperature around the filter during sampling.

Condenser - Four impingers were connected in series with leak-free, ground-glass fittings. The first, third and fourth impingers were the Greenburg-Smith design modified by replacing the inserts with a glass tube that has an unconstricted 13mm (0.5 in.) ID and that extends to within 13mm (0.5 in.) of the flask bottom. The second impinger was a Greenburg-Smith with the standard tip and plate. The fourth impinger outlet connection was fitted with a thermometer capable of measuring +/-1 degrees C (1.8 deg. F) of true value in the range of 0 to 25 degrees C (32 deg. to 77 deg. F).

Upon receipt of the standard Greenburg-Smith impingers, each impinger was checked visually for damage -- breaks, cracks, or manufacturing flaws such as poorly-shaped connections.

Metering System - The metering system consisted of a vacuum gauge, a vacuum pump, thermometers capable of measuring +/-5.4 degrees F of true value in the range of 32 to 194 degrees F, a dry gas meter with 2 percent accuracy at the required sampling rate; and related equipment.

When the metering system was used with a pitot tube, the system was assured verification of an isokinetic sampling rate through the use of a nomograph.

Barometer - An aneroid barometer capable of measuring atmospheric pressure to within +/-2.5mm (0.1 in.) Hg was used. The barometer was calibrated against the absolute pressure obtained from a nearby National Weather Service station and adjusted for the elvation difference between the station and the laboratory.

6.2 Sample Recovery/Analysis

Probe Liner and Nozzle Brushes - Nylon bristle brushes with stainless steel wire handles were used. The probe brush was slightly longer than the probe. A separate, smaller, and very flexible brush was used for the nozzle.

Wash Bottles - A 1000 mL Guth wash bottle was used for probe and glassware rinsing with acetone.

Sample Storage Containers - 500 mL, narrow-mouth, chemically resistant, borosilicate glass bottles were used for storage of acetone rinses. The bottles have leak-proof screw caps with rubber-backed Teflon cap liners, and are constructed to preclude leakage and to resist chemical attack. Prior to field use, the cap seals and the bottle cap seating surfaces were inspected for chips, cuts, cracks, and manufacturing deformities which would allow leakage.

Petri Dishes - Polyethylene petri dishes were used for storage and for transportation of the filters and collected sample filters.

Graduated Cylinder and/or Triple Beam Balance - A triple beam balance was used to measure the chemicals added and the water condensed in the impingers before and during sampling. Additionally, a graduated cylinder was used to measure the chemicals initially placed in the first and second impingers. The graduated cylinder has subdivisions less than or equal to 2 mL and the triple beam balance is capable of weighing to the nearest 0.1 g.

Plastic Storage Containers - Several airtight plastic or metal containers were used for storage of silica gel. The silica gel used was weighed at the test site.

6.3 Analytical Equipment

Glassware - 250 mL glass beakers used for evaporation of the acetone rinses and petri dishes, as specified previously, were used to facilitate transport.

Balance - An analytical grade balance capable of weighing the filters and the sample beakers to within +/-0.1 mg was used. A triple beam balance as described in Section 6.2 was used for field weighings.

Reagents and Other Supplies - All reagents used met or exceeded specifications established by the Committee on Analytical Reagents of the American Chemical Society (ACS), or as specified in 40 CFR 60, Appendix A.

6.4 Calibration of Apparatus - EPA Method 5

Calibration procedures were conducted for the EPA method test equipment specified herein in accordance with the applicable test method. A detailed log of calibration data is maintained in the laboratory and is presented in the Appendices.

Calibration Meter System - Method 5. A reference dry gas meter calibrated against a bell prover was purchased from NAPP, Inc. with the necessary calibration data. This meter is used for pre- and post-test calibration checks as specified in APTD-0576. The dry gas meter was calibrated after field use according to procedure outlined in Paragraph 5.3 of EPA Method 5. The DGM was well within its required calibration limits of 5 percent from initial calibration.

Sample Train Thermometer - Method 5. The thermometer used to measure the temperature of the gas leaving the impinger train was calibrated using a mercury-in-glass thermometer in accordance with standard methods.

Dry Gas Meter Thermometer - Method 5. The dry gas meter thermometers were checked in accordance with APTD-0576.

Stack Temperature Sensor - Method 5. The stack temperature sensor (type "K" thermocouple) was calibrated upon receipt and checked before and after field use. It was uniquely marked for identification. The calibration was carried out in accordance with APTD-0576.

Probe Heater - Method 5. The probes were constructed according to APTD-0581, therefore, the calibration curves of APTD-0576 were used.

Barometer - Method 5. The field barometer was adjusted initially and before each test series to agree within +/-2.5mm (0.1 in.) Hg of the National Weather Service station pressure value. With a correction for the altitude difference between the station and the sampling point applied at a rate of -2.4mm Hg/30m (-0.1 in. Hg/100 ft.).

Probe Nozzle - Method 5. Probe nozzles were calibrated before initial use in the field. Using a micrometer, the nozzle ID was measured to the nearest 0.025 (0.001 in.). Three measurements were made using different diameters each time, and an average was obtained. The difference between the high and low readings did not exceed 0.1mm (0.004 in.). Each nozzle was permanently and uniquely identified.

Pitot Tube - Method 5. The type "S" pitot tube assembly was calibrated by the manufacturer. However, the tubes were inspected for damage before and after each run.

Analytical Balance - All Methods. The analytical balance was initially checked and is checked before each use with Class-S weights, and the data is recorded on an analytical balance calibration log. The balance agreed within +/-2 mg of the Class-S weights.

6.5 Presampling Quality Assurance Checks

Probe and Nozzle - The probe and nozzle were cleaned internally by brushing first with deionized-distilled water, and finally with acetone; both were allowed to dry in the air. The objective was to leave the probe liner free from contaminants. The probe's heating system was checked to ensure that it was operating properly. The probe was sealed at the inlet and checked for leaks at a vacuum of 15 inches Hg.

Impingers, Filter Holder, Glass Connectors, Flasks, Etc. - All glassware was cleaned first with detergent and tap water and then with deionized-distilled water. All glassware was visually inspected for cracks or breakage.

Pump - The vacuum pump was checked for any erratic behavior (nonuniform or insufficient flow).

Filters - The filters were visually checked against light for irregularities, flaws, and pinhole leaks. Petri dishes were labeled and the filters were kept in their respective dishes except during actual sampling and weighing.

The filters were desiccated at 60 degrees +/-10 degrees F and at ambient pressure for at least 24 hours, and then weighed at 6-hour intervals until weight changes of less than or equal to 0.5 mg from the previous weighings were achieved. During each weighing, the filter was not exposed to the laboratory atmosphere for greater than 2 minutes or to a relative humidity of greater than 50 percent. The analytical balance was calibrated with Class-S standard weights each day used. A data form was kept with the balance at all times for recording the dates and acceptabilities of the balance checks.

Equipment Packing - Equipment was packed to withstand severe treatment during shipping and field handling operations. The following containers were used.

Probe - The inlet and outlet of the probe were sealed to protect the probe from breakage. The probe was then packed inside a section of PVC pipe and the ends were sealed.

Impingers, Connectors, and Assorted Glassware - All impingers and glassware were packed in a rigid container specifically designed for the glassware by NAPP, Inc.

Volumetric Glassware - Assorted laboratory glassware is generally packed in the manufacturer's original packing or equivalent.

Meter Box - The meter box housing was sufficient to protect components.

7.0 CHAIN-OF-CUSTODY

The chain-of-custody procedures were followed according to EPA Quality Assurance Handbook, Volume III. A Chain-of-Custody Form was established for each set of samples. Each form remained with the samples during field and analytical procedures. Once the samples were received at the laboratory for analysis, they were kept under lock and key with the Chain-of-Custody Forms until analysis was completed.

The Chain-of-Custody Forms are presented in the Appendices.

8.0 PROJECT PERSONNEL

Members of the Environmental Sciences and Engineering Department of Waldemar S. Nelson and Company, Inc. conducted the particulate and opacity emissions tests at Southern Scrap Material Co., Ltd. Members of the test crew are listed below with resumes presented in the Appendices:

- Lawrence R. Schumer (Project Manager)
  Senior Environmental Scientist
- R. Javier Acuna (Supervised Field Sampling)
  Scientific Technician
- Jeffrey M. Pujol (Assisted in Field Sampling)
  Environmental Technician.

9.0 DISCUSSION OF PROCEDURES AND RESULTS

9.1 Sampling

The NAPP, Inc., EPA Method 5 sample train functioned properly throughout the three reported test runs. No instrumentation or equipment malfunctions were noted.

The three sample runs reported were conducted:

- SS-P-1 on May 5, 1987
- SS-P-2 and SS-P-3 on May 6, 1987.

The sample traverse points were first calculated in accordance with EPA Method 1, then a modification was utilized.

The number of traverse points was reduced from eight (8) to four (4) due to the explosion hazard and process limitations.

All fuel tanks and storage containers of flammable liquids are required to be removed from the automobiles received at the Port Allen facility. However, an occasional fuel tank or fuel container in the trunk of an automobile is not detected. As a result, the heat generated by the shredding operation causes an explosion.

The stack has been modified by installing "explosion panels" to protect the equipment. The location of the panels, four of which are located in the grating at the test platform level, require that no personnel be on or proximate to that area during operation.

Therefore, in order to test the unit the following work sequence had to be utilized to maintain a reasonable level of safety.

1) Stop sample pump at end of point.
2) Stop mill feed.
3) Allow all existing feed to clear mill.
4) Technician climb up stack and position probe at next sample point.
5) Technician climb down to test console level.
6) Advise foreman to restart mill feed.
7) Restart sample pump when feed begins.
8) Run 15 minute sample point.
9) Start over from Item 1 repeating cycle 4 times.

Due to the need to stop and start the mill for each sample point, it was decided to reduce the number of sample points from 8 to 4 to minimize the impact of the stopping and starting of the process and the time which a technician was required to be on the test platform level.

The explosion hazard is a routine danger in an automobile shredding operation. The frequency of occurrence cannot be reasonably predicted and therefore constitutes a serious safety concern. No explosion occurred during testing. However, a minor explosion was noted following completion.

The reduction in sample points is not expected to significantly affect sample results.

9.2 Sample Recovery

METHOD 5 - Sample recovery was conducted utilizing standard methods presented in 40 CFR 60, Appendix A as a guideline. No complications were noted.

9.3 Sample Analysis

METHOD 5 - The particulate samples were analyzed utilizing Method 5 (40 CFR 60), Appendix A as a guideline. No complications were noted.

9.4 Results

The particulate results indicate good repeatability. A summary of results is presented in Table 9-1.

TABLE 9-1

RESULTS
CAR SHREDDING OPERATION
PARTICULATE TEST

DATE	RUN NO.	PERCENT ISOKINETIC	CONCENTRATION (GR/DSCF)	EMISSION RATE (LBS/HR)
05-05-87	SS-P-1	93	0.016	6.04
05-06-87	SS-P-2	98	0.017	6.63
05-06-87	SS-P-3	98	0.018	7.00
AVERAGE:		96	0.017	6.56
ALLOWABLE:	(LADEQ-AQD, Regulations Chapter 19.5)			43.42

The analytical results yielded positive weights for Filter 87011; however, Filters 87012 and 87013 yielded negative weights. The sample recovery procedures defined in Section 5.1.2 herein were performed. During each run, remnants of the filters adhered to the filter holder gaskets. To minimize loss of these remnants, the gasket is rinsed with acetone and the remnants are captured in the acetone rinse. While this occurs during most Method 5 tests, it is generally unnoticed because the particulate capture of the filter is usually sufficient to offset this minor filter displacement. This was not the case with Filters 87012 and 87013 where the particulate capture weighed less than the filter remnants yielding a negative filter weight, but an increased net weight gain in the acetone rinse.

The average emission rate for the three test runs during operation was 6.56 lbs/hr as compared to the allowable of 43.42 lbs/hr for the subject unit.

Process weight rate and process weight rate limitation calculations follow:

TABLE 9-2

PROCESS WEIGHT RATE

Assume: Each car averages 2200 lbs (1.1 tons)

RUN	DATE	TIME	HOURS	CARS	TONS	TONS/HR
1	05/05/87	1255-1430	1.58	61	67.1	42.5
2	05/06/87	1010-1200	1.83	64	70.4	38.7
3	05/06/87	1307-1453	1.77	82	90.2	51.0
AVERAGE (TONS/HR):						44.1

LaDEQ Air Pollution Control Regulation Section 19.5 (Table 3) provide for interpolation of process weight rates greater than 30 tons/hr as follows:

E = 55.0 [(P)E0.11] - 40]

where: E = Emission Rate (lbs/hr)
P = Process Weight Rate (tons/hr)

thus: E = 55.0 [(44.1)E0.11 - 40]

Allowable Emission Rate = 43.4 lbs/hr

A complete listing of the Method 5 test results and a table of uniform stack parameters are presented in Tables 9-3 and 9-4.

WALDEMAR S. NELSON & COMPANY
ENGINEERS AND ARCHITECTS
ENVIRONMENTAL SCIENCE AND ENGINEERING DEPARTMENT
STACK TESTING AND AREA MONITORING

****

SOUTHERN SCRAP METAL CO., INC. - PORT ALLEN, LA 87011
PARTICULATE TEST - RUNS NO. SS-P-1, 2, & 3
EPA METHOD 5 - MAY 5 AND MAY 6, 1987

METHOD 5 - PARTICULATE EMISSIONS

RUN NO.	PERCENT ISOKINETIC %	PARTICULATE WEIGHT, TOTAL MG	PARTICULATE LOADING AT STD CONDITIONS GR/DSCF	PARTICULATE LOADING AT STACK CONDITIONS GR/ACF	PARTICULATE EMISSION RATE LBS/HR	PARTICULATE LOADING AT STD CONDITIONS LBS/DSCF
	PERI	MF	CAN	CAT	CAW	C
1	92.5213	29.60	0.160E-01	0.150E-01	0.604E+01	0.229E-05
2	98.4328	46.10	0.166E-01	0.149E-01	0.663E+01	0.238E-05
3	97.5234	48.20	0.177E-01	0.157E-01	0.700E+01	0.253E-05

AVERAGE PARTICULATE LOADING STD CONDITIONS (CAN):	0.168E-01	GR/DSCF
AVERAGE PARTICULATE LOADING STACK CONDITIONS (CAT):	0.152E-01	GR/ACF
AVERAGE EMISSION RATE (CAW):	0.656E+01	LBS/HR
AVERAGE PARTICULATE LOADING STD CONDITIONS (C):	0.240E-05	LBS/DSCF

TABLE 9-3

WALDEMAR S. NELSON & COMPANY
ENGINEERS AND ARCHITECTS
ENVIRONMENTAL SCIENCE AND ENGINEERING DEPARTMENT
STACK TESTING AND AREA MONITORING

****

SOUTHERN SCRAP METAL CO., INC. - PORT ALLEN, LA 87011
PARTICULATE TEST - RUNS NO. SS-P-1, 2, & 3
EPA METHOD 5 - MAY 5 AND MAY 6, 1987

UNIFORM STACK PARAMETERS

VARIABLE	DESCRIPTION	UNITS	VALUES		
	RUN NO.		1	2	3
VM	DRY GAS VOLUME, METER CONDITIONS	DCF	29.720	44.390	44.390
PB	BAROMETRIC PRESSURE	IN. HG	30.02	30.02	30.02
PM	AVERAGE ORIFICE PRESSURE DROP	IN. H2O	0.740	0.882	0.885
TM	AVERAGE METER TEMPERATURE	DEG. F	92.0	89.0	98.0
(1) VMSTD	DRY GAS VOLUME, STANDARD CONDITIONS	DSCF	28.47	42.76	42.07
VW	TOTAL WATER COLLECTED	ML	26.2	66.6	79.6
VWV	VOLUME OF WATER VAPOR, STANDARD CONDITIONS	ML	1.23	3.13	3.75
(2) PMOS	PERCENT MOISTURE BY VOLUME	%	4.2	6.8	8.2
(3) MD	MOLE FRACTION OF DRY GAS	-	0.958	0.932	0.918
PCO2	PERCENT CO2 BY VOLUME, DRY	%	0.1	0.1	0.1
PO2	PERCENT O2 BY VOLUME, DRY	%	20.6	20.6	20.6
* PCO	PERCENT CO BY VOLUME, DRY	%	-	-	-
* PN2	PERCENT N2 BY VOLUME, DRY	%	79.3	79.3	79.3
(4) MWD	MOLECULAR WEIGHT, DRY STACK GAS	-	28.84	28.84	28.84
(5) MW	MOLECULAR WEIGHT, WET STACK GAS	-	28.39	28.10	27.95
DPS	AVERAGE STACK VELOCITY HEAD	IN. H2O	0.70	0.76	0.76
TS	AVERAGE STACK TEMPERATURE	DEG. F	82.0	89.0	87.0
PS	STACK PRESSURE, ABSOLUTE	IN. HG	30.00	30.00	30.00
(6) VS	AVERAGE STACK GAS VELOCITY	FPM	2390.0	2640.0	2650.0
ID	INSIDE STACK DIAMETER	IN.	60.0	60.0	60.0
AS	STACK AREA	SQ. IN.	2827.4	2827.4	2827.4
(7) QS	STACK FLOWRATE, DRY, STANDARD CONDITIONS	DSCFM	43900.0	46500.0	46200.0

* THE PERCENT VOLUMES OF NITROGEN (PN2) REPORTED INCLUDE PERCENT N2, CO, AND ALL OTHER FLUE GAS CONSTITUENTS NOT QUANTIFIED ABOVE.

TABLE 9-4

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST
FIELD DATA FORM
(EPA METHOD 1,2,3,4,5,8,& 17)

CLIENT SOUTHERN SCRAP METAL CO., INC.

FACILITY PORT ALLEN, LA.

RUN NUMBER SS-P-1

WSNCO JOB NO. 87011

SAMPLING LOCATION STACK

SAMPLING DATE MAY 5, 1987

TEST PERSONNEL

PROJECT CHIEF LAWRENCE R. SCHUMER

TESTING ENGINEER
1 ______
2 ______

ENGR. TECHNICIAN
1 R. JAVIER ACUNA
2 JEFFREY M. PUJOL

LAB TECHNICIAN
1 ______
2 ______

OTHER
1 ______
2 ______

WSNCO FORM NO. ST008

RUN NO SS-P-1
DATE 5-5-87

SAMPLING TRAIN SPECIFICATIONS

RECORDED BY [signature]
ASSISTED BY [signature]

I. PROBE ASSEMBLY

A. PROBE LENGTH 4½ FT.
B. LINER MATERIAL Glass
C. PITOT NUMBER 001
D. PITOT COEFFICIENT 0.84

II. MISC. COMPONENTS

A. NOZZLE DIAMETER 0.205 IN.
B. NOZZLE IDENT. NO. 1871
C. UMBILICAL LENGTH 50.0 FT.
D. FILTER HOLDER TYPE Glass
E. FILTER NUMBER 87011

III. IMPINGER CONTENT

NUMBER	TYPE*	NORMAL MATERIAL	NORMAL AMOUNT	USE MATERIAL	USE AMOUNT	FINAL AMOUNT	NET GAIN
1	M	DW	100ML	DW	524.2	539.5	15.30
2	GS	DW	100ML	DW	537.9	540.9	3.00
3	M	DRY	———	DRY	432.8	434.7	1.9
4	M	ADSORBENT**	~200GM.	SG	598.9	604.9	6.0

#4 CONTAINER WEIGHT = ______ GM.
WEIGHT WITH ADSORBENT = ______ GM.

TOTAL MOISTURE ADSORBED 26.20

* GS = GREENBURG-SMITH, M = MODIFIED, O = OTHER ______
** SG = SILICA GEL, D = DRIERITE, O = OTHER ______

IV. CONTROL CONSOLE: ΔH@ (PRE-TEST) ______ ΔH@ (POST-TEST) ______
Y (PRE-TEST) ______ Y (POST-TEST) ______

CONSOLE NO. ______

	VELOCITY	TEMPERATURE	PRESSURE
SENSOR	☐ STANDARD ☒ "S" SHAPED	☒ THERMOCOUPLE (TYPE K) ☐ OTHER ______	☒ STANDARD ☐ "S" SHAPED
READING DEVICE	☒ DI MANOMETER (0-10 IN. H_2O) [5 struck through, 10 written] ☐ HIGH SENSITIVITY (RANGE ___) ☐ OTHER ______	☒ PYROMETER (TYPE K) ☐ OTHER ______	☐ DI MANOMETER (0-5 IN. H_2O) ☐ HIGH SENITIVITY (RANGE ___) ☒ OTHER U-TUBE

COMMENTS: ______

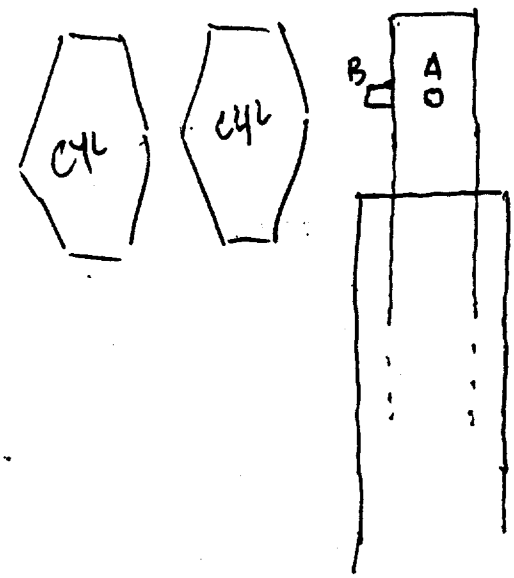
RUN NO. SS-P-1

DATE 5-5-87

STACK GEOMETRY

RECORDED BY RQa

SKETCH OF FLOW PROFILE AND CROSS-SECTION
(ILLUSTRATE PORT-POINT CONFIGURATION, FLOW INTERFERENCES, ETC.)
NOTE: SAME AS RUN ______



FOR ROUND STACKS

A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT 64.0 IN.
B. PORT LENGTH 4.0 IN.
STACK DIAMETER: (A-B) 60.0 IN.
STACK AREA: 2827.43 $IN.^2$

FOR RECTANGULAR STACKS

A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT ______ IN.
B. PORT LENGTH ______ IN.
STACK DEPTH: (A-B) ______ IN.
STACK WIDTH (INSIDE) ______ IN.
STACK AREA (DEPTH X WIDTH) ______ $IN.^2$
EQUIVALENT DIAMETER $\left(2\left[\frac{L \times W}{L + W}\right]\right)$ ______ IN.

SAMPLING CROSS-SECTION IS:

NO. OF DUCT DIAMETERS		TYPE OF FLOW OBSTRUCTION
8	DIAMETERS DOWNSTREAM OF	
2	DIAMETERS UPSTREAM OF	

NUMBER OF SAMPLING POINTS

MIN. REQ'D. (METHOD 1) ______
USE ______

RUN NO. SS-P-1

DATE 5-5-87

TRAVERSE POINTS

RECORDED BY RGA

POINT	PERCENT OF DIAMETER FROM INSIDE PORT TO POINT — NUMBER OF TRAVERSE POINTS ON A DIAMETER: 2	4	6	8	10	12	14	16	18	20	22	24	DISTANCE FROM INSIDE PORT (IN.)	DISTANCE FROM OUTSIDE PORT (IN.)	USE (IN.)
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1	15.0	19.0	19.0
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2	45.0	49.0	49.0
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5			
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9			
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5			
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2			
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1			
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4			
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0			
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2			
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3			
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8			
13							94.3	87.5	81.2	75.0	68.5	60.2			
14							98.2	91.5	85.4	79.6	73.8	67.7			
15								95.1	89.1	83.5	78.2	72.8			
16								98.4	92.5	87.1	82.0	77.0			
17									95.6	90.3	85.4	80.6			
18									98.6	93.3	88.4	83.9			
19										96.1	91.3	86.8			
20										98.7	94.0	89.5			
21											96.5	92.1			
22											98.9	94.5			
23												96.8			
24												98.9			

NOTE: SAME AS RUN NO. ______

COMMENTS:

RUN NO. SS-P-1 RECORDED BY [signature]

DATE 5/6/80 CHECKED BY [signature]

NOMOGRAPH DATA

NOTE: SAME AS RUN ____________

TA	AMBIENT TEMPERATURE	= ~88	°F
Pb	BAROMETRIC PRESSURE	= 30.02	IN. Hg.
ΔH @	REFERENCE ΔH	= 0.740	IN. H_2O
TM	AVG. METER TEMPERATURE	= 91.0	°F
% H_2O	MOISTURE CONTENT	= 4.2	% BY VOL.
Po	STATIC (GUAGE) PRESSURE IN STACK	= .3	IN. H_2O
	x 0.074	= 0.0222	IN. Hg.
PS	ABSOLUTE PRESSURE IN STACK, Pb - Po	= 30.00	IN. Hg.
PM	METER PRESSURE (~Pb)	= 30.02	IN. Hg.
PS/PM	=		
C	CORRECTION FACTOR	= .845	
TS	STACK TEMPERATURE	= 82.3	°F
ΔP	AVERAGE STACK VELOCITY HEAD	= 0.70	IN. H_2O
ΔPMAX.	MAXIMUM STACK VELOCITY HEAD	= 0.80	IN. H_2O
D	PROBE TIP DIAMETER	= 0.205	IN.

Req'd Sampling Rate or Volume ____________ Calculated Sampling Rate or Volume (Pre-test) ____________

TS					
ΔPREF					

PITOT LEAK CHECKS*

OPENING	PRE-TEST	BY	POST-TEST	BY
IMPACT	☑ STABLE ☐ LEAKING	[initials]	☑ STABLE ☐ LEAKING	[initials]
STATIC	☑ STABLE ☐ LEAKING	[initials]	☑ STABLE ☐ LEAKING	[initials]

* Vacuum must remain stable for 15 seconds @ 3 in. H_2O.

SAMPLING TRAIN LEAK CHECKS

LEAK CHECKS*	PRE-TEST	POST-TEST
RATE OF LEAK (CFM)	.007	.003
TIME (24 HOUR CLOCK)	1249	1442
BY	[initials]	[initials]

* Rates ≤ 0.02 CFM @ 15 in. Hg. vacuum or 4% of average sampling rate (whichever is less) are acceptable.

RUN NO. SS-P-1 PARTICULATE SAMPLING RECORDED BY [illegible]

DATE ______ ASSISTED BY [illegible]

SAMPLING TIME PER POINT 15 MIN.

PORT POINT	CLOCK TIME	METER VOLUME (DCF)	ΔP VEL. HEAD (IN. H_2O)	ΔH ORIFICE (IN. H_2O)	METER TEMP. IN (°F)	METER TEMP. OUT (°F)	STACK TEMP. (°F)	BOX TEMP. (°F)	BATH TEMP. (°F)	TRAIN VACUUM (IN. Hg.)	COMMENT NUMBER
A-1	1300 / 1315	659.382 / 667.141	.53	.80	86	86	79	150	.30	.3	
2	1318 / 1332	673.311	.35	.59	90	91	88	150	.30	.2	
B-1	1352 / 1407	680.449	.44	.65	94	96	81	178	.30	.2	
2	1418 / 1433	689.105	.64	1.0	94	97	81	145	.30	.3	
		29.72									

COMMENTS: 1.

2. .0230 LBS

3.

4.

5.

6. Stack temp reach HI of 97 during

7. test. Recorded readings taken at

8. start of run.

9. A 1 - 16 cars

10. A 2 - 13 cars

11. B-1 12 cars 3 Lifts ~500-700 LBS loose wt

12. B-2

13.

14.

15.

16. 1 Car = ~ 1.1 TON (Gross)

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST
FIELD DATA FORM
(EPA METHOD 1,2,3,4,5,8,& 17)

CLIENT SOUTHERN SCRAP METAL CO., INC.

FACILITY PORT ALLEN, LA.

RUN NUMBER SS-P-2

WSNCO JOB NO. 87011

SAMPLING LOCATION STACK

SAMPLING DATE MAY 6, 1987

TEST PERSONNEL

PROJECT CHIEF LAWRENCE R. SCHUMER

TESTING ENGINEER
1
2

ENGR. TECHNICIAN
1 R. JAVIER ACUNA
2 JEFFREY M. PUJOL

LAB TECHNICIAN
1
2

OTHER
1
2

RUN NO SS-P-2
DATE 5-6-87

SAMPLING TRAIN SPECIFICATIONS

RECORDED BY RGa
ASSISTED BY [illegible]

I. PROBE ASSEMBLY

A. PROBE LENGTH 4½ FT.
B. LINER MATERIAL Glass
C. PITOT NUMBER 001
D. PITOT COEFFICIENT 0.84

II. MISC. COMPONENTS

A. NOZZLE DIAMETER 0.205 IN.
B. NOZZLE IDENT. NO. 1871
C. UMBILICAL LENGTH 50.0 FT.
D. FILTER HOLDER TYPE Glass
E. FILTER NUMBER 87012

III IMPINGER CONTENT

NUMBER	TYPE*	NORMAL MATERIAL	NORMAL AMOUNT	USE MATERIAL	USE AMOUNT	FINAL AMOUNT	NET GAIN
1	M	DW	100ML	DW	516.3	537.2	20.9
2	GS	DW	100ML	DW	541.5	561.3	19.8
3	M	DRY	———	DRY	426.0	427.6	1.6
4	M	ADSORBENT**	~200GM.	SG	590.1	614.4	24.3

#4 CONTAINER WEIGHT = ______ GM.
WEIGHT WITH ADSORBENT = ______ GM.

TOTAL MOISTURE ADSORBED 66.6

* GS = GREENBURG-SMITH, M = MODIFIED, O = OTHER ______
** SG = SILICA GEL, D = DRIERITE, O = OTHER ______

IV CONTROL CONSOLE: ΔH@ (PRE-TEST) ______ ΔH@ (POST-TEST) ______

CONSOLE NO. ______
Y (PRE-TEST) ______ Y (POST-TEST) ______

	VELOCITY	TEMPERATURE	PRESSURE
SENSOR	☐ STANDARD ☑ "S" SHAPED	☑ THERMOCOUPLE (TYPE K) ☐ OTHER ______	☑ STANDARD ☐ "S" SHAPED
READING DEVICE	☑ DI MANOMETER (0-5 10 IN. H_2O) ☐ HIGH SENSITIVITY (RANGE ___) ☐ OTHER ______	☑ PYROMETER (TYPE K) ☐ OTHER ______	☐ DI MANOMETER (0-5 IN. H_2O) ☐ HIGH SENTIVITY (RANGE ___) ☑ OTHER U-TUBE

COMMENTS: ______

RUN NO. SS-P-2

DATE 5-6-87

STACK GEOMETRY

RECORDED BY RJA.

SKETCH OF FLOW PROFILE AND CROSS-SECTION
(ILLUSTRATE PORT-POINT CONFIGURATION, FLOW INTERFERENCES, ETC.)
NOTE: SAME AS RUN SS-P-1

FOR ROUND STACKS

A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT ________ IN.

B. PORT LENGTH ________ IN.

STACK DIAMETER: (A-B) ________ IN.

STACK AREA: ________ $IN.^2$

FOR RECTANGULAR STACKS

A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT ________ IN.

B. PORT LENGTH ________ IN.

STACK DEPTH: (A-B) ________ IN.

STACK WIDTH (INSIDE) ________ IN.

STACK AREA (DEPTH X WIDTH) ________ $IN.^2$

EQUIVALENT DIAMETER $\left(2\left[\frac{L \times W}{L + W}\right]\right)$ ________ IN.

SAMPLING CROSS-SECTION IS:

NO. OF DUCT DIAMETERS		TYPE OF FLOW OBSTRUCTION	NUMBER OF SAMPLING POINTS
________	DIAMETERS DOWNSTREAM OF	________	MIN. REQ'D. (METHOD 1) ________
________	DIAMETERS UPSTREAM OF	________	USE ________

RUN NO. SS-P-2
DATE 5-6-87

TRAVERSE POINTS

RECORDED BY RGa.

POINT	2	4	6	8	10	12	14	16	18	20	22	24	DISTANCE FROM INSIDE PORT (IN.)	DISTANCE FROM OUTSIDE PORT (IN.)	USE (IN.)
	PERCENT OF DIAMETER FROM INSIDE PORT TO POINT — NUMBER OF TRAVERSE POINTS ON A DIAMETER														
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1			
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2			
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5			
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9			
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5			
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2			
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1			
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4			
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0			
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2			
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3			
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8			
13							94.3	87.5	81.2	75.0	68.5	60.2			
14							98.2	91.5	85.4	79.6	73.8	67.7			
15								95.1	89.1	83.5	78.2	72.8			
16								98.4	92.5	87.1	82.0	77.0			
17									95.6	90.3	85.4	80.6			
18									98.6	93.3	88.4	83.9			
19										96.1	91.3	86.8			
20										98.7	94.0	89.5			
21											96.5	92.1			
22											98.9	94.5			
23												96.8			
24												98.9			

NOTE: SAME AS RUN NO. SS-P-1

COMMENTS:

WSNCO FORM NO. ST008

RUN NO. SS-P-2

DATE 5-6-87

NOMOGRAPH DATA

RECORDED BY [signature]

CHECKED BY [signature]

NOTE: SAME AS RUN ____________

TA	AMBIENT TEMPERATURE	= 88°	°F
Pb	BAROMETRIC PRESSURE	= 30.02	IN. Hg.
ΔH @	REFERENCE ΔH	= 0.882	IN. H_2O
TM	AVG. METER TEMPERATURE	= 88.3	°F
% H_2O	MOISTURE CONTENT	= 6.8	% BY VOL.
Po	STATIC (GUAGE) PRESSURE IN STACK	= .3	IN. H_2O
	x 0.074	= 0.0222	IN. Hg.
PS	ABSOLUTE PRESSURE IN STACK, Pb - Po	= 30.00	IN. Hg.
PM	METER PRESSURE (~Pb)	= 30.02	IN. Hg.
PS/PM	=		
C	CORRECTION FACTOR	= 0.895	
TS	STACK TEMPERATURE	= 89°	°F
ΔP	AVERAGE STACK VELOCITY HEAD	= 0.76	IN. H_2O
ΔPMAX.	MAXIMUM STACK VELOCITY HEAD	= 0.80	IN. H_2O
D	PROBE TIP DIAMETER	= 0.205	IN.

Req'd Sampling Rate or Volume ____________ Calculated Sampling Rate or Volume (Pre-test) ____________

TS					
ΔPREF					

PITOT LEAK CHECKS*				
OPENING	PRE-TEST	BY	POST-TEST	BY
IMPACT	☑ STABLE ☐ LEAKING	[initials]	☑ STABLE ☐ LEAKING	[initials]
STATIC	☑ STABLE ☐ LEAKING	[initials]	☑ STABLE ☐ LEAKING	[initials]

* Vacuum must remain stable for 15 seconds @ 3 in. H_2O.

SAMPLING TRAIN LEAK CHECKS		
LEAK CHECKS*	PRE-TEST	POST-TEST
RATE OF LEAK (CFM)	.004	0.0
TIME (24 HOUR CLOCK)	0948	1210
BY	[initials]	[initials]

*Rates ≤ 0.02 CFM @ 15 in. Hg. vacuum or 4% of average sampling rate (whichever is less) are acceptable.

RUN NO. SS-P-2 | **PARTICULATE SAMPLING** | RECORDED BY [signature]

DATE 5-6-87 | ASSISTED BY JMD

SAMPLING TIME PER POINT 20 MIN.

PORT POINT	CLOCK TIME	METER VOLUME (DCF)	Δ P VEL. HEAD (IN. H_2O)	Δ H ORIFICE (IN. H_2O)	METER TEMP. IN (°F)	METER TEMP. OUT (°F)	STACK TEMP. (°F)	BOX TEMP. (°F)	BATH TEMP. (°F)	TRAIN VACUUM (IN. Hg)	COMMENT NUMBER
A-1	1013 / 1033	690.216 / 701.335	.62	.95	78	78	89	190	30	3	
-2	1038 / 1058	711.062	.47	.70	87	88	90	191	30	3	
B-1	1118 / 1138	722.126	.58	.88	93	95	89	190	30	3	
2	1144 / 1204	733.725	.64	1.0	95	97	88	190	30	3	
		43.51									

COMMENTS:
1.
2. A-1 17 cars 3 grabs Loose Mat.
3. A-2 12 Cars 2 grabs Loose Mat
4. B-1 13 cars 5 grabs
5. B-2 22 cars
6.
7.
8.
9. ~~Run 1~~ A-1
10.
11. ~~Run 2~~
12.
13.
14.
15.
16.

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST
FIELD DATA FORM
(EPA METHOD 1,2,3,4,5,8, & 17)

CLIENT SOUTHERN SCRAP METAL CO., INC.

FACILITY PORT ALLEN, LA.

RUN NUMBER SS-P-3

WSNCO JOB NO. 87011

SAMPLING LOCATION STACK

SAMPLING DATE MAY 6, 1987

TEST PERSONNEL

PROJECT CHIEF LAWRENCE R. SCHUMER

TESTING ENGINEER
1
2

ENGR. TECHNICIAN
1 R. JAVIER ACUNA
2 JEFFREY M. PUJOL

LAB TECHNICIAN
1
2

OTHER
1
2

RUN NO SS-P-3
DATE 5-6-87

SAMPLING TRAIN SPECIFICATIONS

RECORDED BY [illegible]
ASSISTED BY [illegible]

I. PROBE ASSEMBLY

A. PROBE LENGTH 4½ FT.
B. LINER MATERIAL Glass
C. PITOT NUMBER 001
D. PITOT COEFFICIENT 0.84

II. MISC. COMPONENTS

A. NOZZLE DIAMETER 0.205 IN.
B. NOZZLE IDENT. NO. 1871
C. UMBILICAL LENGTH 50.0 FT.
D. FILTER HOLDER TYPE Glass
E. FILTER NUMBER 87013

III. IMPINGER CONTENT

NUMBER	TYPE*	NORMAL MATERIAL	NORMAL AMOUNT	USE MATERIAL	USE AMOUNT	FINAL AMOUNT	NET GAIN
1	M	DW	100ML	DW	528.8	575.0	46.2
2	GS	DW	100ML	DW	521.9	546.2	24.3
3	M	DRY	———	DRY	423.4	424.4	1.0
4	M	ADSORBENT**	~200GM.	SG	630.3	638.4	8.1

#4 CONTAINER WEIGHT = ______ GM.
WEIGHT WITH ADSORBENT = ______ GM.

TOTAL MOISTURE ADSORBED 79.6

* GS = GREENBURG-SMITH, M = MODIFIED, O = OTHER ______
** SG = SILICA GEL, D = DRIERITE, O = OTHER ______

IV. CONTROL CONSOLE: ΔH@ (PRE-TEST) ______ ΔH@ (POST-TEST) ______

CONSOLE NO. ______
Y (PRE-TEST) ______ Y (POST-TEST) ______

	VELOCITY	TEMPERATURE	PRESSURE
SENSOR	☐ STANDARD ☑ "S" SHAPED	☑ THERMOCOUPLE (TYPE K) ☐ OTHER ______	☑ STANDARD ☐ "S" SHAPED
READING DEVICE	☑ DI MANOMETER (0-~~5~~ 10 IN. H_2O) ☐ HIGH SENSITIVITY (RANGE ___) ☐ OTHER ______	☑ PYROMETER (TYPE K) ☐ OTHER ______	☐ DI MANOMETER (0-5 IN. H_2O) ☐ HIGH SENSITIVITY (RANGE ___) ☑ OTHER U-TUBE

COMMENTS: ______

RUN NO. SS-P-3

DATE 5-6-87 STACK GEOMETRY RECORDED BY [signature]

SKETCH OF FLOW PROFILE AND CROSS-SECTION
(ILLUSTRATE PORT-POINT CONFIGURATION, FLOW INTERFERENCES, ETC.)
NOTE: SAME AS RUN SS-P-1

FOR ROUND STACKS

A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT ______ IN.

B. PORT LENGTH ______ IN.

STACK DIAMETER: (A-B) ______ IN.

STACK AREA: ______ $IN.^2$

FOR RECTANGULAR STACKS

A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT ______ IN.

B. PORT LENGTH ______ IN.

STACK DEPTH: (A-B) ______ IN.

STACK WIDTH (INSIDE) ______ IN.

STACK AREA (DEPTH X WIDTH) ______ $IN.^2$

EQUIVALENT DIAMETER $\left(2\left[\frac{L \times W}{L + W}\right]\right)$ ______ IN.

SAMPLING CROSS-SECTION IS:

NO. OF DUCT DIAMETERS		TYPE OF FLOW OBSTRUCTION
______	DIAMETERS DOWNSTREAM OF	______
______	DIAMETERS UPSTREAM OF	______

NUMBER OF SAMPLING POINTS

MIN. REQ'D. (METHOD 1) ______

USE ______

RUN NO. SS-P-3

DATE 5-6-87

TRAVERSE POINTS

RECORDED BY [signature]

POINT	PERCENT OF DIAMETER FROM INSIDE PORT TO POINT — NUMBER OF TRAVERSE POINTS ON A DIAMETER: 2 ☐	4 ☐	6 ☐	8 ☐	10 ☐	12 ☐	14 ☐	16 ☐	18 ☐	20 ☐	22 ☐	24 ☐	DISTANCE FROM INSIDE PORT (IN.)	DISTANCE FROM OUTSIDE PORT (IN.)	USE (IN.)
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1			
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2			
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5			
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9			
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5			
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2			
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1			
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4			
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0			
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2			
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3			
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8			
13							94.3	87.5	81.2	75.0	68.5	60.2			
14							98.2	91.5	85.4	79.6	73.8	67.7			
15								95.1	89.1	83.5	78.2	72.8			
16								98.4	92.5	87.1	82.0	77.0			
17									95.6	90.3	85.4	80.6			
18									98.6	93.3	88.4	83.9			
19										96.1	91.3	86.8			
20		NOTE: SAME AS RUN NO. SS-P-1								98.7	94.0	89.5			
21											96.5	92.1			
22											98.9	94.5			
23												96.8			
24												98.9			

COMMENTS:

RUN NO. SS-P-3
DATE 5/6/87

NOMOGRAPH DATA

RECORDED BY [illegible]
CHECKED BY JW

NOTE: SAME AS RUN ____

TA	AMBIENT TEMPERATURE	= 88.0	°F
Pb	BAROMETRIC PRESSURE	= 30.02	IN. Hg.
ΔH @	REFERENCE ΔH	= 0.885	IN. H_2O
TM	AVG. METER TEMPERATURE	= 97.3	°F
% H_2O	MOISTURE CONTENT	= 8.2	% BY VOL.
Po	STATIC (GUAGE) PRESSURE IN STACK	= .3	IN. H_2O
	x 0.074	= 0.0222	IN. Hg.
PS	ABSOLUTE PRESSURE IN STACK, Pb - Po	= 30.00	IN. Hg.
PM	METER PRESSURE (~Pb)	= 30.02	IN. Hg.
PS/PM	= ____		
C	CORRECTION FACTOR	= 0.895	
Ts	STACK TEMPERATURE	= 87.3	°F
ΔP	AVERAGE STACK VELOCITY HEAD	= 0.76	IN. H_2O
ΔPMAX.	MAXIMUM STACK VELOCITY HEAD	= 0.80	IN. H_2O
D	PROBE TIP DIAMETER	= 0.205	IN.

Req'd Sampling Rate or Volume ____ Calculated Sampling Rate or Volume (Pre-test) ____

TS					
ΔPREF					

PITOT LEAK CHECKS*				
OPENING	PRE-TEST	BY	POST-TEST	BY
IMPACT	☑ STABLE ☐ LEAKING	[illegible]	☑ STABLE ☐ LEAKING	[illegible]
STATIC	☑ STABLE ☐ LEAKING	[illegible]	☑ STABLE ☐ LEAKING	[illegible]

* Vacuum must remain stable for 15 seconds @ 3 in. H_2O.

SAMPLING TRAIN LEAK CHECKS		
LEAK CHECKS*	PRE-TEST	POST-TEST
RATE OF LEAK (CFM)	0.0 CFM @ 10" Hg	0.0 CFM @ 10" Hg
TIME (24 HOUR CLOCK)	1306	1504
BY	[illegible]	[illegible]

*Rates ≤ 0.02 CFM @15in. Hg. vacuum or 4% of average sampling rate (whichever is less) are acceptable.

RUN NO. SS-P-3 **PARTICULATE SAMPLING** RECORDED BY [illegible]

DATE 5-6-87. ASSISTED BY JMD

SAMPLING TIME PER POINT 20 MIN.

PORT POINT	CLOCK TIME	METER VOLUME (DCF)	ΔP VEL. HEAD (IN. H_2O)	ΔH ORIFICE (IN. H_2O)	METER TEMP. IN (°F)	METER TEMP. OUT (°F)	STACK TEMP. (°F)	BOX TEMP. (°F)	BATH TEMP. (°F)	TRAIN VACUUM (IN. Hg)	COMMENT NUMBER
B-1	1313 / 1333	734.160 / 744.901	.55	.53	95	95	86	160	30	3	
B-2	1337 / 1357	756.551	.64	1.0	96	97	86	165	30	4	
A-1	1413 / 1433	767.640	.58	.88	100	102	91	170	30	3	
A-2	1438 / 1458	778553	.55	.83	98	100	86	175	30	3	
		44.39									

COMMENTS: 1.

2. B-1 22 Cars 1 grab

3. B-2 23 Cars

4. A-1 20 Cars

5. A-2 19 Cars

6.

7.

8.

9.

10.

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14.

15.

16.

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST

Analytical Worksheet

(EPA METHOD 5)

CLIENT: Southern Scrap

WSNCo JOB NO.: 87011

RUN NO.: SS-P-3 BY: Raul J. Acuna

DATE: 5/7/87

ACETONE BLANK

BY: Jeffrey M. Pujol DATE: 5/7/87

Visual Observations: Clear

Sample No.: SS-B-1 (13)

Acetone Volume: 200 ml

Any Noted Acetone Loss: none

Final Beaker Weight: 110,312.6 mg.

Beaker Tare Weight: 110,311.2 mg.

Acetone Blank Net Weight: 1.4 mg.

BLANK RESIDUAL = ACETONE BLANK NET WEIGHT ÷ ACETONE WEIGHT

Blank Residual = 1.4 mg. ÷ 200 ml. = 0.007 mg/ml

% BLANK RESIDUAL = BLANK RESIDUAL ÷ DENSITY OF ACETONE (785.7 mg/ml) x 100

% Blank Residual = 0.007 mg/ml ÷ 785.7 mg/ml x 100 = 0.000008909 %

If BLANK RESIDUAL is less than 0.001% then:

ALLOWABLE BLANK RESIDUAL = BLANK RESIDUAL

ALLOWABLE BLANK RESIDUAL = 0.000008909 mg/ml

If % BLANK RESIDUAL is greater than or equal to 0.001% then:

ALLOWABLE BLANK RESIDUAL = DENSITY OF ACETONE x 0.00001 = N/A mg/ml

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST

Analytical Worksheet

ACETONE RINSE

BY: Jeffrey M. Pujol   DATE: 5/7/87

Visual Observations: Few suspended particulates

Sample No.: SS-P-1 (14)

Acetone Volume: 172 ml.

Blank Correction = Acetone Volume x Allowable Blank Residual

Blank Correction =

172 ml. x 0.0000089 mg/ml = 0.0015 mg.

Final Beaker Weight: 104257.9 mg.

Beaker Tare Weight: 104,235.1 mg.

Acetone Rinse Net Weight: 22.8 mg.

Minus Blank Correction: 0.0015 mg.

Corrected Net Weight: 22.8 mg.

Any Noted Acetone Loss: none

FILTER WEIGHT

BY: ~~Slight tan coating~~ Jeffrey M. Pujol   DATE: 5/7/87

Visual Observations: slight tan coating

Filter No.: 87011

Sample No.: SS-F-1

Final Filter Weight: 531.8 mg.

Filter Tare Weight: 525.0 mg.

Filter Net Weight: 6.8 mg.

SAMPLE WEIGHT

BY: Jeffrey M. Pujol   DATE: 5-13-87

Acetone Rinse Corrected Net Weight: 22.8 mg.

Filter Net Weight: 6.8 mg.

Total Sample Weight: 29.6 mg.

ANALYST: Jeffrey M. Pujol   DATE: 5-13-87
Signature

WSNCO FORM NO. ST010

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST

Analytical Worksheet

ACETONE RINSE

BY: Jeffrey M. Pujol DATE: 5/7/87

Visual Observations: Few suspended particulates, Some filter remnants

Sample No.: SS-P-2 (15) Final Beaker Weight: 97743.5 mg.

Acetone Volume: 198 ml. Beaker Tare Weight: 97687.6 mg.

Blank Correction = Acetone Volume x Allowable Blank Residual

Acetone Rinse Net Weight: 55.9 mg.

Minus Blank Correction: 0.0018 mg.

Blank Correction =

198 ml. x 0.0000089 mg/ml = 0.0018 mg.

Corrected Net Weight: 55.9 mg.

Any Noted Acetone Loss: N/A

FILTER WEIGHT

BY: Jeffrey M. Pujol DATE: 5/7/87

Visual Observations: Slight tan coating

Filter No.: 87012 Final Filter Weight: 514.5 mg.

Sample No.: SS-F-2 Filter Tare Weight: 524.3 mg.

Filter Net Weight: (-9.8) mg.

SAMPLE WEIGHT

BY: Jeffrey M. Pujol DATE: 5/13/87

Acetone Rinse Corrected Net Weight: ~~55.8~~ 55.9 mg.

Filter Net Weight: (-9.8) mg.

Total Sample Weight: 46.1 mg.

ANALYST: Jeffrey M Pujol DATE: 5/13/87
Signature

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST

Analytical Worksheet

ACETONE RINSE

BY: Jeffrey M. Pujol DATE: 5/7/87

Visual Observations: FILTER REMNANTS

Sample No.: SS-P-3 (16) Final Beaker Weight: 107,449.0 mg.

Acetone Volume: 189 ml. Beaker Tare Weight: 107,400.2 mg.

Blank Correction = Acetone Volume x Allowable Blank Residual

Acetone Rinse Net Weight: 48.8 mg.

Minus Blank Correction: 0.00168 mg.

Blank Correction =

189 ml. x 0.0000089 mg/ml = 0.00168 mg.

Corrected Net Weight: 48.8 mg.

Any Noted Acetone Loss: N/A

FILTER WEIGHT

BY: Jeffrey M. Pujol DATE: 5/7/87

Visual Observations: Slight tan Coating

Filter No.: 87013 Final Filter Weight: 525.2 mg.

Sample No.: SS-P-3 Filter Tare Weight: 525.8 mg.

Filter Net Weight: (-0.6) mg.

SAMPLE WEIGHT

BY: Jeffrey M. Pujol DATE: 5-13-87

Acetone Rinse Corrected Net Weight: 48.8 mg.

Filter Net Weight: (-0.6) mg.

Total Sample Weight: 48.2 mg.

ANALYST: Jeffrey M. Pujol DATE: 5-13-87
Signature

LIST OF EQUATIONS
(EPA METHODS 1 THRU 5)

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS
(68 DEGREES F, 29.921 IN. HG.), DSCF

VM = DRY GAS VOLUME, METER CONDITIONS (DCF)
Y = DRY GAS METER CALIBRATION FACTOR
PB = BAROMETRIC PRESSURE (IN. HG.)
PM = AVERAGE ORIFICE PRESSURE DROP (IN. H2O)
TM = AVERAGE METER TEMPERATURE (DEGREES F)

$$VMSTD = \frac{17.636 * VM * [PB + \frac{PM}{13.6}]}{(TM + 459.69)} = \quad DSCF$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS, SCF
VW = TOTAL WATER COLLECTED

$$VWV = 0.04707 * VW = SCF$$

PERCENT MOISTURE IN STACK GAS

$$PMOS = \frac{100 * VWV}{VMSTD * VWV} = \quad \%$$

MOLE FRACTION OF DRY GAS, MD

$$MD = 1 - \frac{VWV}{VMSTD + VWV}$$

MOLECULAR WEIGHT OF DRY STACK GAS, MWD

$$MWD = (\%CO2 * 0.440) + (\%O2 * 0.320) + (\%CO + \%N2) * 0.280$$

MOLECULAR WEIGHT OF WET STACK GAS

$$MW = MWD * MD + 18.015 (1 - MD)$$

AVERAGE STACK GAS VELOCITY AT STACK CONDITIONS, FPM

CP = PITOT COEFFICIENT
DPS = AVERAGE STACK VELOCITY HEAD
PS = STACK PRESSURE, ABSOLUTE (IN. HG.)
TS = AVERAGE STACK TEMPERATURE (DEGREES F)

$$VS = 5129.4 * CP * DPS \quad \frac{TS + 459.69}{PS * MW} = \quad FPM$$

VOLUMETRIC FLOWRATE AT STANDARD CONDITIONS, DSCFM

AS = STACK AREA (SQ. IN.)

$$QS = \frac{0.12247 * VS * AS * MD * PS}{(TS + 459.69)} = \quad DSCFM$$

PERCENT ISOKINETIC

TT = NET TIME OF RUN (MIN.)
DN = NOZZLE DIAMETER (IN.)

$$PERI = \frac{1039.6 * (TS + 459.69) * VMSTD}{VS * TT * PS * MD * (DN)^2} = \quad \%$$

PARTICULATE LOADING AT STANDARD CONDITIONS, GR/DSCF

MF = PARTICULATE WEIGHT, TOTAL (MG.)

$$\text{CAN} = 0.015432 * (\text{MF}/\text{VMSTD}) = \qquad \text{GR/DSCF}$$

PARTICULATE LOADING AT STACK CONDITIONS, GR/ACF

$$\text{CAT} = \frac{17.636 * \text{CAN} * \text{PS} * \text{MD}}{(\text{TS} * 459.69)} = \qquad \text{GR/ACF}$$

PARTICULATE EMISSION RATE, LBS/HR

$$\text{CAW} = 0.008571 * \text{CAN} * \text{QS} = \qquad \text{LBS/HR}$$

PARTICULATE LOADING AT STANDARD CONDITIONS, LB/DSCF

$$\text{C} = \text{CAN} / 7{,}000 = \qquad \text{LB/DSCF}$$

EMISSION RATE, LB/MMBTU

F = DSCF/MMBTU, USE 9820 FOR BITUMINOUS COAL AND O2

$$\text{E} = \text{C} * \text{F} * \frac{20.9}{20.9 - \%\text{O2}} = \qquad \text{LB/MMBTU}$$

WALDEMAR S. NELSON AND COMPANY
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ANALYTICAL BALANCE CALIBRATION FORM

BALANCE NAME: TORBAL MODEL EA-1AP NUMBER: 160530

CLASSIFICATION OF STANDARD WEIGHTS: S-1

DATE	0.500 g	1.0000 g	10.0000 g	50.0000 g	100.0000 g	ANALYST
1-30-87	0.5003	1.0007	10.0006	50.0005	100.0006	[illegible]
2-12-87	0.5003	1.0004	10.0003	50.0005	100.0003	[illegible]
2-14-87	0.5001	1.0002	10.0002	50.0004	100.0003	[illegible]
2-16-87	0.5000	1.0001	10.0000	50.0001	100.0001	[illegible]
2-27-87	0.5000	1.0002	10.0002	50.0002	100.0003	[illegible]
3-2-87	0.5001	1.0002	10.0000	50.0002	100.0001	R.M. Hogan
3-5-87	0.5000	1.0000	10.0000	50.0003	100.0004	[illegible]
3-6-87	0.5000	1.0000	10.0000	50.0000	100.0000	[illegible]
3-16-87	0.5001	1.0002	10.0002	50.0004	100.0003	[illegible]
3-19-87	0.5001	1.0003	10.0002	50.0005	100.0005	[illegible]
3-20-87	0.5000	1.0002	10.0001	50.0004	100.0004	[illegible]
3-25-87	0.5001	1.0003	10.0000	50.0000	100.0000	[illegible]
3-31-87	0.5000	1.0002	10.0001	50.0004	100.0002	[illegible]
4-27-87	0.5002	1.0004	10.0000	50.0003	100.0000	[illegible]
4-28-87	0.5003	1.0004	10.0003	50.0003	100.0002	[illegible]
5-4-87	0.5000	1.0000	10.0001	50.0002	100.0001	[illegible]
5-8-87	0.5001	1.0004	10.0002	50.0003	100.0004	[illegible]
5-13-87	0.5000	1.0004	10.0003	50.0004	100.0005	[illegible]

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FILTER WEIGHT LOG
(EPA METHOD 5, 8, & 17)

Filter Serial Number	Filter Type	WSNCo Job No.	Desiccation Data (Initial) Date	Time (24-hour Clock)	By	Tare Weight Determination First Weight (g.)	Date	Time (24-hour Clock)	By	Second Weight (g.)	Date	Time (24-hour Clock)	By	Tare Weight w_t (g.)	Desiccation Data (Final) Date	Time (24-hour Clock)	By	Tare Weight Determination First Weight (g.)	Date	Time (24-hour Clock)	By	Second Weight (g.)	Date	Time (24-hour Clock)	By	Final Weight w_f (g.)	Net Weight ($w_f - w_t$) (g.)
87001	M-5	87020	2/2/87	845	Jmf	.5137	2/2/87	1639	Jmf	.5140	2/3/87	740	Jmf	.5137	2/26/87	1616	Jmf	.5840	2/27/87	1616	Jmf	.5845	3/2/87	915	RMA	0.5845	0.0708
87002	M-5	87020	2/2/87	845	Jmf	.5185	2/2/87	1639	Jmf	.5189	2/3/87	740	Jmf	.5185	2/26/87	1616	Jmf	VOID									
87003	M-5	87020	2/2/87	845	Jmf	.5397	2/2/87	1639	Jmf	.5391	2/3/87	740	Jmf	.5396	2/26/87	1616	Jmf	.5531	2/30/87	1616	Jmf	.5527	3/2/87	915	RMA	0.5531	0.0135
87004	M-5	87030	2/2/87	845	Jmf	.5234	2/2/87	1639	Jmf	.5233	2/3/87	740	Jmf	.5233	2/26/87	1616	Jmf	.5687	3/2/87	1616	Jmf	.5683	3/6/87	915	RMA	0.5687	0.0454
87005	M-5	87020	2/2/87	845	Jmf	.5223	2/2/87	1639	Jmf	.5222	2/3/87	740	Jmf	.5222	2/26/87	1616	Jmf	.5245	2/27/87	1100	Jmf	.5244	3/2/87	915	RMA	0.5245	0.0023
87006	M-5	87020	2/2/87	845	Jmf	.5199	2/2/87	1639	Jmf	.5203	2/3/87	740	Jmf	.5199	2/26/87	1616	Jmf	.5145	2/27/87	1100	Jmf	.5143	3/2/87	915	RMA	0.5145	(-0.0054)
87007	M-5	87020	2/2/87	845	Jmf	.5171	2/2/87	1639	Jmf	.5170	2/3/87	740	Jmf	.5170	2/26/87	1616	Jmf	.5324	3/5/87	1100	Jmf	.5319	3/6/87	915	RMA	0.5324	0.0154
87008	M-5	87070	2/2/87	845	Jmf	.5207	2/2/87	1639	Jmf	.5207	2/3/87	740	Jmf	.5207	2/26/87	1616	Jmf	.5150	3/6/87	1620	Jmf	.5152	3/10/87	1530	Jmf	0.5152	(-0.0055)
87009	M-5	87070	2/2/87	845	Jmf	.5277	2/2/87	1634	Jmf	.5279	2/3/87	740	Jmf	.5277	2/26/87	1616	Jmf	.5220	3/6/87	1620	Jmf	.5222	3/11/87	1530	Jmf	0.5222	(-0.0055)
87010	M-5	87070	2/2/87	845	Jmf	.5303	2/2/87	1639	Jmf	.5306	2/3/87	740	Jmf	.5303	2/26/87	1616	Jmf	.5264	3/6/87	1620	Jmf	.5262	3/11/87	1530	Jmf	0.5264	(-0.0039)
87011	M-5	87011	2/2/87	845	Jmf	.5250	2/2/87	1639	Jmf	.5252	2/3/87	740	Jmf	.5250	5/7/87	1616	Jmf	.5318	5/6/87	1105	Jmf	.5317	5/9/87	1345	Jmf	0.5318	0.0068
87012	M-5	87011	2/2/87	845	Jmf	.5243	2/2/87	1634	Jmf	.5243	2/3/87	740	Jmf	.5243	5/7/87	1616	Jmf	.5145	5/6/87	1105	Jmf	.5142	5/8/87	1345	Jmf	0.5145	(-0.0098)
87013	M-5	87011	3/1/87	1620	Jmf	.5263	3/4/87	1620	Jmf	.5258	3/7/87	1530	Jmf	.5256	5/7/87	1616	Jmf	.5252	5/6/87	1105	Jmf	.5248	5/9/87	1345	Jmf	0.5252	(-0.0006)
87014	M-5		3/1/87	1620	Jmf	.5230	3/4/87	1620	Jmf	.5225	3/7/87	1530	Jmf	.5225	1 [illegible]		Jmf										
87015	M-5		3/1/87	1620	Jmf	.5305	3/4/87	1620	Jmf	.5300	3/7/87	1530	Jmf	.5300	1 [illegible]		Jmf										
87016	M-5		3/1/87	1620	Jmf	.5295	3/7/87	1530	Jmf	.5298	3/8/87	0730	Jmf	.5295	1 [illegible]		Jmf										
87017	M-5		3/1/87	1620	Jmf	.5240	3/4/87	1620	Jmf	.5237	3/7/87	1530	Jmf	.5237	1 [illegible]		Jmf										
87018	M-5		3/1/87	1620	Jmf	.5249	3/4/87	1620	Jmf	.5245	3/7/87	1530	Jmf	.5245	1 [illegible]		Jmf										
87019																											
87020																											
87021																											
87022																											
87023																											
87024																											
28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

COMMENTS:
Audited 87001 2/2/87 0.5737g
Audited 87000 2/3/87 0.5204g
Audited 87008 3/16/87 0.5150
Audited 87010 3/17/87 0.5262
Audited 87016 3/18/87 0.5298
Audited 87011 5/8/87 0.5320

WSNCO FORM NO. 87009

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

BEAKER WEIGHT LOG
(EPA METHOD 5, 8, & 17)

Beaker Serial Number	Beaker Type	WSNCo Job No.	Desiccation Data (Initial): Date	Time (24-hour Clock)	By	Tare Weight Determination: First Weight (g.)	Date	Time (24-hour Clock)	By	Second Weight (g.)	Date	Time (24-hour Clock)	By	Tare Weight wt_t (g.)
1	M-5	87020	2/8/87	1430	RQA	106.637[illegible]	2/12/87	1630	Jmf	106.63[illegible]	2/14/87	1330	LRS	106.637[illegible]
2	M-5	87020	2/5/87	1430	RQA	105.6395	2/12/87	1630	Jmf	105.639[illegible]	2/14/87	1330	LRS	105.639[illegible]
3	M-5	87020	2/5/87	1430	RQA	106.7446	2/12/87	1630	Jmf	106.745	2/14/87	1330	LRS	106.7446
4	M-5	87020	2/5/87	1430	RQA	107.3390	2/12/87	1630	Jmf	107.339[illegible]	2/14/87	1916	LRS	107.3390
5	M-5	87020	2/9/87	1430	RQA	110.9906	2/12/87	1630	Jmf	110.9912	2/14/87	1330	LRS	110.9906
6	M-5	87020	2/9/87	1430	RQA	106.997[illegible]	2/12/87	1630	Jmf	106.997[illegible]	2/14/87	1916	LRS	106.997[illegible]
7	M-5	87020	2/[illegible]/87	1430	RQA	109.5856	2/12/87	1630	Jmf	109.586	2/14/87	1330	LRS	109.5856
8	M-5	87020	2/6/87	1430	RQA	109.8352	2/12/87	1630	Jmf	109.8355	2/14/87	1330	LRS	109.8353
9	M-5	87070	2/[illegible]/87	1430	RQA	108.2899	2/12/87	1630	Jmf	108.290	2/14/87	1330	LRS	108.2899
10	M-5	87070	2/13/87	1430	RQA	108.1634	2/17/87	1630	Jmf	108.1631	2/18/87	1330	LRS	108.163[illegible]
11	M-5	87070	2/14/87	1430	RQA	107.9348	2/17/87	1630	Jmf	107.9350	2/18/87	1330	LRS	107.934[illegible]
12	M-5	87070	2/13/87	1430	RQA	107.5740	2/12/87	1630	Jmf	107.5736	2/14/87	1916	LRS	107.573[illegible]
13	m-5	87011	4/27/87	0800	Jmf	110.3112	4/27/87	0800	Jmf	110.3113	[illegible]	0810	Jmf	110.3112
14	m-5	87011	4/27/87	0800	Jmf	104.2356	4/27/87	0800	Jmf	104.235[illegible]	[illegible]	0810	Jmf	104.235[illegible]
15	m-5	87011	4/27/87	0800	Jmf	97.6876	4/27/87	0800	Jmf	97.687[illegible]	[illegible]	0810	Jmf	97.687[illegible]
16	m-5	87011	4/27/87	0800	Jmf	107.4002	4/27/87	0800	Jmf	107.4003	[illegible]	0810	Jmf	107.400[illegible]
17	m-5		4/27/87	0800	Jmf	106.7277	4/28/87	1120	Jmf	106.7278	5/1/87	0855	Jmf	106.727[illegible]
18	m-5		4/27/87	0800	Jmf	106.7370	4/28/87	0810	Jmf	106.73[illegible]	5/1/87	0855	Jmf	106.737[illegible]
19	m-5		4/27/87	0800	Jmf	100.0526	4/27/87	0800	Jmf	100.0527	[illegible]	0810	Jmf	100.052[illegible]
20	m-5		4/27/87	0800	Jmf	106.9953	4/27/87	0800	Jmf	106.9955	[illegible]	0810	Jmf	106.995[illegible]
28	27	26	25	24	23	22	21	20	19	18	17	16	15	14

Beaker Serial Number	Desiccation Data (Final): Date	Time (24-hour Clock)	By	Tare Weight Determination: First Weight (g.)	Date	Time (24-hour Clock)	By	Second Weight (g.)	Date	Time (24-hour Clock)	By	Final Weight wt_f (g.)	Net Weight $(wt_f - wt_t)$ (g.)
1	[illegible]	1100	Jmf	106.7953	3/2/87	1105	Jmf	106.7955	3/5/87	740	Jmf	106.7955	0.1576
2	[illegible]	1100	Jmf	105.7213	3/2/87	1105	Jmf	105.7216	3/5/87	740	Jmf	105.7216	0.0821
3	[illegible]	1100	Jmf	107.1971	3/2/87	1105	Jmf	107.1973	3/5/87	740	Jmf	107.1973	0.4527
4	[illegible]	1100	Jmf	107.344[illegible]	3/2/87	1105	Jmf	107.3441	3/5/87	740	Jmf	107.3441	0.0051
5	[illegible]	1100	Jmf	110.9916	3/2/87	1105	Jmf	110.9920	3/5/87	740	Jmf	110.9920	0.0014
6	[illegible]	1100	Jmf	107.049[illegible]	3/5/87	740	Jmf	107.049[illegible]	3/2/87	1105	Jmf	107.0490	0.0520
7	[illegible]	1100	Jmf	109.6149	3/2/87	1105	Jmf	109.6149	3/5/87	740	Jmf	109.6149	0.0293
8	[illegible]	1100	Jmf	109.849[illegible]	3/2/87	1105	Jmf	109.8490	3/5/87	740	Jmf	109.8493	0.0140
9	3/16/87	0730	RMH	108.3336	3/17/87	1530	Jmf	108.3331	3/18/87	0730	RMH	108.3336	0.0437
10	3/16/87	0730	RMH	108.2010	3/17/87	1530	Jmf	108.[illegible]	3/18/87	0730	RMH	108.2000	0.0369
11	3/16/87	0730	RMH	107.9721	3/17/87	1530	Jmf	107.9720	3/18/87	0730	RMH	107.9721	0.0373
12	3/16/87	0730	RMH	107.5756	3/17/87	1530	Jmf	107.5754	3/18/87	0730	RMH	107.5758	0.0020
13	5/9/87	1350	Jmf	110.3123	5/12/87	0805	Jmf	110.3126	5/13/87	0730	Jmf	110.3126	0.0014
14	5/9/87	1350	Jmf	104.2577	5/12/87	0805	Jmf	104.2579	5/13/87	0730	Jmf	104.2579	0.0228
15	5/9/87	1350	Jmf	97.7432	5/12/87	0805	Jmf	97.7435	5/13/87	0730	Jmf	97.7435	0.0559
16	5/9/87	1350	Jmf	107.4485	5/12/87	0805	Jmf	107.4490	5/13/87	0730	Jmf	107.4490	0.0488
17													
18													
19													
20													
	13	12	11	10	9	8	7	6	5	4	3	2	1

COMMENTS:
Audited 2 2/16/87 105.6398 LRS Jmf
Audited 9 2/16/87 108.2901 LRS Jmf
Audited 11 3/17/87 107.9724
Audited 12 3/18/87 107.5754 Jmf
Audited 13 4/28/87 110.3115 RMH
Audited 15 4/28/87 97.6880 RMH
Audited 19 4/28/87 100.0530 RMH

WSNCo FORM NO. [illegible]

ITEM: 51-601-7121 PROBE JACKET ASSEMBLY 1 600 1 10/24/93
PART NO. DESCRIPTION SERIAL NO. DATE

SOLD TO: W. S. Nelson 124654 16738 10/24/93
COMPANY P.O. NO. S.O. NO. DATE

002

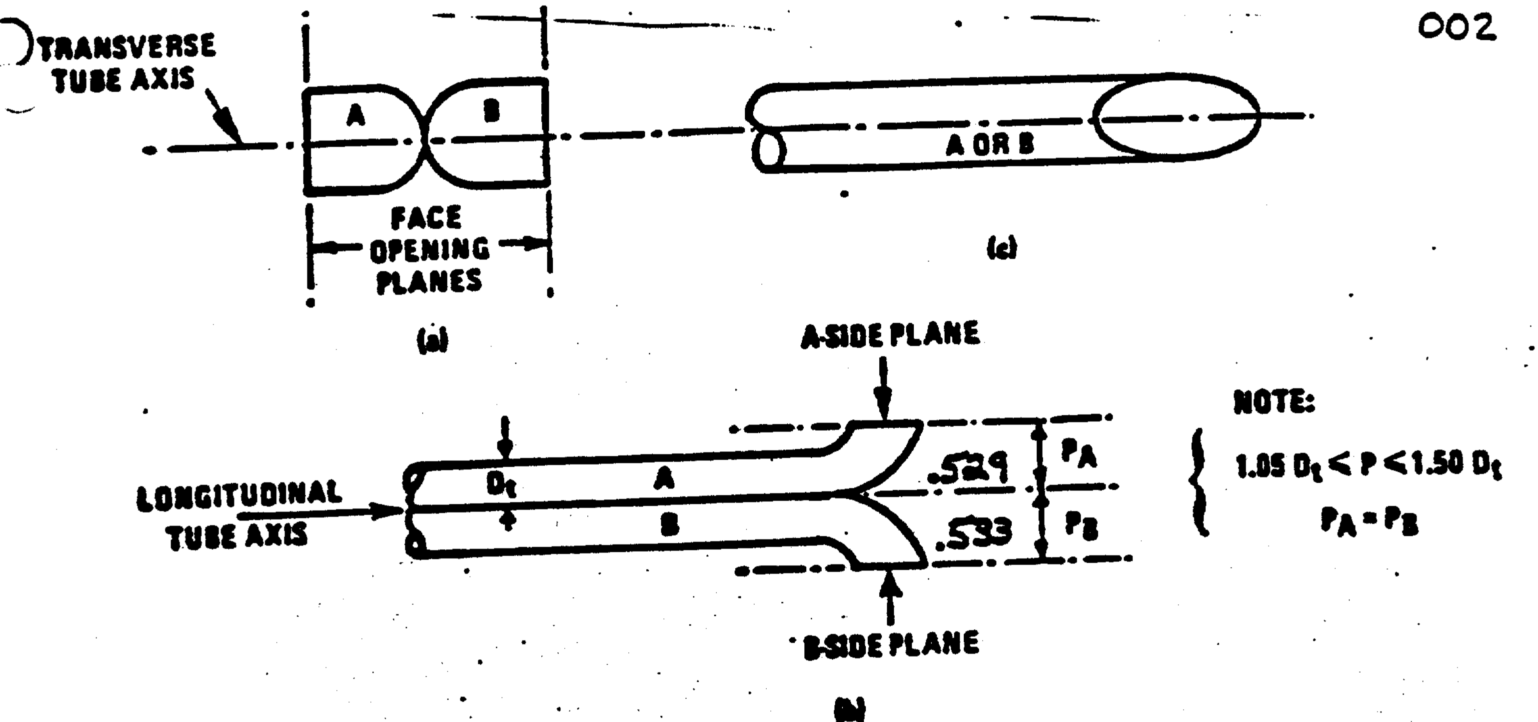
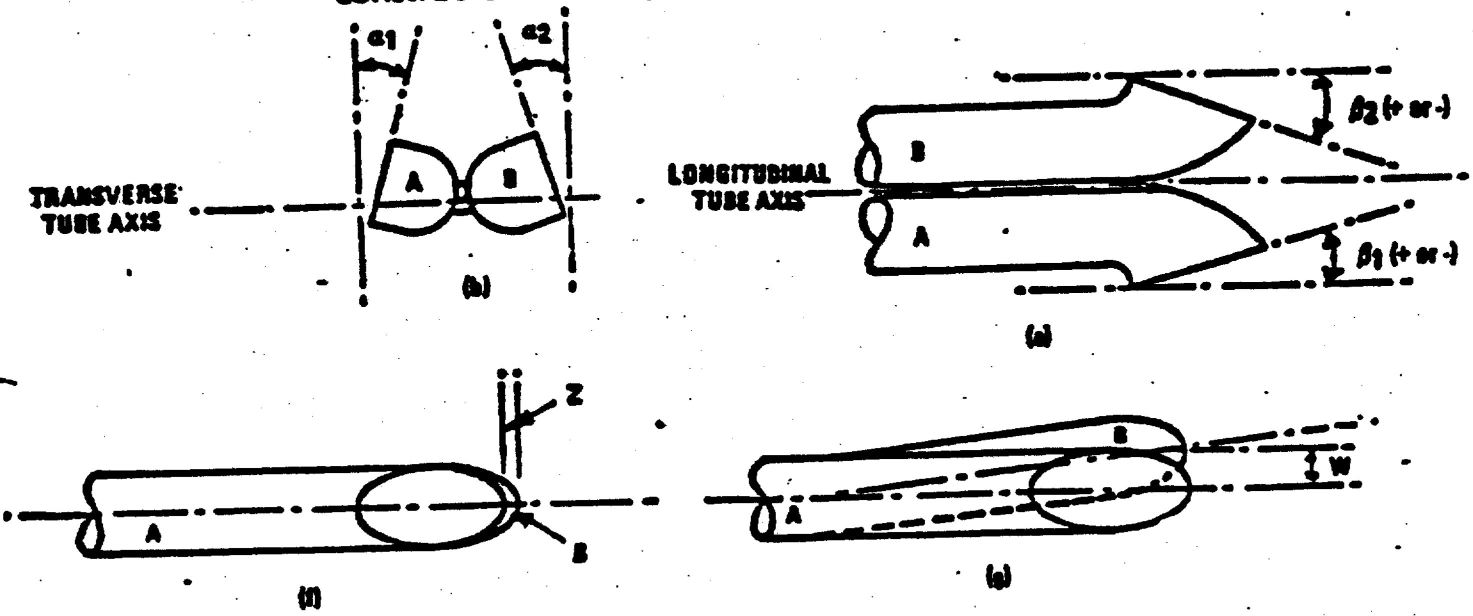


Figure 2-2. Properly constructed Type S pitot tube, shown in: (a) end view; face opening planes perpendicular to transverse axis; (b) top view; face opening planes parallel to longitudinal axis; (c) side view; both legs of equal length and centerlines coincident, when viewed from both sides. Baseline coefficient values of 0.84 may be assigned to pitot tubes constructed this way.



α_1 0° LESS THAN 10° β_1 0° LESS THAN 5°

α_2 0° β_2 0°

z .010" LESS THAN .32cm (1/8") w 0" LESS THAN .08cm (1/32")

Figure 2-3. Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect the baseline value of $\bar{C}_{p(s)}$ so long as α_1 and $\alpha_2 < 10°$, β_1 and $\beta_2 < 5°$, $z < 0.32$ cm (1/8 in.) and $w < 0.08$ cm (1/32 in.) (citation 11 in Section 6).

ITEM: 31-601-4½ / PROBE JACKET ASSEMBLY / 680 / 10/24/...
PART NO. DESCRIPTION SERIAL NO. DATE

SOLD TO: W. S. NELSON / 24654 / 6738 / 10/24/...
COMPANY P.O. NO. S.O. NO. DATE

2.6 Determine the stack gas dry molecular weight. For combustion processes or processes that emit essentially CO_2, O_2, CO, and N_2, use Method 3. For processes emitting essentially air, an analysis need not be conducted; use a dry molecular weight of 29.0. For other processes, other methods, subject to the approval of the Administrator, must be used.

2.7 Obtain the moisture content from Reference Method 4 (or equivalent) or from Method 5.

2.8 Determine the cross-sectional area of the stack or duct at the sampling location. Whenever possible, physically measure the stack dimensions rather than using blueprints.

4. Calibration

4.1 Type S Pitot Tube. [illegible]

After verifying the face opening alignment, measure and record the following dimensions of the pitot tube: [illegible]

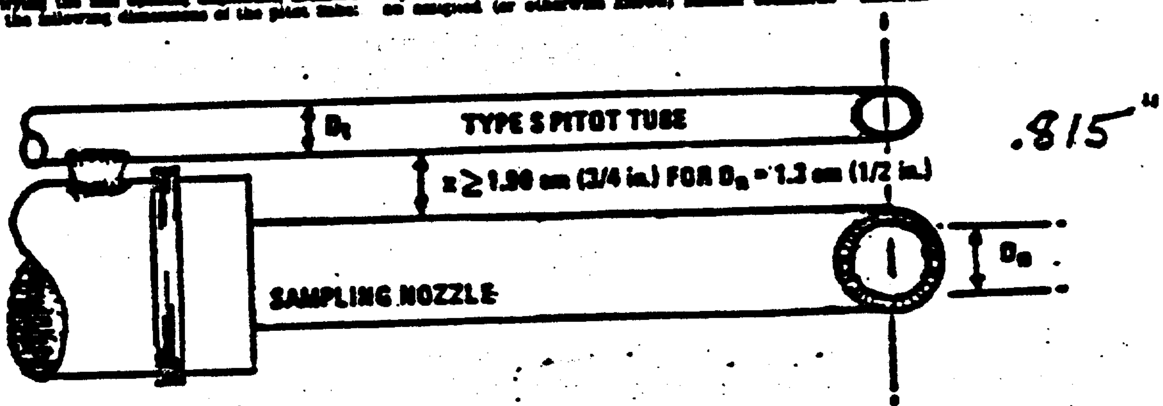
[illegible]

4.1.1 Type S Pitot Tube Assemblies. [illegible]

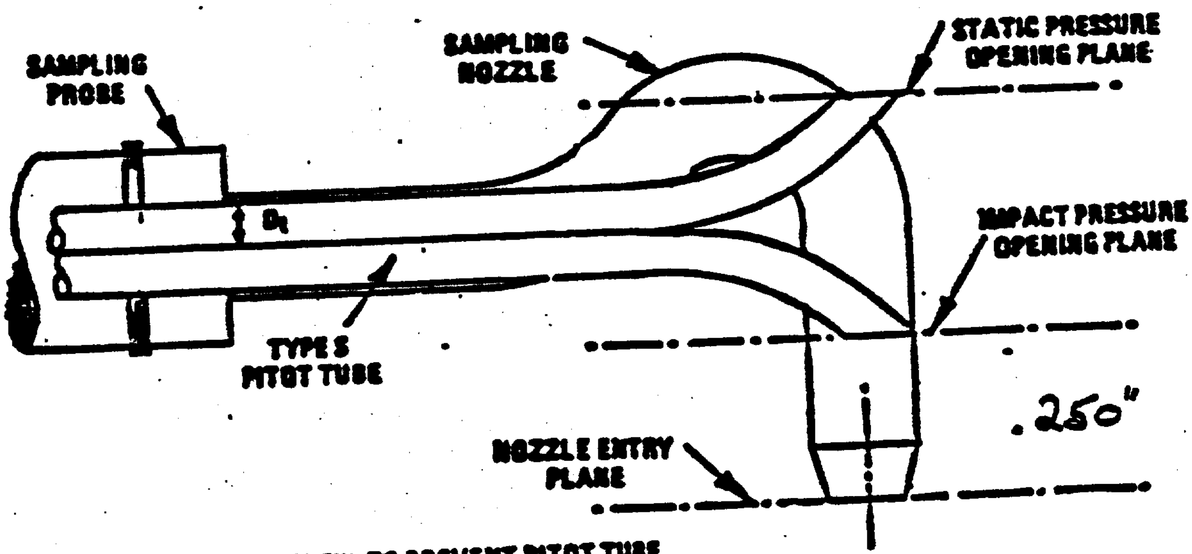
[illegible]

NOTE.—[illegible]

4.1.2 Calibration Setup. [illegible]



A. BOTTOM VIEW; SHOWING MINIMUM PITOT-NOZZLE SEPARATION.



B. SIDE VIEW; TO PREVENT PITOT TUBE FROM INTERFERING WITH GAS FLOW STREAMLINES APPROACHING THE NOZZLE, THE IMPACT PRESSURE OPENING PLANE OF THE PITOT TUBE SHALL BE EVEN WITH OR ABOVE THE NOZZLE ENTRY PLANE.

Figure 2-6. Proper pitot tube - sampling nozzle configuration to prevent aerodynamic interference; buttonhook - type nozzle; centers of nozzle and pitot opening aligned; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.)

ITEM: 31-601-4½ / PROBE JACKET ASSEMBLY / 680 / 10/24/93
PART NO. DESCRIPTION SERIAL NO. DATE

SOLD TO: W.S. NELSON / 24654 / 6738 / 10/24/93
COMPANY P.O. NO. S.O. NO. DATE

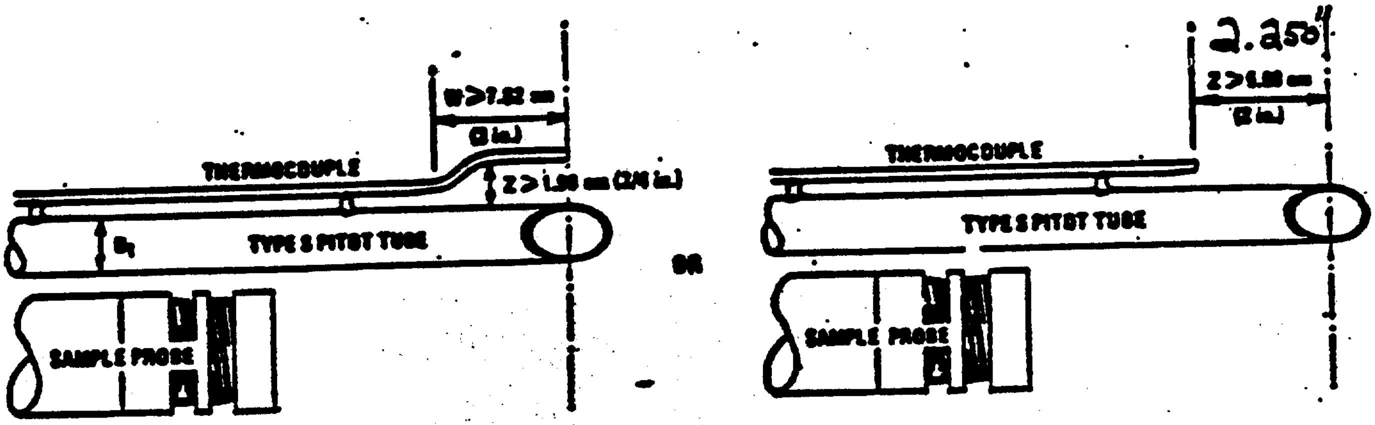


Figure 2-7. Proper thermocouple placement to prevent interference; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.).

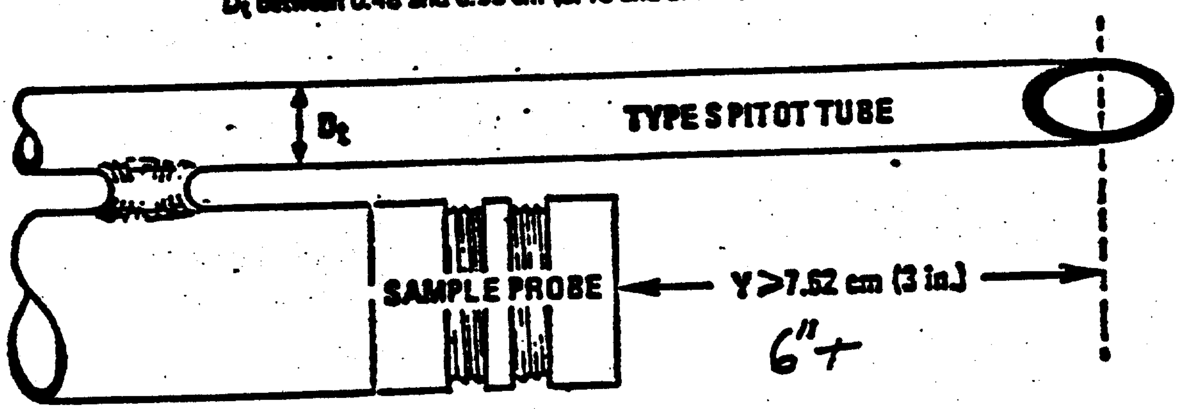


Figure 2-8. Minimum pitot-sample probe separation needed to prevent interference; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.).

4.1.2.1 The flowing gas stream must be confined to a duct of definite cross-sectional area, either circular or rectangular. For circular cross-sections, the minimum duct diameter shall be 30.5 cm (12 in.); for rectangular cross-sections, the width (shorter side) shall be at least 25.4 cm (10 in.).

4.1.2.2 The cross-sectional area of the calibration duct must be constant over a distance of 10 or more duct diameters. For a rectangular cross-section, use an equivalent diameter, calculated from the following equation, to determine the number of duct diameters:

$$D_e = \frac{2LW}{(L+W)}$$

Equation 2-1

where:
D_e = Equivalent diameter
L = Length
W = Width

To ensure the presence of stable, fully developed flow patterns at the calibration site, or "test section," the site must be located at least eight diameters downstream and two diameters upstream from the nearest disturbances.

Note.—The eight- and two-diameter criteria are not absolute; other test section locations may be used (subject to approval of the Administrator), provided that the flow at the test site is stable and demonstrably parallel to the duct axis.

4.1.2.3 The flow system shall have the capacity to generate a test-section velocity around 915 m/min (3,000 ft/min). This velocity must be constant with time to guarantee steady flow during calibration. Note that Type S pitot tube coefficients obtained by single-velocity calibration at 915 m/min (3,000 ft/min) will generally be valid to within ±3 percent for the measurement of velocities above 305 m/min (1,000 ft/min) and to within ±5 to 6 percent for the measurement of velocities between 180 and 305 m/min (600 and 1,000 ft/min). If a more precise correlation between C_p and velocity is desired, the flow system shall have the capacity to generate at least four distinct, time-invariant test-section velocities covering the velocity range from 180 to 1,525 m/min (600 to 5,000 ft/min), and calibration data shall be taken at regular velocity intervals over this range (see Citations 9 and 14 in Section 6 for details).

4.1.2.4 Two entry ports, one each for the standard and Type S pitot tubes, shall be cut in the test section; the standard pitot entry port shall be located slightly downstream of the Type S port, so that the standard and Type S impact openings will lie in the same cross-sectional plane during calibration. To facilitate alignment of the pitot tubes during calibration, it is advisable that the test section be constructed of plexiglas or some other transparent material.

4.1.3 Calibration Procedure. Note that this procedure is a general one and must not be used without first referring to the special considerations presented in Section 4.1.5. Note also that this procedure applies only to single-velocity calibration. To obtain calibration data for the A and B sides of the Type S pitot tube, proceed as follows:

4.1.3.1 Make sure that the manometer is properly filled and that the oil is free from contamination and is of the proper density. Inspect and leak-check all pitot lines; repair or replace if necessary.

4.1.3.2 Level and zero the manometer. Turn on the fan and allow the flow to stabilize. Seal the Type S entry port.

4.1.3.3 Ensure that the manometer is level and zeroed. Position the standard pitot tube at the calibration point (determined as outlined in Section 4.1.5.1), and align the tube so that its tip is pointed directly into the flow. Particular care should be taken in aligning the tube to avoid yaw and pitch angles. Make sure that the entry port surrounding the tube is properly sealed.

4.1.3.4 Read Δp_{std} and record its value in a data table similar to the one shown in Figure 2-9. Remove the standard pitot tube from the duct and disconnect it from the manometer. Seal the standard entry port.

4.1.3.5 Connect the Type S pitot tube to the manometer. Open the Type S entry port. Check the manometer level and zero. Insert and align the Type S pitot tube so that its A side impact opening is at the same point as was the standard pitot tube and is pointed directly into the flow. Make sure that the entry port surrounding the tube is properly sealed.

4.1.3.6 Read Δp_s and enter its value in the data table. Remove the Type S pitot tube from the duct and disconnect it from the manometer.

4.1.3.7 Repeat steps 4.1.3.3 through 4.1.3.6 above until three pairs of Δp readings have been obtained.

4.1.3.8 Repeat steps 4.1.3.3 through 4.1.3.7 above for the B side of the Type S pitot tube.

4.1.3.9 Perform calculations, as described in Section 4.1.4 below.

4.1.4 Calculations.

4.1.4.1 For each of the six pairs of Δp readings (i.e., three from side A and three from side B) obtained in Section 4.1.3 above, calculate the value of the Type S pitot tube coefficient as follows:

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

NOZZLE CALIBRATION LOG

NOZZLE ID NO. 1871

DATE: 5/5/87
MEASURED BY: LRB

MEASUREMENT NO.	DIAMETER
1	.205
2	.205
3	.205
AVG.	.205

DATE:
MEASURED BY:

MEASUREMENT NO.	DIAMETER
1	
2	
3	
AVG.	

DATE
MEASURED BY:

MEASUREMENT NO.	DIAMETER
1	
2	
3	
AVG.	

DATE:
MEASURED BY:

MEASUREMENT NO.	DIAMETER
1	
2	
3	
AVG.	

DATE:
MEASURED BY:

MEASUREMENT NO.	DIAMETER
1	
2	
3	
AVG.	

DATE:
MEASURED BY:

MEASUREMENT NO.	DIAMETER
1	
2	
3	
AVG.	

DATE:
MEASURED BY:

MEASUREMENT NO.	DIAMETER
1	
2	
3	
AVG.	

DATE:
MEASURED BY:

MEASUREMENT NO.	DIAMETER
1	
2	
3	
AVG.	

DATE:
MEASURED BY:

MEASUREMENT NO.	DIAMETER
1	
2	
3	
AVG.	

NOTE: The difference between the high and low readings must not exceed 0.004 inches.

COMMENTS:

WSNCO FORM NO. ST007

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

BAROMETER CALIBRATION LOG

BAROMETER ID NO.: WSN 4892 BY: J. Acuna

TIME (0000-2400): 1300 DATE: 11/21/86

NWS STATION LOCATION: N.O. International Airport

CALIBRATION DATA

SYMBOL	DESCRIPTION	DATA	UNITS
P_{BR}	Barometric pressure at NWS Station	30.12	"Hg
E_R	Elevation above sea level of NWS Station	220	ft.
E_L	Elevation above sea level of laboratory	30.0	ft.
P_{BL}	Barometric pressure at laboratory	30.22	"Hg

$P_{BL} = P_{BR} - \left[(E_L - E_R) \times 0.11 \text{ "Hg/100 ft.}\right] =$ 30.21 "Hg

COMMENTS:

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

TEMPERATURE GAUGE CALIBRATION LOG

BY: R. Javier Acuna DATE: 6-3-85

GAUGE ID NO.: TG-006 GAUGE DESCRIPTION: 50-500°F Bimetalic Hotbox

CALIBRATION DATA

OBSERVATION NO.	TEMPERATURE REFERENCE THERMOMETER °F			SAMPLING TEMP. GAUGE °F			PERCENT ERROR °R
	°C	°F	°R	°C	°F	°R	
1	18	64	524	16	60	520	.76
2	39	102	562	35	95	555	1.2
3	56	133	593	57	135	595	.34
4	68	154	614	66	150	610	.65
5	79	174	634	79	175	635	.16
6	83	181	641	85	185	645	.62
7	92	198	658	93	200	660	.30
8							
9							
10*							

*Temperature must be within 10 percent of the average absolute stack temperature from the previous test.

Average stack temperature: N/A °F.

The reference thermometer and the sampling temperature gauge absolute temperature readings must agree within 1.5 percent.

COMMENTS:

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

TEMPERATURE GAUGE CALIBRATION LOG

BY: R. Javier Acuna DATE: 6/4/85

GAUGE ID NO.: TG 004 GAUGE DESCRIPTION: -40° TO 160°F Cold box

CALIBRATION DATA

OBSERVATION NO.	TEMPERATURE: REFERENCE THERMOMETER °F			TEMPERATURE: SAMPLING TEMP. GAUGE °F			PERCENT ERROR °R
	°C	°F	°R	°C	°F	°R	
1	0	32	492	0	32	492	
2	22	72	532	21	70	530	.37
3	26	79	539	27	80	540	.18
4	31	89	549	32	90	550	.18
5	38	100	560	37	98	558	.36
6	42	108	568	41	106	566	.35
7	47	117	577	46	114	574	.52
8	50	122	582	49	120	580	.34
9	65	149	609	63	145	605	.66
10*	71	160	620	70	158	618	.32

*Temperature must be within 10 percent of the average absolute stack temperature from the previous test.

Average stack temperature: N/A °F.

The reference thermometer and the sampling temperature gauge absolute temperature readings must agree within 1.5 percent.

COMMENTS:

napp inc.

2104 KRAMER LANE • AUSTIN, TEXAS 78758 • 512/836-5110 • TWX 910 874 1365

MODEL 31 MANUAL STACK SAMPLER
GAS FLOW MEASUREMENT INSTRUMENTS - CALIBRATION

DRY GAS METER NO: 75291 **AND/OR ORIFICE NO: 807 **

CALIBRATED BY: D.D. DATE: 2-5-87

BAROMETRIC PRESSURE P_b = 29.32 in Hg

RUN # 44

ORIFICE SETTING ΔH (in H_2O)	TEST METER VOLUME V_w (ft^3)	DRY GAS METER VOLUME V_d (ft^3)	TEMPERATURE: TEST METER T_w (°F)	TEMPERATURE: DRY GAS METER INLET T_{di} (°F)	TEMPERATURE: DRY GAS METER OUTLET T_{do} (°F)	TEMPERATURE: DRY GAS METER AVG. T_d (°F)	TIME θ (min.)	DRY GAS METER γ	ORIFICE ΔH@
0.2	2	2.028	74	75	75	75	7:30	.991	1.62
0.8	3	3.022	74	75	75	75	5:50	.996	1.74
1.8	5	5.017	74	75	75	75	6:29	.997	1.74
3.4	5	5.006	74	74	74	74	4:44	.994	1.76
5.0	5	4.989	74	76	76	76	3:57	.997	1.79
8.0	5	4.937	74	75	75	75	3:11	.998	1.86
								.996	1.75

$$\gamma = \frac{V_w (P_b + .11)(T_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(T_w + 460)}$$

$$\Delta H@ = \frac{(0.0317)\,\Delta H}{P_b\,(T_{do} + 460)} \left[\frac{(T_w + 460)\,\theta}{V_w}\right]^2$$

**Usually one dry gas meter and one orifice are calibrated together because the calibration time is half that required for two separate runs. However, the calibrations are not unique to each other and only one may appear on a form if an item is calibrated alone.

napp inc.
2104 KRAMER LANE • AUSTIN, TEXAS 78758 • 512/835-6110 • TWX 910 874 1385

MODEL 31 MANUAL STACK SAMPLER
GAS FLOW MEASUREMENT INSTRUMENTS - CALIBRATION

DRY GAS METER NO: 75291 **AND/OR ORIFICE NO: 807 **

CALIBRATED BY: D.D. DATE: 2-5-87

BAROMETRIC PRESSURE P_b = 29.29 in Hg

RUN # 45

ORIFICE SETTING ΔH (in H_2O)	TEST METER VOLUME V_w (ft^3)	DRY GAS METER VOLUME V_d (ft^3)	TEMPERATURE: TEST METER T_w (^oF)	TEMPERATURE: DRY GAS METER INLET T_{di} (^oF)	TEMPERATURE: DRY GAS METER OUTLET T_{do} (^oF)	TEMPERATURE: DRY GAS METER AVG. T_d (^oF)	TIME θ (min.)	DRY GAS METER γ	ORIFICE $\Delta H@$
0.2	2	2.013	74	75	75	75	7:37	.998	1.67
0.8	3	3.017	73	76	76	75	5:50	.999	1.73
1.8	5	5.021	74	75	75	75	6:30	.997	1.75
3.4	5	5.006	74	75	75	75	4:45	.996	1.77
5.0	5	4.980	74	75	75	75	3:58	.997	1.82
8.0	5	4.934	74	75	75	75	3:11	.999	1.87
								.998	1.77

$$\gamma = \frac{V_w (P_b + .11)(T_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(T_w + 460)}$$

$$\Delta H@ = \frac{(0.0317)\ \Delta H}{P_b\ (T_{do} + 460)} \left[\frac{(T_w + 460)\ \theta}{V_w}\right]^2$$

**Usually one dry gas meter and one orifice are calibrated together because the calibration time is half that required for two separate runs. However, the calibrations are <u>not</u> unique to each other and only one may appear on a form if an item is calibrated alone.

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MODEL 31 MANUAL STACK SAMPLER
GAS FLOW MEASUREMENT INSTRUMENTS - CALIBRATION

DRY GAS METER NO: 75291 ** AND/OR ORIFICE NO: 807 **

CALIBRATED BY: D. D. DATE: 2-5-87

BAROMETRIC PRESSURE P_b = 29.28 in Hg

RUN # 46

ORIFICE SETTING ΔH (in H_2O)	TEST METER VOLUME V_w (ft^3)	DRY GAS METER VOLUME V_d (ft^3)	TEMPERATURE: TEST METER T_w (°F)	TEMPERATURE: DRY GAS METER: INLET T_{di} (°F)	TEMPERATURE: DRY GAS METER: OUTLET T_{do} (°F)	TEMPERATURE: DRY GAS METER: AVG. T_d (°F)	TIME θ (min.)	DRY GAS METER γ	ORIFICE ΔH@
0.2	2	2.024	74	76	76	76	7:30	.995	1.62
0.8	3	3.018	74	76	76	76	5:46	.999	1.70
1.8	5	5.021	74	76	76	76	6:28	.999	1.74
3.4	5	5.011	74	76	76	76	4:45	.998	1.78
5.0	5	4.977	74	75	75	75	3:57	.998	1.80
8.0	5	4.921	74	75	75	75	3:11	1.002	1.88
								.999	1.75

$$\gamma = \frac{V_w (P_b + .11)(T_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(T_w + 460)}$$

$$\Delta H@ = \frac{(0.0317)\,\Delta H}{P_b\,(T_{do} + 460)} \left[\frac{(T_w + 460)\,\theta}{V_w}\right]^2$$

**Usually one dry gas meter and one orifice are calibrated together because the calibration time is half that required for two separate runs. However, the calibrations are not unique to each other and only one may appear on a form if an item is calibrated alone.

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P_b	29.32
METER NO.	75291
ORIFICE NO.	807

DATE ?-5-87

RUN NO. 44

ORIFICE SETTING ΔH	0.2 /	0.8 /	1.8 /	3.4 /	5.0 /	8.0 /
INLET START	75	76	75	74	76	75
INLET END	76	76	76	74.	76	75
INLET AVERAGE T_{di}	75	75	75	74	76	75
OUTLET START	75	75	75	73	76	75
OUTLET END	75	76	75	74	76	75
OUTLET AVERAGE T_{do}	75	75	75	74	76	75
TOTAL AVERAGE T_d	75/535	75/535	75/535	74/534	76/536	75/535
WET VOLUME V_w	2	3	5	5	5	5
TANK TEMP T_w	74/534	74/534	74/534	74/534	74/534	74/534
DGM END	184.463	196.975	193.683	169.774	202.422	179.982
DGM START	182.435	193.953	188.666	164.768	197.433	175.045
DRY VOLUME V_d	2.028	3.022	5.017	5.006	4.989	4.937
DGM FACTOR Y	.991	.996	.997	.994	.997	.998
TIME θ	7:30	5:50	6:29	4:44	3:57	3:11
ORIFICE FACTOR ΔH@	1.62	1.74	1.74	1.76	1.79	1.86

napp inc.

DATE	2-5-87
RUN NO.	45

P_b	29.29
METER NO.	75291
ORIFICE NO.	807

ORIFICE SETTING ΔH	0.2 /	0.8 /	1.8 /	3.4 /	5.0 /	8.0 /
INLET START	75	74	75	75	75	75
INLET END	76	76	76	76	75	75
INLET AVERAGE T_{di}	75	76	75	75	75	75
OUTLET START	75	74	75	74	75	75
OUTLET END	75	75	75	75	75	75
OUTLET AVERAGE T_{do}	75	76	75	75	75	75
TOTAL AVERAGE T_d	75/535	76/536	75/535	75/535	75/535	75/535
WET VOLUME V_w	2	3	5	5	5	5
TANK TEMP T_w	74/534	73/533	74/534	74/534	74/534	74/534
DGM END	231.431	229.247	225.859	208.481	214.295	220.055
DGM START	229.418	226.230	220.838	203.475	209.315	215.121
DRY VOLUME V_d	2.013	3.017	5.021	5.006	4.980	4.934
DGM FACTOR γ	.998	.999	.997	.996	.997	.999
TIME θ	7:37	5:50	6:30	4:45	3:58	3:11
ORIFICE FACTOR $\Delta H@$	1.67	1.73	1.75	1.77	1.82	1.87

napp inc.

P_b	29.28
METER NO.	75291
ORIFICE NO.	807

DATE 2-5-87

RUN NO. 46

ORIFICE SETTING ΔH	0.2	0.8	1.8	3.4	5.0	8.0
INLET START	76	76	76	75	75	75
INLET END	76	77	76	76	75	75
INLET AVERAGE T_{di}	76	76	76	76	75	75
OUTLET START	76	76	76	76	75	75
OUTLET END	76	76	76	76	75	75
OUTLET AVERAGE T_{do}	76	76	76	76	75	75
TOTAL AVERAGE T_d	76/536	76/536	76/536	76/536	75/535	75/535
WET VOLUME V_w	2	3	5	5	5	5
TANK TEMP T_w	74/534	74/534	74/534	74/534	74/534	74/534
DGM END	233.514	236.693	242.148	247.510	253.209	258.753
DGM START	231.490	233.675	237.127	242.499	248.232	253.832
DRY VOLUME V_d	2.024	3.018	5.021	5.011	4.977	4.921
DGM FACTOR γ	.995	.999	.997	.998	.998	1.002
TIME θ	7:30	5:46	6:28	4:45	3:57	3:11
ORIFICE FACTOR ΔH@	1.62	1.70	1.74	1.78	1.80	1.88

napp inc.

ΔH FOR MAXIMUM VACUUM

DATE 8/6/87

SERIAL NO. 310-576A

SO 8500

OPERATOR A.WALLS

CUSTOMER W.S. Nelson

ΔH	VACUUM	METER TEMP, °F INLET	OUTLET
0	23	81	82
.5	20.9	81	82
1.0	19.8	81	82
1.5	18.9	81	82
1.8	18.2	81	82
2.5	17.5	81	82
3.0	17	81	81
4.0	16	81	81
5	15.1	81	81
6	14.3	81	81
7	14	82	81
8	13	82	81
9	12	82	82
10	11.8	83	82

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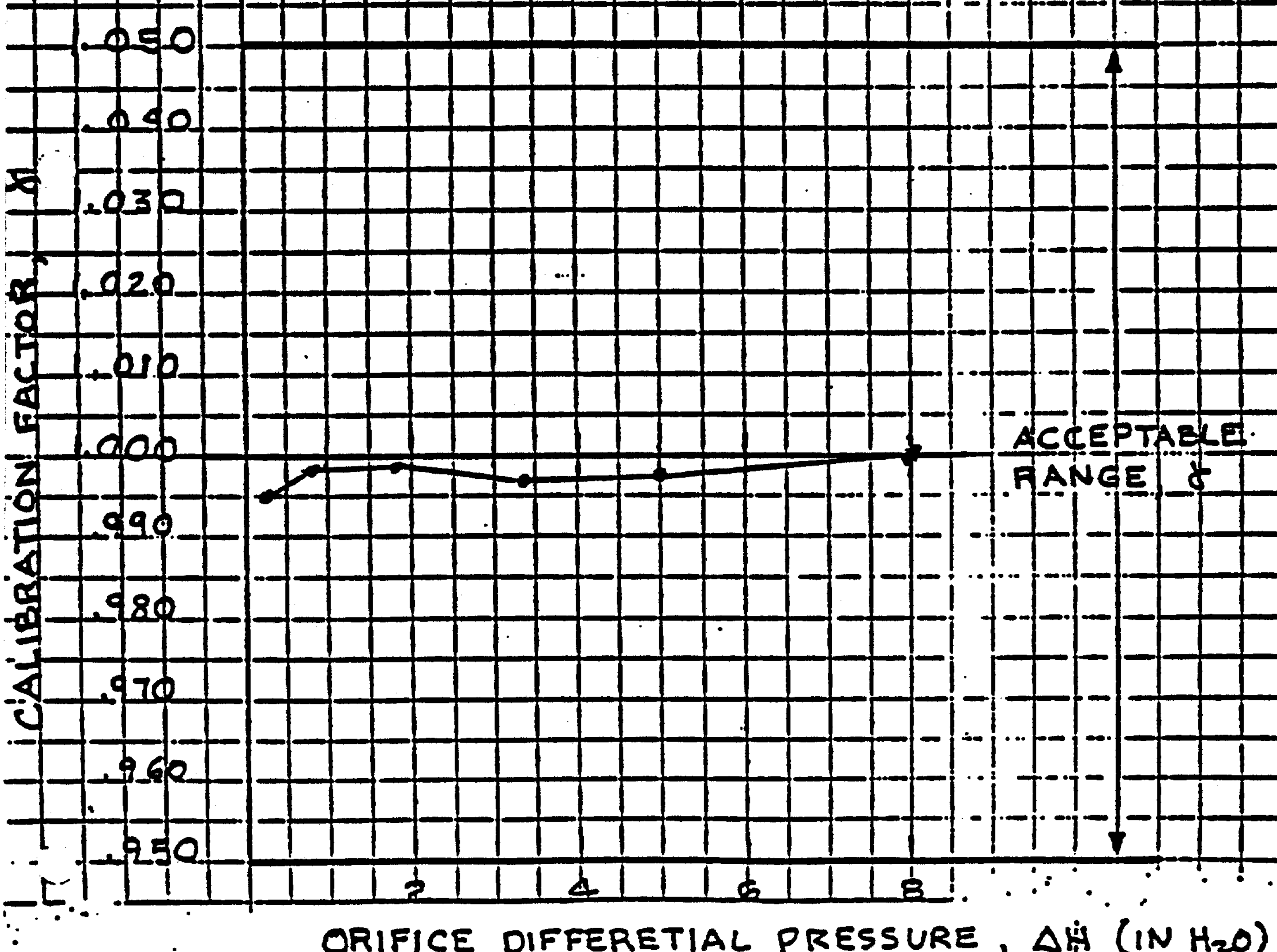
1500 Kramer Lane Austin, Texas 78758

CALIBRATION STANDARD DGM

DGM # 75291
DATE 2-5-87
P_b, IN HG 29.29

ORIFICE ΔH IN WATER	FLOW RATE APPROX @ 3?? CFM	TEST 1 γ	TEST 2 γ	TEST 3 γ	MAX Δ [.03 ALLOWED]	AVG γ [.95-1.05]
.2	.25	.991	.998	.995	.004	.995
.8	.50	.996	.999	.999	.003	.998
1.8	.75	.997	.997	.999	.002	.998
3.4	1.04	.994	.996	.998	.004	.996
5.0	1.26	.997	.997	.998	.001	.997
8.0	1.59	.998	.999	1.002	.004	1.000
				AVG γ		.997



STANDARD: EQUITABLE METER CO
BELL PROVER # 1054

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

DRY GAS METER AND ORIFICE POST-TEST CALIBRATION CHECK

Date ____________________ Box No. ____________

Barometric pressure, P_b = 20.22 in. Hg Dry gas meter No. ____________

Orifice manometer setting, ΔH, in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test: Meter t_w, °F	Temperature: Dry gas meter: Inlet t_{di}, °F	Temperature: Dry gas meter: Outlet t_{do}, °F	Temperature: Dry gas meter: Average t_d, °F	Time θ, min	Y	ΔH@
.6	5.145	5.000	68	68	67	67.7	11.2		
.6	5.316	5.000	68	73	72	71.0	12.3		
.6	5.148	5.000	72	74	74	73.3	11.9		
								1.039	1.74

Calculations

ΔH	$\frac{\Delta H}{13.6}$	Y: $\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	ΔH@: $\frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\, \theta}{V_w}\right]^2$
.6	0.0441	1.0269	1.58
.6	0.0441	1.0596	1.88
.6	0.0441	1.0306	1.76

	Previous Value	±5% Range	Accept	Recalibrate	By
Y	1.009	0.959 – 1.059	✓		[signature]
ΔH@	1.676	1.592 – 1.760	✓		[signature]

COMMENTS:

BATON ROUGE SHREDDER DAILY REPORT

KW HRS. 23

MO.	DAY	YR.
5	5	82

DAY	NIGHT

	SHIFT	GRINDING TIME	STEEL MACHINE HR	STEEL KW HOURS	ALUMINUM MACHINE HR	ALUMINUM KW
BEGINNING	7:00		138876	253212		
END	5:30		138914	255599		
NET			3.8	2387		

INPUT MATERIAL TOTAL GT 141.03

OPERATING AND DOWNTIME REPORT

FROM	TO	MIN	OPERATING	STARTUP/CHECK/GREASE	CLEANUP	SCHEDULED MAINT.	CHANGE HAMMERS	CHANGE LINER/BOLT	WELD ROTOR & CAPS	BREAKS		JAMS	ELECTRICAL	MECHANICAL	HYDRAULIC	FEED ROLL	MILL BEARING	EXPLOSION	CRANE	DUMP TRUCK	NO MATERIAL	NO CREW	BAD WEATHER	MAGNETS	LUNCH		ALL OTHER (EXPLAIN)
			SCHEDULED									UNSCHEDULED															
7:00	10:00			/	/	/																					
10:00	12:00																										/ Set Te...
12:00	12:30																								/		
12:30	12:55																										/ Set Test
12:55	1:10		/	Test									16 cars														
1:10	1:14																										/ SRT Re...
1:14	1:30		/		Test								13 cars														
1:30	1:48																										/ Set Test
1:48	2:04		/		Test									12 cars					3 grabs								
2:04	2:12																										/ Set Test
2:12	2:30		/		Test									20 cars				3 grabs									
2:30	2:55			/	/																						/ Set Test
2:55	4:00		/																								
4:00	4:20											/															
4:20	5:10		/																								
TOTALS:																											

MAJOR PROBLEMS ON REPAIRS:

Fill out daily even if there is no production

BATON ROUGE SHREDDER DAILY REPORT

KW HRS.

DAY	NIGHT

MO.	DAY	YR.
5	6	82

	SHIFT	GRINDING TIME	STEEL MACHINE HR	STEEL KW HOURS	ALUMINUM MACHINE HR	ALUMINUM KW
BEGINNING	7:00		138914	255599		57
END			138962	259325		
NET			4.8	3726		

INPUT MATERIAL   TOTAL GT 227.17

OPERATING AND DOWNTIME REPORT

FROM	TO	MIN	OPERATING	STARTUP/CHECK/GREASE	CLEANUP	SCHEDULED MAINT.	CHANGE HAMMERS	CHANGE LINER/BOLT	WELD ROTOR & CAPS	BREAKS		JAMS	ELECTRICAL	MECHANICAL	HYDRAULIC	FEED ROLL	MILL BEARING	EXPLOSION	CRANE	DUMP TRUCK	NO MATERIAL	NO CREW	BAD WEATHER	MAGNETS	LUNCH		ALL OTHER (EXPLAIN)
7:00	10:00			/	/	/			1/6																		/
10:00	10:10												17							(3) ///							
10:10	10:30		/											12 cars													/
10:30	10:33																										
10:33	10:52		/												10 cars						/						
10:52	11:13																										/
11:13	11:35														13 cars						卌						
11:35	11:39																										/
11:39	12:00		/											22 cars													
12:00	12:30																								/		/
12:30	1:07																										/
1:07	1:30		/													20 cars							/				
1:30	1:32																										/
1:32	1:55		/														23 cars										
1:55	2:08																										/
2:08	2:30		/													20 cars											
TOTALS:																											

MAJOR PROBLEMS ON REPAIRS:

Fill out daily even if there is no production

BATON ROUGE SHREDDER DAILY REPORT

KW HRS. ______

DAY	NIGHT

MO.	DAY	YR.
5	6	87

Cont.

	SHIFT	GRINDING TIME	STEEL MACHINE HR	STEEL KW HOURS	ALUMINUM MACHINE HR	ALUMINUM KW
BEGINNING						
END						
NET						

INPUT MATERIAL ______ TOTAL GT ______

OPERATING AND DOWNTIME REPORT

TIME FROM	TO	MIN	SCHEDULED: OPERATING	STARTUP/CHECK/GREASE	CLEANUP	SCHEDULED MAINT.	CHANGE HAMMERS	CHANGE LINER/BOLT	WELD ROTOR & CAPS	BREAKS		UNSCHEDULED: JAMS	ELECTRICAL	MECHANICAL	HYDRAULIC	FEED ROLL	MILL BEARING	EXPLOSION	CRANE	DUMP TRUCK	NO MATERIAL	NO CREW	BAD WEATHER	MAGNETS	LUNCH		ALL OTHER (EXPLAIN)
2:30	2:31																										/ Se [illegible]
2:31	253		/										19 CARS														
253	335																										
335	345		/																								
345	350																	/									
3[illegible]	456												48 CARS														
45[illegible]						/																					
TOTALS:																											

MAJOR PROBLEMS ON REPAIRS:

fill out daily even if there is no production