AP42 Section: 11.1

Reference Number: 76

Title: Results Of A Source Emission Compliance Test On An Asphalt Plant Operated By C. S. McCrossan, Maple Grove, Minnesota,

MMT Environmental Services, Inc., St. Paul, MN,

November 17, 1994.

AP-42 Section 11.1
Reference
Report Sect. 4
Reference 76

MMT Environmental Services, Inc.
4610 North Churchill Street
St. Paul, MN 55126-5892
Phone (612) 483-9595 Fax (612) 483-2699

RESULTS OF A SOURCE EMISSION COMPLIANCE TEST ON AN ASPHALT PLANT OPERATED BY C.S. McCROSSAN MAPLE GROVE, MINNESOTA October 20, 1994

Submitted to:

C.S. McCrossan, Inc.
P.O. Box 1240
7865 Jefferson Highway
Maple Grove, MN 55311
Attn: Mr. Robert Dongoske

Prepared by:

Ted Gibbons
Sampling Team Leader

Approved by:

Alan L. Trowbridge
Director of Technical Services

MMT Report Number: 10089
MMT Project Number: 9608
Report Issued: November 17, 1994

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REPORT CERTIFICATIONS

1. **Certification of sampling procedures by the sampling team leader:**
I certify under penalty of law that the sampling procedures were performed in accordance with the approved test plan and that the data presented in this test report are, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained in the report.

Name: Ted M. Gibbons Signature: Ted M. Gibbons

Title: Technical Services Technician Date: 11-17-94

2. **Certification of analytical procedures by the responsible sample analyst:**
I certify under penalty of law that the analytical procedures were performed in accordance with the requirements of the test methods and that the data presented in this test report are, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained in the report.

Name: Bill Anderson Signature: Bill Anderson

Title: Technical Services Technician Date: 11-17-94

3. **Certification of test report by testing department senior staff:**
I certify under penalty of law that this report and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed the sampling and analyses relating to the performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained in the report.

Name: Alan L. Trowbridge Signature: Alan L. Trowbridge

Title: Director of Technical Services Date: 11-17-94

4. **Certification of test report by the emission facility Owner or Operator:**
I certify under penalty of law that the information submitted in this report accurately reflects the operating conditions at the emission facility during this performance test and describes the date and nature of all operational and maintenance activities that were performed on the process and control equipment during the month prior to the performance test. Based on my inquiry of the person or persons who performed the operational and maintenance activities, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained in the cover letter or attachments submitted with this report.

Name: Robert Dongoske Signature: Robert Dongoske

Title: Corp Eq. MGR Date: 12/1/94

RESULTS OF A SOURCE EMISSION COMPLIANCE TEST ON AN ASPHALT PLANT OPERATED BY C.S. McCROSSAN, INC., MAPLE GROVE, MINNESOTA
October 20, 1994

MMT Report Number: 10089
MMT Project Number: 9608
Report Issued: November 17, 1994

1 INTRODUCTION

MMT Environmental Services, Inc. (MMT) was contracted by C.S. McCrossan, Inc. to perform a source emission compliance test on a single source at their hot-mix asphalt plant operating in Maple Grove, Minnesota. The source is a Standard Steel Corporation model 1064 asphalt plant. Emissions generated by the plant's aggregate drum dryer are controlled by a Standard Steel Corporation model RM-290 scrubber. The scrubber exhaust was tested for particulate and visible emissions on October 20, 1994. The test was performed as a condition of Minnesota Pollution Control Agency air emission permit number 785A-93-OT-3 which identifies the source as Emission Point #1. This report presents the results of the test program along with all substantiating documentation.

The MMT sampling team consisted of Messrs. Ted Gibbons, Bill Anderson and Robert Laska. Mr. Robert Dongoske represented C.S. McCrossan, Inc. throughout the test period. Representatives of the Minnesota Pollution Control Agency were invited to witness the test proceedings but declined to do so.

2 TEST RESULTS

The results of the particulate emission test are presented in Table 2.1. The data indicates an average effluent particulate concentration of 0.027 grains per dry standard cubic foot and an average source particulate emission rate of 11.6 pounds per hour. The average process weight rate during the test period was 436 tons per hour.

The asphalt plant source emissions are regulated by Minnesota Rule 7011.0905. In order to be in compliance with this rule, the effluent particulate concentration must be less than 0.30 grains per dry standard cubic foot **and** the particulate emissions must also satisfy at least **one** of the following:

1) Particulate concentration less than 0.053 grains per dry standard cubic foot;
   Based on Minnesota Rule 7011.0735 and a volumetric flow rate of 49,643 dscfm.
2) Particulate mass emission rate less than 45.8 pounds per hour;
   Based on Minnesota Rule 7011.0730 and a process weight rate of 436 tons per hour.

The scrubber particulate emissions, as tested, were in compliance with this emission standard.

The visible emission test was performed concurrent with the particulate test run #1. The maximum observed plume opacity was zero (0) percent; i.e. no visible emissions were observed during the test period. Minnesota Rule 7011.0905 states that the asphalt concrete plant shall not discharge into the atmosphere any gases which exhibit greater than 20 percent opacity, except that a maximum of 40 percent opacity shall be permissible for not more than four minutes within any 30-minute period and a maximum of 60 percent opacity shall be permissible for not more than four minutes in any 60-minute period. The scrubber visible emissions, as tested, were in compliance with this standard.

No problems were encountered during sample acquisition or analysis. Based on a review of the entire test proceedings, it is MMT's opinion that the results presented herein are accurate and can be used for compliance status determination.

Table 2.1 Particulate Emission Test Results
C.S. McCrossan, Inc., Maple Grove, Minnesota
Asphalt Plant Scrubber Exhaust Test, October 20, 1994

Parameter	Run #1	Run #2	Run #3	Average
Time of Test;				
Start Time, hr	1017	1200	1338	---
Finish Time, hr	1119	1302	1441	---
Effluent Temperature, °F	144	144	143	144
Effluent Moisture Content, % v/v	22.5	22.6	22.0	22.4
Effluent Composition Parameters;				
Carbon Dioxide, % v/v dry	3.1	2.8	3.0	3.0
Oxygen Content, % v/v dry	16.0	16.4	16.3	16.2
Effluent Volumetric Flow Rate;				
Actual Conditions, acfm	71,487	81,789	73,894	75,723
Standard Conditions, scfm	60,304	68,945	62,573	63,941
Dry Standard Conditions, dscfm	46,711	53,377	48,841	49,643
Effluent Particulate Concentration;				
Front Catch Only, gr/dscf	0.0282	0.0202	0.0279	0.0254
Back Catch Only, gr/dscf	0.0033	0.0017	0.0007	0.0019
Total Catch, gr/dscf	0.0315	0.0219	0.0286	**0.0273**
Source Particulate Emission Rate;				
Classical Method, lb/hr	~~12.50~~ 12.61	~~9.93~~ 10.02	~~11.87~~ 11.97	11.43
Ratio of Areas Method, lb/hr	13.12	10.14	12.03	11.76
Average of Two Methods, lb/hr	12.81	10.04	11.95	**11.60**
Test Quality Control Parameters;				
Total Sampling Time, min.	60.0	60.0	60.0	60.0
Total Volume Sampled, dscf	35.342	39.248	35.677	36.756
Total Particulate Mass Collected, g	0.0721	0.0557	0.0661	0.0646
Average Isokinetic Variation, %	104.2	101.2	100.6	102.0

Standard Conditions: 68°F, 29.92 in. Hg

3 PROCESS DATA

The asphalt plant is shown schematically in Figure 4.1. Production data is presented in Appendix E and summarized in Table 3.1. During the test period the burner on the plant's aggregate drum dryer was fired with natural gas.

Table 3.1 Summary of Process Data
C.S. McCrossan, Inc., Maple Grove, Minnesota
Asphalt Plant Scrubber Exhaust Test, October 20, 1994

Parameter	Run #1	Run #2	Run #3	Average
Time of Test, hr				
Start	1017	1200	1338	---
Finish	1119	1302	1441	---
Process Weight Rate;				
Virgin Aggregate, ton/hr	294	294	294	294
Recycle Material, ton/hr	126	126	126	126
Liquid Asphalt, ton/hr	16	16	16	16
Total Material, ton/hr	436	436	436	436
Recycle Percentage, %	29	29	29	29
Material Moisture Content;				
Virgin Aggregate, %	3.8	2.9	2.8	3.2
Recycle Material, %	2.6	2.6	2.2	2.5
Combined Material, %	3.4	2.8	2.6	2.9
Dryer Exit Gas Temperature, °F	275	272	275	274
Scrubber Parameters;				
Pressure Drop, in WC	3.1	3.1	3.1	3.1
Water flow rate, gpm	250	250	250	250
Water pressure, psi	110	110	110	110

4 TEST PROCEDURES

In order to determine the pollutant emission rate from stationary sources, the Environmental Protection Agency (EPA) has established a series of reference methods which specify the manner in which tests must be performed. These reference methods are found in the Code of Federal Regulations (40 CFR 60) under Title 40 "Protection of the Environment"; Chapter 1 "Environmental Protection Agency"; Subchapter C "Air Programs"; Part 60 "Standards of Performance for New Stationary Sources"; Appendix A "Reference Methods". Unless otherwise noted, the tests presented in this report were performed according to the EPA Reference Methods as revised on July 1, 1993. A brief description of the test procedures used follows.

4.1 SAMPLING POINTS

The number of sampling points and their location with in the source stack/duct was determined per EPA Method 1 which is entitled "Sample and velocity traverses for stationary sources". In this method the number of sampling points is based on the length of straight, undisturbed flow both before and after the sampling port location. Site specific data is presented in Figure 4.1.

4.2 EFFLUENT VOLUMETRIC FLOW RATE

The effluent volumetric flow rate was determined per EPA Method 2 which is entitled "Determination of stack gas velocity and volumetric flow rate (Type S pitot tube)". Gas velocity pressure (head) and temperature data were obtained during each EPA Method 5 particulate test run by traversing each of the sampling points defined by EPA Method 1. This data, along with gas density (EPA Method 3) and moisture content (EPA Method 4), was used to calculate the gas velocity at each sampling point. The source volumetric flow rate was calculated by multiplying the average gas velocity by the stack/duct cross-sectional area at the point of measurement.

4.3 EFFLUENT COMPOSITION AND MOLECULAR WEIGHT

The density of the effluent was determined per EPA Method 3 which is entitled "Gas analysis for the determination of dry molecular weight". One gas sample was collected during each EPA Method 5 particulate test run. The gas samples were analyzed for carbon dioxide and oxygen concentrations with a standard Orsat analyzer using commercially prepared solutions. For calculations of gas density the balance of the gas was assumed to be nitrogen and carbon monoxide.

4.4 EFFLUENT MOISTURE CONTENT

The effluent moisture content was determined per EPA Method 4 which is entitled "Determination of moisture content in stack gases". Data for making the gas moisture content determinations was collected simultaneously with each EPA Method 5 particulate test run. The gas moisture content was calculated from the mass and/or volume of liquid collected in the Method 5 sampling train cold box impingers and the volume of gas sampled.

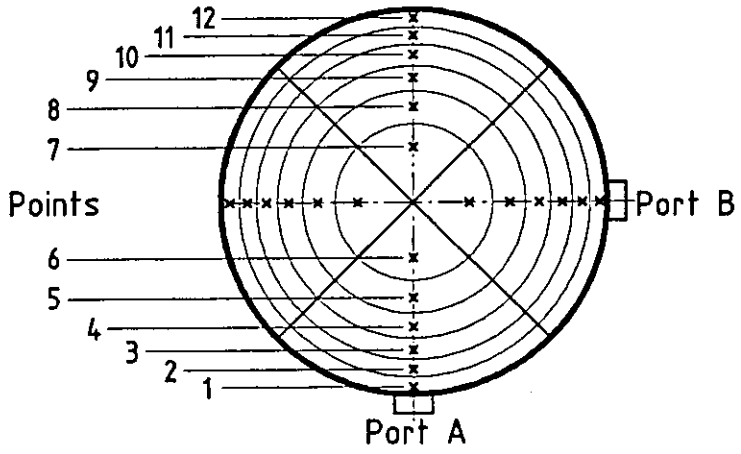
Figure 4.1 Site Description Form
C.S. McCrossan, Inc., Maple Grove, Minnesota
Asphalt Plant Scrubber Exhaust Test, October 20, 1994

SAMPLING LOCATION DATA

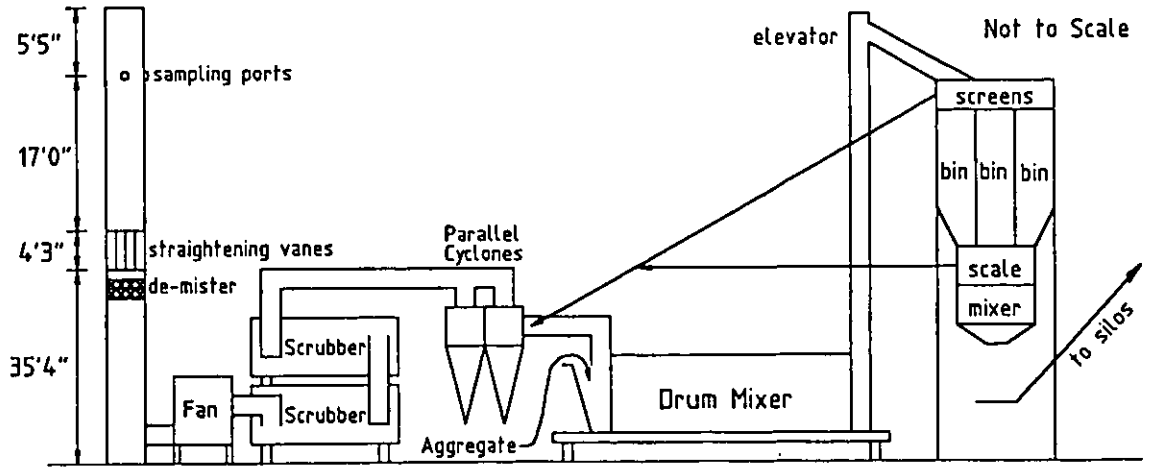
Duct Cross-Sectional Dimension;	
Traverse Diameter, inch	102.0
Length of straight, undisturbed flow;	
Before ports, inch	204
After ports, inch	65
Before ports, stack diameters	2.0
After ports, stack diameters	0.6
Number of sampling points;	
Required by EPA Method 1	24
Actually used	24
Number of ports	2
Number of points per port	12
Particulate test sampling time;	
Minutes per point	2.5
Minutes per test run	60.0

SAMPLING POINT LOCATION WITHIN STACK CROSS-SECTION

Point Number	Percent of Traverse	Inches from Inside Wall
1	2.1	2.2
2	6.7	6.8
3	11.8	12.0
4	17.7	18.0
5	25.0	25.6
6	35.6	36.2
7	64.4	65.8
8	75.0	76.6
9	82.3	84.0
10	88.2	90.0
11	93.3	95.2
12	97.9	99.8



SAMPLING SITE SCHEMATIC



4.5 EFFLUENT PARTICULATE CONCENTRATION

The effluent particulate concentration was determined per EPA Method 5 which is entitled "Determination of particulate emissions from stationary sources". For each test run, particulate matter was isokinetically withdrawn from the gas stream at each of the EPA Method 1 defined sampling points and collected on a glass fiber filter which was maintained at constant temperature (248±25°F). Water vapor, organic vapors and inorganic vapors which passed through the filter were collected in an impinger trap which was ice-cooled to maintain an exit temperature of not more than 68°F.

The EPA Method 5 sampling train (Figure 4.2) includes a heated sampling probe with attached nozzle, thermocouple and S-type pitot tube. The probe attaches to the front sample case (hot box) which houses a glass cyclone (optional) and an all-glass in-line filter holder in a temperature controlled environment. The front sample case is connected to the back sample case (cold box) which houses a series of glass impingers and a desiccant column in an ice bath. The back sample case is connected to the control unit which contains the sample vacuum pump, gas meter, pressure and temperature indicators and all operating controls.

A representative particulate sample was acquired by sampling for equal periods of time at the center of a number of equal area regions within the stack/duct. At each sampling point the gas velocity head and temperature were measured and the sampling rate rapidly adjusted to isokinetic conditions with the aid of a nomograph or programmable computing device. Sample gas drawn into the nozzle flowed through the probe to the glass fiber filter where the solid particulate matter was collected. The gases then passed through the ice-cooled condenser (impingers and desiccant column) which quantitatively removed all moisture and condensable particulate matter from the gas stream. The gas then passed through the vacuum pump, the dry test gas meter and the calibrated orifice.

Leak checks to detect any dilution air being pulled into the sampling line were performed at the beginning and end of each test run and also when and if any sample line connections were broken.

After completion of each test run, the sampling train was removed to the clean-up area for sample recovery. The filter was removed from the filter holder and placed in Container #1. Particulate matter collected in the nozzle, probe and all connecting glassware in front of the filter was quantitatively transferred to Container #2 by means of a distilled water wash followed by an acetone wash. A stiff brush was used in the probe cleaning step to help dislodge deposits.

The liquid collected in impingers #1, #2 and #3 was measured and transferred to Container #3. These impingers and all connecting pieces between the filter paper and the desiccant column were then rinsed with distilled water and these rinsings were added to Container #3. These same pieces were then rinsed with acetone and these rinsings were placed in Container #4.

The desiccant column was then weighed and its contents transferred to a waste desiccant container. Samples of the rinse solutions (water and acetone) were retained as analytical blanks.

Sample particulate analysis was performed at MMT's laboratory. The filter was dried in a 105°C oven for three hours and then desiccated to a constant weight. The contents of Container #2 were quantitatively transferred to a tared beaker, evaporated at ambient temperature and pressure to near dryness and then desiccated to a constant weight.

Figure 4.2 Particulate Sampling Train Description
C.S. McCrossan, Inc., Maple Grove, Minnesota
Asphalt Plant Scrubber Exhaust Test
October 20, 1994

PARTICULATE SAMPLING TRAIN IDENTIFICATION

Sampling Train Manufacturer: ..... MMT Environmental Services, Inc.
Sampling Train Model: ..... Universal Stack Sampler, unit #5

Hot Box Set-up and Operating Temperature;
- Cyclone used: ..... No
- Filter Media: ..... Glass Fiber Filter, Whatman GF/C, 11.0 cm diameter
- Filtration Temperature: ..... 248 ± 25 degrees Fahrenheit

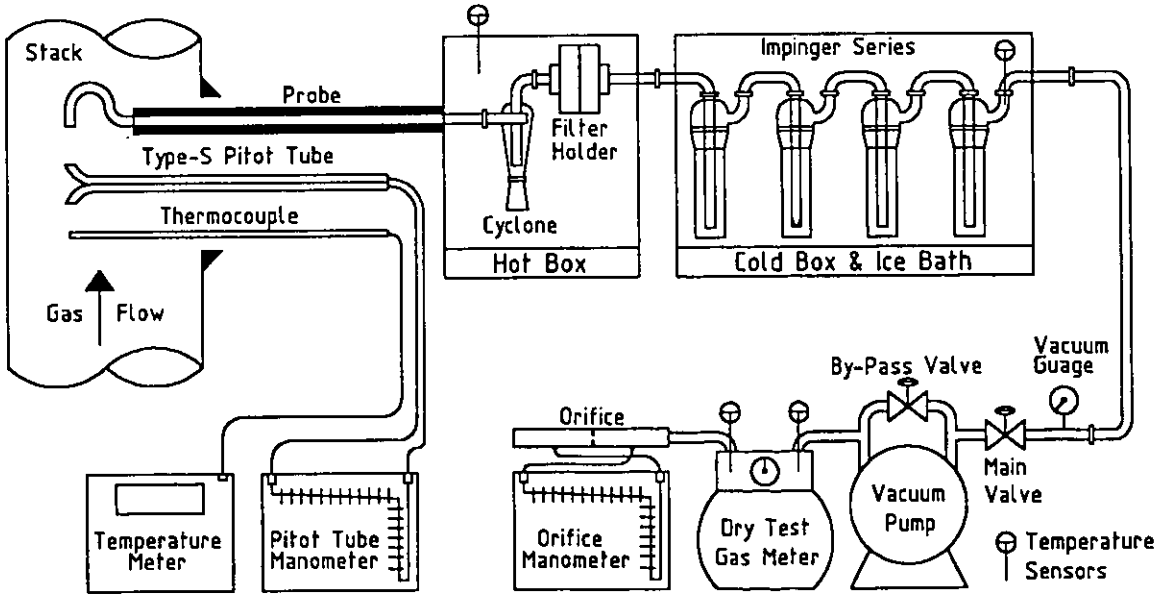
Cold Box Set-up; Impinger Type and Initial Contents
- Impinger #1: ..... Modified Greenburg-Smith design, 100 ml deionized, distilled water
- Impinger #2: ..... Standard Greenburg-Smith design, 100 ml deionized, distilled water
- Impinger #3: ..... Modified Greenburg-Smith design, empty
- Impinger #4: ..... Modified Greenburg-Smith design, ≈ 250 grams silica gel, indicating type

Nozzles Used: ..... MMT #L3, 0.355" diameter, stainless steel

Sampling Probe Used: .... MMT #126, inconel liner

Pitot Tube Used: ..... MMT #96, S-type, 0.838 coefficient

PARTICULATE SAMPLING TRAIN SCHEMATIC



The contents of Container #3 were analyzed for condensable organic compounds using the chloroform/ethyl ether extraction procedure described in Minnesota Rule 7011.0725. The collected extract was transferred to a tared beaker, evaporated at ambient temperature and pressure to near dryness and then desiccated to a constant weight. The contents of Container #4 were quantitatively transferred to a tared beaker, evaporated at ambient temperature and pressure to near dryness and then desiccated to a constant weight.

The mass of particulate matter collected and the volume of gas sampled were used to calculate the effluent particulate concentration. The source particulate mass emission rate was calculated by multiplying the effluent particulate concentration by the source volumetric flow rate. Separate calculations were performed for total catch, front catch only (Containers 1 & 2) and back catch only (Containers 3 & 4).

4.6 SOURCE PLUME OPACITY

The source visible emissions were determined by the visual observations of a certified visible emissions evaluator per EPA Method 9 which is entitled "Visual determination of the opacity of emissions from stationary sources".

In this procedure, the observer positions himself at a distance sufficient to provide a clear view of the emissions with the sun oriented in the 140 degree sector to his back. Consistent with this requirement, the observer's line of site was, as much as possible, perpendicular to the plume's direction.

Opacity observations were made at the point of greatest opacity in that portion of the plume where condensed water vapor was not present. Observations were made at 15-second intervals and recorded to the nearest 5 percent opacity.

5 QUALITY ASSURANCE

The project manager is responsible for implementation of the quality assurance program as applied to any specific project.

5.1 SAMPLING QUALITY ASSURANCE

Source sampling quality assurance procedures are implemented to ensure work is performed:

- by competent, trained individuals experienced on the specific methodologies being used
- using properly calibrated equipment
- using approved procedures for sample handling and documentation

All measuring devices (pitot tubes, dry gas meters, thermocouples, portable gas analyzers, etc.) are uniquely identified and calibrated with documented procedures and acceptance criteria before and after each field effort. Records of all calibration data are maintained in the files. Prior to the test program, MMT provides the following:

- filter numbers and tare weights of all filters available for the test
- results of an acetone residue analysis on the acetone to be used during the test
- calibrations of all pitot tubes, dry gas meters, orifice meters, thermocouples and probes

Specific details of MMT's QA program for stationary air pollution sources may be found in "Quality Assurance Handbook for Air Pollution Measurement Systems", Volume III (EPA-600/4-7-027b).

5.2 ANALYTICAL QUALITY CONTROL

MMT maintains a vigorous quality control program for all sample analyses. This program is based on the general guidelines given in "Handbook for Analytical Quality Control in Water and Waste water Laboratories" (EPA-600/4-79-019); March 1979 . This program suggests guidelines in the areas of:

- Laboratory services
- Glassware
- Solvents
- Analytical performance
- Instrument selection
- Reagents
- Gases
- Laboratory safety

Standards and curves are determined for each analysis using the appropriate standard. Least square linear regression calculations are used in determining "best fit" to the data. Correlation coefficients are also calculated.

5.3 CALIBRATION GASES

MMT uses either EPA Protocol 1 or Acublend Certified Master gases (Scott Specialty Gases) when performing all calibrations in order to ensure tolerances on gas concentrations have been verified and are negligible. Certifications of all calibration gas bottles used during testing are presented in each report.

APPENDIX A: CALCULATIONS

DEFINITION OF UNIT ABBREVIATIONS

ACFM ..... ACTUAL CUBIC FEET PER MINUTE

DEG F ..... DEGREES FAHRENHEIT

DCF ..... DRY CUBIC FEET

DSCF ..... DRY STANDARD CUBIC FEET

DSCFM ..... DRY STANDARD CUBIC FEET PER MINUTE

FPS ..... FEET PER SECOND

G ..... GRAMS

GR/ACF ..... GRAINS PER ACTUAL CUBIC FOOT

GR/DSCF ..... GRAINS PER DRY STANDARD CUBIC FOOT

GR/SCF ..... GRAINS PER STANDARD CUBIC FOOT

IN ..... INCHES

IN HG ..... INCHES OF MERCURY

IN WC ..... INCHES OF WATER

LB/HR ..... POUNDS PER HOUR

LB/LB-MOLE .. POUND PER POUND-MOLE

MIN ..... MINUTES

ML ..... MILLILITERS

SCF ..... STANDARD CUBIC FEET

SCFM ..... STANDARD CUBIC FEET PER MINUTE

SF ..... SQUARE FEET

% V/V DRY ... PERCENT BY VOLUME, DRY BASIS

DEFINITION OF STANDARD CONDITIONS

STANDARD TEMPERATURE ..... 68 DEGREES FAHRENHEIT

STANDARD PRESSURE ..... 29.92 INCHES OF MERCURY

DEFINITION OF VARIABLES

An .... CROSS-SECTIONAL AREA OF NOZZLE, SF
As .... CROSS-SECTIONAL AREA OF STACK, SF
Bwp ... EFFLUENT MOISTURE CONTENT, PERCENT BY VOLUME
Bws ... EFFLUENT MOISTURE CONTENT, PROPORTION BY VOLUME
Ca* ... EFFLUENT PARTICULATE CONCENTRATION AT ACTUAL CONDITIONS, GR/ACF; *=f,b,t; Caf: FRONT CATCH ONLY; Cab: BACK CATCH ONLY; Cat: TOTAL CATCH
CD .... EFFLUENT CARBON DIOXIDE CONCENTRATION, % V/V DRY
CM .... EFFLUENT CARBON MONOXIDE CONCENTRATION, % V/V DRY
Cp .... PITOT TUBE COEFFICIENT, DIMENSIONLESS
Cs* ... EFFLUENT PARTICULATE CONCENTRATION AT DRY STANDARD CONDITIONS, GR/DSCF; *=f,b,t; Csf: FRONT CATCH ONLY; Csb: BACK CATCH ONLY; Cst: TOTAL CATCH
Cw* ... EFFLUENT PARTICULATE CONCENTRATION AT STANDARD CONDITIONS, GR/SCF; *=f,b,t; Cwf: FRONT CATCH ONLY; Cwb: BACK CATCH ONLY; Cwt: TOTAL CATCH
Dn .... NOZZLE DIAMETER, IN
I ..... ISOKINETIC VARIATION, %
Md .... EFFLUENT MOLECULAR WEIGHT, LB/LB-MOLE, DRY BASIS
Ms .... EFFLUENT MOLECULAR WEIGHT, LB/LB-MOLE, WET BASIS
NI .... EFFLUENT NITROGEN CONCENTRATION, % V/V DRY
OX .... EFFLUENT OXYGEN CONCENTRATION, % V/V DRY
Pb .... BAROMETRIC PRESSURE, IN HG
Pg .... STACK STATIC PRESSURE, IN WC
Po .... AVERAGE PRESSURE DROP ACROSS THE METERING ORIFICE, IN WC
Ps .... STACK ABSOLUTE PRESSURE, IN HG
Pv .... AVERAGE SQUARE-ROOT VELOCITY PRESSURE, IN WC
Qa .... EFFLUENT FLOW RATE AT ACTUAL CONDITIONS, ACFM
Qs .... EFFLUENT FLOW RATE AT STANDARD CONDITIONS, SCFM
Qsd ... EFFLUENT FLOW RATE AT STANDARD CONDITIONS, DRY BASIS, DSCFM
Rc* ... SOURCE PARTICULATE EMISSION RATE, CLASSICAL METHOD, LB/HR; *=f,b,t; Rcf: FRONT CATCH ONLY; Rcb: BACK CATCH ONLY; Rct: TOTAL CATCH
Rr* ... SOURCE PARTICULATE EMISSION RATE, RATIO OF AREAS METHOD, LB/HR; *=f,b,t; Rrf: FRONT CATCH ONLY; Rrb: BACK CATCH ONLY; Rrt: TOTAL CATCH
Sl .... STACK DIAMETER OR LENGTH, IN
Sw .... STACK WIDTH, IN
Ti .... TOTAL SAMPLING TIME, MIN
Tm .... AVERAGE DRY GAS METER TEMPERATURE, DEG F
Ts .... AVERAGE EFFLUENT TEMPERATURE, DEG F
Vl .... VOLUME OF LIQUID COLLECTED, ML
Vm .... VOLUME OF GAS SAMPLED AT METER CONDITIONS, DCF
Vms ... VOLUME OF GAS SAMPLED AT STANDARD CONDITIONS, DSCF
Vs .... AVERAGE EFFLUENT VELOCITY, FPS
Vw .... VOLUME OF WATER VAPOR COLLECTED AT STANDARD CONDITIONS, SCF
Wb .... MASS OF PARTICULATE MATTER COLLECTED IN THE BACK (WET) CATCH, G
Wf .... MASS OF PARTICULATE MATTER COLLECTED IN THE FRONT (DRY) CATCH, G
Wt .... TOTAL MASS OF PARTICULATE MATTER COLLECTED, G
Y ..... DRY GAS METER COEFFICIENT, DIMENSIONLESS

EQUATIONS USED TO CALCULATE PARTICULATE EMISSIONS

```
An = 0.005454154 * Dn * Dn

As = 0.005454154 * Sl * Sl      (FOR ROUND STACKS)

As = Sl * Sw / 144.0      (FOR RECTANGULAR STACKS)

Ps = Pb + Pg/13.6

NI = 100.0 - CD - OX - CM

Wt = Wf + Wb

Vms = (528/29.92) * Vm * Y * (Pb + Po/13.6) / (Tm + 460.0)

Vw = 0.04707 * Vl

Bws = Vw / (Vw + Vms)

Bwp = 100.0 * Bws

Md = 0.440 * CD  +  0.320 * OX  + 0.280 * (NI + CM)

Ms = Md * (1.0 - Bws)  +  18.0 * Bws

Vs = 85.49 * Cp * Pv * SQRT( (Ts+460.0)/(Ms*Ps) )

Qa = 60.0 * Vs * As

Qs = Qa * (528/29.92) * Ps / (Ts + 460.0)

Qsd = Qs * (1.0 - Bws)

I = 0.09450 * (Ts+460.0) * Vms / (Ps * Vs * An * Ti * (1.0-Bws) )

Csf = 15.42 * Wf / Vws
Csb = 15.42 * Wb / Vws
Cst = 15.42 * Wt / Vws

Cwf = Csf / (1.0 - Bws)
Cwb = Csb / (1.0 - Bws)
Cwt = Cst / (1.0 - Bws)

Caf = Cwf * (29.92/528.0) * (Ts+460.0) / Ps
Cab = Cwb * (29.92/528.0) * (Ts+460.0) / Ps
Cat = Cwt * (29.92/528.0) * (Ts+460.0) / Ps

Rcf = 0.008578 * Csf * Qsd
Rcb = 0.008578 * Csb * Qsd
Rct = 0.008578 * Cst * Qsd

Rrf = 0.008578 * Csf * (Vms/Ti) * (As/An)
Rrb = 0.008578 * Csb * (Vms/Ti) * (As/An)
Rrt = 0.008578 * Cst * (Vms/Ti) * (As/An)
```

TRAVERSE POINT DATA SUMMARY AND VELOCITY PROFILE

PROJECT NUMBER: 9608 COMPANY: C.S. McCROSSAN
TEST NUMBER: 1 SOURCE: ASPHALT SCRUBBER EXHAUST
RUN NUMBER: 1 TIME: 10/20/94 1017-1119

		TRAVERSE POINT DATA					VELOCITY PROFILE	
SAMPLING LOCATION PORT	POINT	VELOCITY PRESSURE IN WC	ORIFICE PRESSURE IN WC	TEMPERATURE, DEG.F STACK GAS	METER INLET	METER OUTLET	SQRT VELOCITY PRESSURE	GAS VELOCITY FT/SEC
A	1	0.0100	0.090	145	55	53	0.100	6.35
A	2	0.0200	0.190	143	55	53	0.141	8.97
A	3	0.0300	0.290	142	56	54	0.173	10.98
A	4	0.0500	0.490	147	57	54	0.224	14.23
A	5	0.0600	0.590	147	58	54	0.245	15.59
A	6	0.0500	0.490	146	59	54	0.224	14.22
A	7	0.1700	1.700	145	61	54	0.412	26.19
A	8	0.2400	2.400	144	63	54	0.490	31.10
A	9	0.2300	2.300	146	64	55	0.480	30.49
A	10	0.2200	2.200	145	66	55	0.469	29.80
A	11	0.2100	2.100	144	67	55	0.458	29.09
A	12	0.2000	2.000	143	67	55	0.447	28.36
B	1	0.0100	0.090	144	63	56	0.100	6.35
B	2	0.0400	0.390	142	64	56	0.200	12.67
B	3	0.0700	0.690	145	65	56	0.265	16.81
B	4	0.0900	0.890	147	66	56	0.300	19.09
B	5	0.1100	1.090	145	68	57	0.332	21.07
B	6	0.1500	1.480	145	69	57	0.387	24.61
B	7	0.1300	1.300	144	70	57	0.361	22.89
B	8	0.1400	1.400	142	70	57	0.374	23.71
B	9	0.1800	1.780	144	70	57	0.424	26.93
B	10	0.1900	1.880	143	70	57	0.436	27.65
B	11	0.2100	2.100	144	70	56	0.458	29.09
B	12	0.1900	1.880	144	70	57	0.436	27.67
AVERAGE		0.1250	1.242	144	64	55	0.331	21.00

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 9608 COMPANY: C.S. McCROSSAN
TEST NUMBER: 1 SOURCE: ASPHALT SCRUBBER EXHAUST
RUN NUMBER: 1 TIME: 10/20/94 1017-1119

244.0 ml actual - corrected to saturated conditions

TEST DATA

GAS METER COEFFICIENT	0.9612 Y	VOLUME OF LIQUID COLLECTED, ML	218.5 Vl
PITOT TUBE COEFFICIENT	0.838 Cp		
NOZZLE DIMENSIONS:		GAS COMPOSITION, % V/V DRY:	
DIAMETER, IN	0.355 Dn	CARBON DIOXIDE	3.10 CD
AREA, SF	0.000687 An	OXYGEN	16.03 OX
		CARBON MONOXIDE	0.00 CM
		NITROGEN (BY DIFFERENCE)	80.87 NI
STACK DIMENSIONS:			
DIAMETER/LENGTH, IN	102.00 Sl	AVE. TRAVERSE POINT DATA:	
WIDTH, IN	0.00 Sw	STACK TEMP., DEG F	144 Ts
AREA, SF	56.745 As	METER TEMP., DEG F	60 Tm
		ORIFICE PRESSURE, IN WC	1.242 Po
BAROMETRIC PRESSURE, IN HG	28.90 Pb	SQRT VELOCITY P., IN WC	0.331 Pv
STACK PRESSURES:		MASS OF PARTICULATE MATTER	
STATIC, IN WC	-0.10 Pg	COLLECTED, G:	
ABSOLUTE, IN HG	28.89 Ps	FRONT CATCH (89.6%)	0.0646 Wf
		BACK CATCH (10.4%)	0.0075 Wb
SAMPLING TIME, MIN	60.00 Ti	TOTAL CATCH	0.0721 Wt
VOLUME OF GAS SAMPLED AT METER, DCF	37.359 Vm		

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	35.342 Vms	GAS MOLECULAR WEIGHT:	
		DRY BASIS, LB/LB-MOLE	29.14 Md
		WET BASIS, LB/LB-MOLE	26.63 Ms
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	10.285 Vw	AVERAGE GAS VELOCITY, FPS	21.00 Vs
GAS MOISTURE CONTENT:		GAS VOLUMETRIC FLOW RATE:	
VOLUME FRACTION	0.2254 Bws	ACTUAL, ACFM	71487 Qa
PERCENT BY VOLUME	22.54 Bwp	STANDARD, SCFM	60304 Qs
		DRY STANDARD, DSCFM	46711 Qsd
		ISOKINETIC VARIATION, %	104.16 I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0184 Caf	0.0021 Cab	0.0206 Cat
STANDARD, GR/SCF	0.0218 Cwf	0.0025 Cwb	0.0244 Cwt
DRY STANDARD, GR/DSCF	0.0282 Csf	0.0033 Csb	0.0315 Cst
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	11.29 Rcf	1.31 Rcb	12.60 Rct
RATIO OF AREAS METHOD	11.76 Rrf	1.36 Rrb	13.12 Rrt

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG * NON-APPLICABLE DATA

TRAVERSE POINT DATA SUMMARY AND VELOCITY PROFILE

PROJECT NUMBER: 9608 COMPANY: C.S. McCROSSAN
TEST NUMBER: 1 SOURCE: ASPHALT SCRUBBER EXHAUST
RUN NUMBER: 2 TIME: 10/20/94 1200-1302

		TRAVERSE POINT DATA					VELOCITY PROFILE	
SAMPLING LOCATION PORT	POINT	VELOCITY PRESSURE IN WC	ORIFICE PRESSURE IN WC	TEMPERATURE, DEG.F STACK GAS	METER INLET	METER OUTLET	SQRT VELOCITY PRESSURE	GAS VELOCITY FT/SEC
A	1	0.0100	0.100	139	62	61	0.100	6.33
A	2	0.0200	0.200	140	62	61	0.141	8.96
A	3	0.0300	0.290	143	62	61	0.173	11.00
A	4	0.0300	0.290	143	64	61	0.173	11.00
A	5	0.0500	0.490	142	65	61	0.224	14.19
A	6	0.0500	0.490	142	66	60	0.224	14.19
A	7	0.1500	1.500	143	69	60	0.387	24.60
A	8	0.2100	2.100	144	70	60	0.458	29.13
A	9	0.2300	2.300	145	71	61	0.480	30.51
A	10	0.2200	2.200	143	71	62	0.469	29.79
A	11	0.2400	2.300	145	71	63	0.490	31.17
A	12	0.2400	2.300	144	70	63	0.490	31.14
B	1	0.0600	0.590	144	67	62	0.245	15.57
B	2	0.0700	0.680	145	68	62	0.265	16.83
B	3	0.0800	0.780	145	70	62	0.283	18.00
B	4	0.0900	0.880	144	71	62	0.300	19.07
B	5	0.2000	2.000	144	73	62	0.447	28.43
B	6	0.3000	2.900	145	75	63	0.548	34.85
B	7	0.2900	2.800	147	75	63	0.539	34.32
B	8	0.2800	2.700	145	74	63	0.529	33.67
B	9	0.2900	2.800	145	75	63	0.539	34.26
B	10	0.2700	2.600	144	74	63	0.520	33.03
B	11	0.2800	2.700	145	74	64	0.529	33.67
B	12	0.2700	2.600	145	74	64	0.520	33.06
AVERAGE		0.1650	1.608	144	70	62	0.378	24.02

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 9608 COMPANY: C.S. McCROSSAN
TEST NUMBER: 1 SOURCE: ASPHALT SCRUBBER EXHAUST
RUN NUMBER: 2 TIME: 10/20/94 1200-1302

308.8 ml actual - corrected to saturated condition

TEST DATA

GAS METER COEFFICIENT	0.9612 Y	VOLUME OF LIQUID COLLECTED, ML	243.2 Vl
PITOT TUBE COEFFICIENT	0.838 Cp		
		GAS COMPOSITION, % V/V DRY:	
NOZZLE DIMENSIONS:		CARBON DIOXIDE	2.80 CD
DIAMETER, IN	0.355 Dn	OXYGEN	16.40 OX
AREA, SF	0.000687 An	CARBON MONOXIDE	0.00 CM
		NITROGEN (BY DIFFERENCE)	80.80 NI
STACK DIMENSIONS:			
DIAMETER/LENGTH, IN	102.00 Sl	AVE. TRAVERSE POINT DATA:	
WIDTH, IN	0.00 Sw	STACK TEMP., DEG F	144 Ts
AREA, SF	56.745 As	METER TEMP., DEG F	66 Tm
		ORIFICE PRESSURE, IN WC	1.608 Po
BAROMETRIC PRESSURE, IN HG	28.85 Pb	SQRT VELOCITY P., IN WC	0.378 Pv
STACK PRESSURES:		MASS OF PARTICULATE MATTER	
STATIC, IN WC	-0.11 Pg	COLLECTED, G:	
ABSOLUTE, IN HG	28.84 Ps	FRONT CATCH (92.3%)	0.0514 Wf
		BACK CATCH (7.7%)	0.0043 Wb
SAMPLING TIME, MIN	60.00 Ti	TOTAL CATCH	0.0557 Wt
VOLUME OF GAS SAMPLED AT METER, DCF	42.001 Vm		

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	39.248 Vms	GAS MOLECULAR WEIGHT:	
		DRY BASIS, LB/LB-MOLE	29.10 Md
		WET BASIS, LB/LB-MOLE	26.60 Ms
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	11.447 Vw	AVERAGE GAS VELOCITY, FPS	24.02 Vs
GAS MOISTURE CONTENT:		GAS VOLUMETRIC FLOW RATE:	
VOLUME FRACTION	0.2258 Bws	ACTUAL, ACFM	81789 Qa
PERCENT BY VOLUME	22.58 Bwp	STANDARD, SCFM	68945 Qs
		DRY STANDARD, DSCFM	53377 Qsd
		ISOKINETIC VARIATION, %	101.23 I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0132 Caf	0.0011 Cab	0.0143 Cat
STANDARD, GR/SCF	0.0156 Cwf	0.0013 Cwb	0.0169 Cwt
DRY STANDARD, GR/DSCF	0.0202 Csf	0.0017 Csb	0.0219 Cst
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	9.25 Rcf	0.77 Rcb	10.02 Rct
RATIO OF AREAS METHOD	9.35 Rrf	0.78 Rrb	10.14 Rrt

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG * NON-APPLICABLE DATA

TRAVERSE POINT DATA SUMMARY AND VELOCITY PROFILE

PROJECT NUMBER: 9608 COMPANY: C.S. McCROSSAN
TEST NUMBER: 1 SOURCE: ASPHALT SCRUBBER EXHAUST
RUN NUMBER: 3 TIME: 10/20/94 1338-1440

		TRAVERSE POINT DATA					VELOCITY PROFILE	
SAMPLING LOCATION PORT	POINT	VELOCITY PRESSURE IN WC	ORIFICE PRESSURE IN WC	TEMPERATURE, DEG.F STACK GAS	METER INLET	METER OUTLET	SQRT VELOCITY PRESSURE	GAS VELOCITY FT/SEC
A	1	0.0400	0.390	144	65	64	0.200	12.67
A	2	0.0500	0.490	143	65	64	0.224	14.15
A	3	0.0700	0.680	142	67	64	0.265	16.73
A	4	0.0800	0.780	145	68	64	0.283	17.93
A	5	0.0900	0.890	143	69	64	0.300	18.99
A	6	0.0900	0.890	143	70	64	0.300	18.99
A	7	0.2400	2.400	142	71	64	0.490	30.98
A	8	0.2900	2.900	141	71	64	0.539	34.03
A	9	0.2400	2.400	144	72	65	0.490	31.04
A	10	0.2300	2.300	145	72	65	0.480	30.41
A	11	0.2200	2.200	143	71	65	0.469	29.69
A	12	0.2300	2.300	144	71	65	0.480	30.38
B	1	0.0100	0.090	143	69	65	0.100	6.33
B	2	0.0100	0.090	143	70	65	0.100	6.33
B	3	0.0200	0.190	142	71	65	0.141	8.94
B	4	0.0300	0.290	144	72	65	0.173	10.97
B	5	0.0300	0.290	145	72	65	0.173	10.98
B	6	0.0500	0.490	142	72	65	0.224	14.14
B	7	0.1700	1.700	143	75	67	0.412	26.10
B	8	0.2400	2.400	142	77	68	0.490	30.98
B	9	0.2400	2.400	144	76	69	0.490	31.04
B	10	0.2200	2.200	143	76	68	0.469	29.69
B	11	0.2300	2.300	144	77	68	0.480	30.38
B	12	0.2100	2.100	142	77	68	0.458	28.98
AVERAGE		0.1388	1.382	143	72	65	0.343	21.70

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 9608 COMPANY: C.S. McCROSSAN
TEST NUMBER: 1 SOURCE: ASPHALT SCRUBBER EXHAUST
RUN NUMBER: 3 TIME: 10/20/94 1338-1440

251.1 ml actual - corrected to saturated condition

TEST DATA

GAS METER COEFFICIENT	0.9612 Y	VOLUME OF LIQUID COLLECTED, ML	213.1 Vl
PITOT TUBE COEFFICIENT	0.838 Cp		
		GAS COMPOSITION, % V/V DRY;	
NOZZLE DIMENSIONS;		CARBON DIOXIDE	3.00 CD
DIAMETER, IN	0.355 Dn	OXYGEN	16.27 OX
AREA, SF	0.000687 An	CARBON MONOXIDE	0.00 CM
		NITROGEN (BY DIFFERENCE)	80.73 NI
STACK DIMENSIONS;			
DIAMETER/LENGTH, IN	102.00 Sl	AVE. TRAVERSE POINT DATA;	
WIDTH, IN	0.00 Sw	STACK TEMP., DEG F	143 Ts
AREA, SF	56.745 As	METER TEMP., DEG F	68 Tm
		ORIFICE PRESSURE, IN WC	1.382 Po
BAROMETRIC PRESSURE, IN HG	28.95 Pb	SQRT VELOCITY P., IN WC	0.343 Pv
STACK PRESSURES;		MASS OF PARTICULATE MATTER	
STATIC, IN WC	-0.10 Pg	COLLECTED, G;	
ABSOLUTE, IN HG	28.94 Ps	FRONT CATCH (97.6%)	0.0645 Wf
		BACK CATCH (2.4%)	0.0016 Wb
SAMPLING TIME, MIN	60.00 Ti	TOTAL CATCH	0.0661 Wt
VOLUME OF GAS SAMPLED AT METER, DCF	38.260 Vm		

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	35.677 Vms	GAS MOLECULAR WEIGHT;	
		DRY BASIS, LB/LB-MOLE	29.13 Md
		WET BASIS, LB/LB-MOLE	26.69 Ms
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	10.031 Vw	AVERAGE GAS VELOCITY, FPS	21.70 Vs
GAS MOISTURE CONTENT;		GAS VOLUMETRIC FLOW RATE;	
VOLUME FRACTION	0.2195 Bws	ACTUAL, ACFM	73894 Qa
PERCENT BY VOLUME	21.95 Bwp	STANDARD, SCFM	62573 Qs
		DRY STANDARD, DSCFM	48841 Qsd
		ISOKINETIC VARIATION, %	100.57 I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0184 Caf	0.0005 Cab	0.0189 Cat
STANDARD, GR/SCF	0.0218 Cwf	0.0005 Cwb	0.0223 Cwt
DRY STANDARD, GR/DSCF	0.0279 Csf	0.0007 Csb	0.0286 Cst
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	11.68 Rcf	0.29 Rcb	11.97 Rct
RATIO OF AREAS METHOD	11.74 Rrf	0.29 Rrb	12.03 Rrt

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG * NON-APPLICABLE DATA

TABLE SUMMARY OF PARTICULATE EMISSION TEST RESULTS

PROJECT NUMBER: 9608 COMPANY: C.S. McCROSSAN
TEST NUMBER: 1 SOURCE: ASPHALT SCRUBBER EXHAUST

TEST PARAMETER	RUN 1	RUN 2	RUN 3
TEST DATE	10/20/94	10/20/94	10/20/94
TIME OF TEST, HR;			
START	1017	1200	1338
FINISH	1119	1302	1440
EFFLUENT TEMPERATURE, DEGREES F	144	144	143
BAROMETRIC PRESSURE, IN HG	28.90	28.85	28.95
EFFLUENT MOISTURE CONTENT, % V/V	22.5	22.6	21.9
EFFLUENT COMPOSITION, % V/V DRY;			
CARBON DIOXIDE	3.1	2.8	3.0
OXYGEN	16.0	16.4	16.3
CARBON MONOXIDE	0.0	0.0	0.0
EFFLUENT VOLUMETRIC FLOW RATE;			
ACTUAL CONDITIONS, ACFM	71487	81789	73894
STANDARD CONDITIONS, SCFM	60304	68945	62573
DRY STANDARD CONDITIONS, DSCFM	46711	53377	48841
ISOKINETIC VARIATION, %	104.2	101.2	100.6
EFFLUENT FRONT HALF PARTICULATE CONCENTRATION;			
ACTUAL CONDITIONS, GR/ACF	0.0184	0.0132	0.0184
STANDARD CONDITIONS, GR/SCF	0.0218	0.0156	0.0218
DRY STANDARD CONDITIONS, GR/DSCF	0.0282	0.0202	0.0279
EFFLUENT BACK HALF PARTICULATE CONCENTRATION;			
ACTUAL CONDITIONS, GR/ACF	0.0021	0.0011	0.0005
STANDARD CONDITIONS, GR/SCF	0.0025	0.0013	0.0005
DRY STANDARD CONDITIONS, GR/DSCF	0.0033	0.0017	0.0007
EFFLUENT TOTAL PARTICULATE CONCENTRATION;			
ACTUAL CONDITIONS, GR/ACF	0.0206	0.0143	0.0189
STANDARD CONDITIONS, GR/SCF	0.0244	0.0169	0.0223
DRY STANDARD CONDITIONS, GR/DSCF	0.0315	0.0219	0.0286
SOURCE PARTICULATE EMISSION RATE;			
CLASSICAL METHOD, LB/HR	12.60	10.02	11.97
RATIO OF AREAS METHOD, LB/HR	13.12	10.14	12.03

PARTICULATE CONCENTRATION AND EMISSION RATES BASED ON ANALYSIS OF THE SAMPLING TRAIN FRONT AND BACK CATCHES.

STANDARD CONDITIONS: 68 DEGREES FAHRENHEIT, 29.92 INCHES OF MERCURY.

APPENDIX B: FIELD DATA FORMS

SOURCE EMISSION TEST
SITE DESCRIPTION DATA SHEET

TRAVERSE POINT LOCATION		
Traverse Point Number	Port Length: Inches From Wall	Inches From Port
1	2.2	
2	6.8	
3	12.0	
4	18.0	
5	25.6	
6	36.2	
7	65.8	
8	76.6	
9	84.0	
10	90.0	
11	95.2	
12	99.8	
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		

PRELIMINARY TRAVERSE DATA	
Effluent Temperature, °F:	
Ave. Velocity Pressure, IN WC:	

MMT Job Number: 9608 Date: Oct. 94

Company: C.S. Mc Crossan

Address:

Source: Scrubber Exhaust

Source Cross-sectional Dimensions

Round Duct; diameter: 102 inches

Rectangular Duct;

Length: — — —

Width: — — —

Equivalent diameter: — — —

$D_e = 2LW/(L+W)$

Distance to Nearest Flow Disturbance;

Before Ports: 204" = 2 diameters

After Ports: 65" = 0.64 diameters

Number of Sampling Points;

Required by EPA Method 1: 24

Actually Used: 24

Number of ports: 2

Points per port: 12

Sampling Time;

Minutes per Point: NA

Minutes per Test Run: NA

SITE SKETCH AND COMMENTS

Port Description: 4" Male NPT

Port Depth = 4.25 inches

4 ports - One unusable due to location of ladder & safety caging

EPA METHOD 2: VOLUMETRIC FLOW RATE DETERMINATION

Field Data Sheet

MMT Job Number: 9608 | Ambient Temperature, °F: 52

Date: Thur 10-20-94 | Barometric Pressure, in. Hg.: 28.9

Company: C.S. McCrossan | Static Pressure, in. WC: -0.09

Source: Scrubber Exhaust | Dry Bulb Temp., °F: 145 = 144

Dimensions, inches: 102" Ø dia. | Wet Bulb Temp., °F: 140

Test Team Members: BA-TG | Relative Humidity, %:

Test No.: 0 Run No.: Prelim | Moisture Content, %: 20.12

VELOCITY TRAVERSE: Time: 0920 Pitot Tube No: 96 Coefficient: A = .838

Traverse Point Number	Inches From Wall	Inches From Port	PORT A ΔP in. H2O	PORT A Temp. °F	PORT B ΔP in. H2O	PORT B Temp. °F	PORT C ΔP in. H2O	PORT C Temp. °F	PORT D ΔP in. H2O	PORT D Temp °F
1	2.2	6.45	.20	.02	.06					
2	6.8	11.05	.20	.01	.07					
3	12.0	16.25	.20	.01	.08		$\bar{x}$ V_p = .103			
4	18.0	22.25	.19	.01	.09		min. V_p = .01			
5	25.6	29.85	.14	.02	.11		Max V_p = .30			
6	36.2	40.45	.06	.03	.16					
7	65.8	70.05	.02	.13	.27		Ideal N_p = .387			
8	76.6	80.85	.01	.17	.28					
9	84.0	88.25		.19	.26		Actual N_p = .413			
10	90.0	94.25			.05		Nozzle ID = .355			
11	95.2	99.45			.04					
12	99.8	104.05	.01							
			Port	Port	Port					

Port Depth = 4.25 X

Nozzle ID	Nozzle dia.	$\bar{x}$ ΔH	min/point	max ΔH	Test Time	est. vol. per test
17	.370	~~2.87~~				
18	.435	2.2	2.5	6.5	60	51
3 ?	.375	1.19	1.6	~~3.6~~	60	38.4
	.355	.96	1.43	2.9	60	34.3
	.300	.49	1.03	1.5	60	24.6

C .97

H 1.77

FORM: S-FD-2b

SOURCE EMISSION TEST
FIELD DATA SHEET

TEST: 1	RUN: 1
Page 1 of 1	

TEST IDENTIFICATION	EQUIPMENT IDENTIFICATION	NOMOGRAPH PARAMETERS
MMT Job Number: 9608	Control Unit No.: 5	ΔH@ 1.77
Date: Thur 10.20.94	Gas Meter Coefficient: .966	TM 55
Company: C.S. McCrossan	Sample Box No.: 5	MC
Source: Scrubber outlet	Probe No.: 126 Length: 126"	PS/PM ≈ 1.0
Source Dimensions: 102" ⌀	Pitot No.: 96 Coefficient: A=.838	C .966
Test Team: RL - BA - TG	Nozzle No.: L3 Diameter: .355	TS 145
Test Procedure: EPA 1-5	Filter No.: 8906	R
Ambient Temp., °F: 52	Barometric Pressure, in.Hg: 28.90	Static Pressure, in.WC: -.1

theo. v.1

CLOCK TIME hours	TRAVERSE POINT NUMBER	SAMPLE TIME min.	SAMPLE VOLUME cu.ft.	VELOCITY HEAD in.WC	ORIFICE ΔH, in.WC REQ.	ORIFICE ΔH, in.WC ACT.	PUMP VAC. inHG	TEMPERATURE, DEG F STACK GAS	GAS METER IN	GAS METER OUT	OVEN	PROBE	LAST IMP.
X 10:17	1	0	87.702	.01	.09	.09	2	145	55	53	249	251	45
	2		88.1	.02	.19	.19	2	143	55	53	251	252	45
10:22	3	5	88.8	.03	.29	.29	2	142	56	54	249	253	45
	4		89.6	.05	.49	.49	3	147	57	54	247	255	45
10:27	5	10	90.7	.06	.59	.59	5	147	58	54	245	253	45
	6		91.8	.05	.49	.49	5	146	59	54	249	252	46
10:32	7	15	92.9	.17	1.68	1.7	8	145	61	54	251	251	46
	8		94.8	.24	2.4	2.4	12	144	63	54	253	253	45
10:37	9	20	97.1	.23	2.28	2.3	12	146	64	55	254	250	45
	10		99.4	.22	2.16	2.2	13	145	66	55	255	249	45
10:42	11	25	101.5	.21	2.04	2.1	13	144	67	55	254	251	45
	12		103.7	.20	1.96	2.0	13	143	67	55	250	249	45
10:47	End	30	105.8										
X 10:49	1	0	105.8	.01	.09	.09	2	144	63	56	251	247	49
	2		106.3	.04	.39	.39	3	142	64	56	249	251	49
10:54	3	5	107.3	.07	.69	.69	4	145	65	56	251	255	50
	4		108.5	.09	.89	.89	5	147	66	56	251	252	50
10:59	5	10	109.9	.11	1.09	1.09	7	145	68	57	250	254	50
	6		111.5	.15	1.48	1.49	8	145	69	57	249	254	50
11:04	7	15	113.2	.13	1.28	1.3	7	144	70	57	250	253	51
	8		115.0	.14	1.38	1.4	7	142	70	57	251	249	51
11:09	9	20	116.8	.18	1.78	1.78	9	144	70	57	251	251	51
	10		118.8	.19	1.88	1.88	10	143	70	57	251	247	52
11:14	11	25	120.5	.21	2.08	2.1	11	144	70	56	253	250	52
	12		123.0	.19	1.88	1.88	9	144	70	57	255	253	54
11:19	End	30	125.061										

MOISTURE DETERMINATION					
IMPINGER	1	2	3	4	5
Final					
Initial	100	100	100	760.1	
Difference					
Total Moisture Collected:					

SYSTEM LEAK CHECKS		
Time	Rate (cfm)	Vac. (in.Hg)
10:05	18"	.003
10:23	.20"	.003

Impinger Catch Description:

DETERMINATION OF GAS COMPOSITION BY ORSAT ANALYSIS								
Sample Id:	Replicate 1		Replicate 2		Replicate 3		Average	
1-1	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Buret Reading	Percent Volume	Compound	Percent Volume
Initial Reading								
Carbon Dioxide							CO_2	
Oxygen							O_2	
Carbon Monoxide							CO	

Total Sampling Time, min.: 60

FORM: S-FD-5

Volume of Gas Sampled, DCF: 37.359

SOURCE EMISSION TEST
FIELD DATA SHEET

TEST: 1 | RUN: 2
Page 1 of 1

TEST IDENTIFICATION	EQUIPMENT IDENTIFICATION	NOMOGRAPH PARAMETER
MMT Job Number: 9608	Control Unit No.: 5	ΔH@ 1.77
Date: 10-20 94 Thur	Gas Meter Coefficient: .966	TM 64
Company: C.S. McCrossan	Sample Box No.: 5	MC 20
Source: Scrubber Outlet	Probe No.: 126 Length: 126"	PS/PM = 1.0
Source Dimensions: 102" ⌀	Pitot No.: 96 Coefficient: A = .838	C .966
Test Team: RA-TG	Nozzle No.: C3 Diameter: .355	TS 145
Test Procedure: EPA 1-5	Filter No.: 8907	R
Ambient Temp., °F: 55	Barometric Pressure, in.Hg: 28.85	Static Pressure, in.WC: -1.10

CLOCK TIME hours	TRAVERSE POINT NUMBER	SAMPLE TIME min.	SAMPLE VOLUME cu.ft.	VELOCITY HEAD in.WC	ORIFICE ΔH, in.WC REQ.	ORIFICE ΔH, in.WC ACT.	PUMP VAC. inHG	TEMPERATURE, DEG F STACK GAS	GAS METER IN	GAS METER OUT	OVEN	PROBE	LAST IMP
X	1200	0	125.662	.01	.98	.10	2	139	62	61	241	252	55
126.1	2		126.2	.02	.2	.20	3	140	62	61	241	255	55
126.8	1205 3	5	126.9	.03	.29	.29	3	143	62	61	244	251	5
127.6	4		127.7	.03	.29	.29	3	143	64	61	251	252	5
128.4	1210 5	10	128.5	.05	.49	.49	3.5	142	65	61	247	250	55
129.4	6		129.5	.05	.49	.49	3.5	142	66	60	246	249	55
130.5	1215 7	15	130.7	.15	1.46	1.5	8	143	69	60	244	247	5
132.3	8		132.5	.21	2.05	2.1	10	144	70	60	245	252	55
134.4	1220 9	20	134.3	.23	2.25	2.3	11	145	71	61	241	251	56
136.6	10		136.5	.22	2.15	2.2	13	143	71	62	243	246	5
138.18	1225 11	25	138.8	.24	2.34	2.3	13	145	71	63	244	250	5
141.1	12		141.1	.24	2.34	2.3	13	144	70	63	249	250	56
143.3	1230 End	30	143.3										
X	1232 1	30 X	X	.06	.59	.59	3	144	67	62	251	248	55
144.5	2		144.5	.07	.68	.68	3	145	68	60	248	247	55
145.7	1237 3	35	145.7	.08	.78	.78	3	145	70	62	246	248	54
147.0	4 *		147.1	.09	.88	.88	4	144	71	62	249	249	54
148.4	1242 5	40	148.4	.20	1.95	2.0	9	144	73	62	251	251	54
150.5	6		150.4	.30	2.93	2.9	13	145	75	63	250	252	53
153.0	1247 7	45	152.8	.29	2.83	2.8	12	147	75	63	252	253	53
155.5	8		155.3	.28	2.73	2.7	12	145	74	63	255	251	53
158.0	1252 9	50	157.8	.29	2.83	2.8	12	145	75	63	251	250	53
160.5	10		160.3	.27	2.63	2.6	11	141	74	63	250	248	53
162.9	1257 11	55	162.7	.28	2.73	2.7	12	145	74	64	247	250	53
165.3	12		165.2	.27	2.64	2.6	11.5	145	74	64	244	251	53
167.7	13 02 End	60	167.663										

Fuel =

30% Recycle

MOISTURE DETERMINATION

IMPINGER	1	2	3	4	5
Final					
Initial	100	100	100	91.5	
Difference					

Total Moisture Collected:

167.663 − 125.062 = 42.601

SYSTEM LEAK CHECKS

Time	Rate (cfm)	Vac. (in.H
1137	.000	19
1304	.004	25

Impinger Catch Description:

DETERMINATION OF GAS COMPOSITION BY ORSAT ANALYSIS

Sample Id: 1-2	Replicate 1 Buret Reading	Replicate 1 Percent Volume	Replicate 2 Buret Reading	Replicate 2 Percent Volume	Replicate 3 Buret Reading	Replicate 3 Percent Volume	Average Compound	Average Percent Volume
Initial Reading								
Carbon Dioxide							CO_2	
Oxygen							O_2	
Carbon Monoxide							CO	

Total Sampling Time, min.: 60

FORM: S-FD-5

Volume of Gas Sampled, DCF: 42.601

SOURCE EMISSION TEST
FIELD DATA SHEET

TEST: 1 /	RUN: 3
Page 1 of 1	

TEST IDENTIFICATION	EQUIPMENT IDENTIFICATION	NOMOGRAPH PARAMETERS
MMT Job Number: 9608	Control Unit No.: 5	ΔH@ 1.77
Date: 10-20-94	Gas Meter Coefficient: .966	TM 64
Company: C.S. McCrossan	Sample Box No.: 5	MC 20
Source: Scrubber Outlet	Probe No.: 126 Length: 126"	PS/PM
Source Dimensions: 102" Ø	Pitot No.: 96 Coefficient: .838	C .966
Test Team: TG-BA	Nozzle No.: L3 Diameter: .355	TS 145
Test Procedure: EPA 1-5	Filter No.: 8908	R
Ambient Temp., °F:	Barometric Pressure, in.Hg: 28.95	Static Pressure, in.WC: -.1

theo. v.l

CLOCK TIME hours	TRAVERSE POINT NUMBER	SAMPLE TIME min.	SAMPLE VOLUME cu.ft.	VELOCITY HEAD in.WC	ORIFICE ΔH, in.WC REQ.	ORIFICE ΔH, in.WC ACT.	PUMP VAC. inHG	TEMPERATURE, DEG F STACK GAS	GAS METER IN	GAS METER OUT	OVEN	PROBE	LAST IMP.
X													
1320	1	0	169.943	.04	.39	.39	2	144	65	64	245	251	55
170.9	2		170.9	.05	.49	.49	3	143	65	64	244	253	55
171.9	3	5	171.9	.07	.68	.68	4	142	67	64	253	250	55
173.1	4		173.0	.08	.78	.74	5	145	68	64	254	251	55
174.4	5	10	174.3	.09	.89	.89	5	143	69	64	253	252	55
175.9	6		175.7	.09	.89	.89	5	143	70	64	249	251	54
177.3	7	15	177.2	.24	2.36	2.36	13	142	71	64	251	253	54
179.6	8		179.6	.29	2.9	2.9	15	141	71	64	247	251	54
182.1	9	20	182.1	.24	2.36	2.4	13	144	72	65	249	253	54
184.4	10		184.2	.23	2.26	2.3	13	145	73	65	251	253	54
186.4	11	25	186.4	.22	2.16	2.2	12	143	71	65	253	253	55
188.6	12		188.6	.23	2.26	2.3	13	144	71	65	254	251	55
190.8	End	30	190.9										
X	1	0	190.9	.01	.09	.09	1	143	69	65	251	253	55
191.3	2		191.2	.01	.09	.09	1	143	70	65	254	251	57
191.8	3	5	191.6	.02	.19	.19	3	142	71	65	253	251	58
192.8	4		192.4	.03	.29	.29	3	144	72	65	253	251	59
193.3	5	10	193.3	.03	.29	.29	3	145	73	65	251	252	59
194.1	6		194.1	.05	.49	.49	3	142	73	65	253	250	59
195.1	7	15	195.2	.17	1.67	1.7	8	143	75	67	254	251	59
197.1	8		197.0	.24	2.36	2.4	13	142	77	68	255	250	59
199.3	9	20	199.1	.24	2.36	2.4	13	144	76	69	254	253	59
201.6	10		201.4	.22	2.16	2.2	12	143	76	68	251	255	59
203.8	11	25	203.7	.23	2.26	2.3	13	144	77	68	250	252	59
206.0	12		206.1	.21	2.06	2.1	12	142	77	68	249	250	60
208.2	End	30	208.203										

MOISTURE DETERMINATION #2

IMPINGER	1	2	3	4	5
Final					
Initial	100	100	100	767.2	
Difference					
Total Moisture Collected:					

SYSTEM LEAK CHECKS

Time	Rate (cfm)	Vac. (in.Hg)
1325	.006	18
1444	.007	20"

Impinger Catch Description:

DETERMINATION OF GAS COMPOSITION BY ORSAT ANALYSIS

Sample Id: 1-3	Replicate 1 Buret Reading	Replicate 1 Percent Volume	Replicate 2 Buret Reading	Replicate 2 Percent Volume	Replicate 3 Buret Reading	Replicate 3 Percent Volume	Average Compound	Average Percent Volume
Initial Reading								
Carbon Dioxide							CO_2	
Oxygen							O_2	
Carbon Monoxide							CO	

Total Sampling Time, min.: 60

FORM: S-FD-5

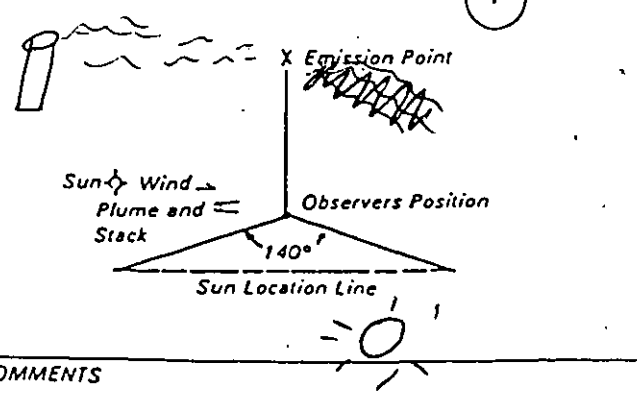
Volume of Gas Sampled, DCF: 38.26

Pl. # 9608 — Test-Run # 1-1 — Fuel = Natural Gas

Visible Emission Observation Form

SOURCE NAME	C.S. McCrossan
ADDRESS	
CITY	Maple Grove
STATE	MN
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	Asphalt Drum Mixer -
OPERATING MODE	
CONTROL EQUIPMENT	Scrubbers
OPERATING MODE	
DESCRIBE EMISSION POINT START	The tan stack STOP "
HEIGHT ABOVE GROUND LEVEL START	100 ft STOP "
HEIGHT RELATIVE TO OBSERVER START	100 ft STOP 100 ft
DISTANCE FROM OBSERVER START	800' STOP 800'
DIRECTION FROM OBSERVER START	NNW STOP NNW
DESCRIBE EMISSIONS START	White Water Plume STOP "
EMISSION COLOR START	? STOP tanish Brown
PLUME TYPE: CONTINUOUS	X
FUGITIVE	☐
INTERMITTENT	☐
WATER DROPLETS PRESENT: NO	☐
YES	X
IF WATER DROPLET PLUME: ATTACHED	X
DETACHED	☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	After H_2O dissipation STOP "
DESCRIBE BACKGROUND START	Blue sky STOP light Blue sky
BACKGROUND COLOR START	Blue STOP Blue
SKY CONDITIONS START	Clear STOP Partly cloudy
WIND SPEED START	5 mph . STOP 5-10
WIND DIRECTION START	West STOP West
AMBIENT TEMP. START	53 STOP 55
WET BULB TEMP.	
RH, percent	

Source Layout Sketch — Draw North Arrow



OBSERVATION DATE	START TIME	STOP TIME
10.20.94	1017	1116

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD	NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS MINIMUM	MAXIMUM
OBSERVER'S NAME (PRINT)	Ted Gibbons
OBSERVER'S SIGNATURE	Ted Gibbons — DATE 10.20.94
ORGANIZATION	MMT Environmental Services, Inc.
CERTIFIED BY	Eastern Technical — DATE 10-5-94
VERIFIED BY	Eastern Technical — DATE 10-5-94

COMMENTS	
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE	
TITLE	DATE

APPENDIX C: LABORATORY REPORTS

SUMMARY OF PARTICULATE EMISSION TEST LABORATORY DATA

PROJECT NUMBER: 9608 COMPANY: C.S. McCROSSAN
TEST NUMBER: 1 SOURCE: ASPHALT SCRUBBER EXHAUST

	MASS OF PARTICULATE MATTER COLLECTED, GRAMS							
	FRONT CATCH				BACK CATCH			TOTAL PARTICULATE MASS COLLECTED
RUN NUMBER	FRONT WASH	CYCLONE CATCH	FILTER CATCH	FRONT TOTAL	IMPINGER CATCH **	IMPINGER WASH	BACK TOTAL	
1	0.0213	0.0000	0.0433	0.0646	0.0022	0.0053	0.0075	0.0721
2	0.0195	0.0000	0.0319	0.0514	0.0010	0.0033	0.0043	0.0557
3	0.0144	0.0000	0.0501	0.0645	0.0005	0.0011	0.0016	0.0661

* NOT APPLICABLE

** CHLOROFORM/ETHYL ETHER EXTRACTION

LABORATORY REPORT: EPA Method 5

Project Number: * 9608 Company: C. S. McClosser

Frontwashes

Test-Run	1-1	1-2	1-3	Date
Dish #	1280	1283	1286	- - - - -
1	2.3159	2.3421	2.3240	10-24-94
2	2.3159	2.3423	2.3238	10-27-94
3	2.3158	2.3420	2.3239	10-28-94
Tare	2.2944	2.3224	2.3093	6-26-94
Blank	0.0001	0.0001	0.0001	- - - - -
Net	0.0213	0.0195	0.0144	- - - - -

Solvent Blanks

Solvents	Acetone	Chloroform	Ether	Date
Dish #	1277	1278	1279	- - - - -
1	2.3088	2.3090	2.3007	10-24-94
2	2.3087	2.3091	2.3007	10-27-94
3	2.3087	2.3091	2.3007	10-28-94
Tare	2.3086	2.3090	2.3005	6-26-94
Net	0.0001	0.0001	0.0002	- - - - -

Backwashes

Test-Run	1-1	1-2	1-3	Date
Dish #	1281	1284	1287	- - - - -
1	2.3025	2.3340	2.3098	10-24-94
2	2.3025	2.3340	2.3096	10-27-94
3	2.3024	2.3339	2.3097	10-28-94
Tare	2.2970	2.3305	2.3084	6-26-94
Blank	0.0001	0.0001	0.0001	- - - - -
Net	0.0053	0.0033	0.0011	- - - - -

Glass Filters

Test-Run	1-1	1-2	1-3	Date
Filter #	8906	8907	8908	- - - - -
1	0.5513	0.5335	0.5513	10-24-94
2	0.5512	0.5337	0.5512	10-27-94
3	0.5511	0.5337	0.5513	10-28-94
Tare	0.5078	0.5016	0.5011	6-2-94
Net	0.0433	0.0319	0.0501	- - - - -

Extractions

Test-Run	1-1	1-2	1-3	Date
Dish #	1282	1285	1288	- - - - -
1	2.3214	2.3209	2.3142	10-24-94
2	2.3214	2.3208	2.3140	10-27-94
3	2.3215	2.3207	2.3141	10-28-94
Tare	2.3189	2.3194	2.3138	6-26-94
Blank	0.0003	0.0003	0.0003	- - - - -
Net	0.0022	0.0010	0.0005	- - - - -

COMMENTS

Lowest Final Weight
- Tare
- Blank(if applicable)

= Sample Net Gain (grams)

Signature Bill Anderson Date 10-28-94

Laboratory Report: Moisture Content of Aggregate Samples

Project Number 9608 Company C.S. McCrossan

Asphalt Plant Test

Test 1-1

Trial #	1	2	3	Date
Dish #	1298	1299	1300	
Tare	2.2981	2.3038	2.3090	4.26.94
Tare + Wet	45.4930	45.7401	45.5043	11.3.94
Wet	43.1949	43.4363	43.1953	
Dry	41.5234	41.7992	41.6009	
Dry + Tare	43.8215	44.0130	43.9099	11.4.94
% Moisture	3.87	3.98	3.69	

% Moisture

	Virgin 10-1/0	30% RAP	Aggregate Composite in Proportion	
1-1	3.85	2.64	3.49	
1-2	2.91	2.63	2.83	
1-3	2.81	2.24	2.64	

Test 1-2

Trial #	1	2	3	Date
Dish #	1301	1302	1303	
Tare	2.3081	2.2983	2.3134	4.26.94
Tare + Wet	45.5044	45.9135	45.6466	11.3.94
Wet	43.1963	43.6152	43.3332	
Dry	41.8314	42.1867	42.3349	
Dry + Tare	44.1395	44.4850	44.6483	11.4.94
% Moisture	3.16	3.28	2.30	

Summary Virgin Aggregate

	Mean	Deviation	% Error	
Test 1-1	3.85	.15	3.8	
1-2	2.91	.53	18.4	
1-3	2.81	.25	8.7	

Test 1-3

Trial #	1	2	3	Date
Dish #	1304	1305	1306	
Tare	2.2820	2.2880	2.2850	4.26.94
Tare + Wet	45.3831	45.7520	45.6701	11.3.94
Wet	43.1011	43.4640	43.3851	
Dry	41.9596	42.3006	42.0442	
Dry + Tare	44.2416	44.5886	44.3292	11.4.94
% Moisture	2.65	2.68	3.09	

Comments

$\frac{\text{Dry}}{\text{Wet}} * 100 =$ % Solids

100- % Solids = % Moisture Virgin Aggregate

Signature Ted Gibbons Date 11.4.94

Laboratory Report: Moisture Content of Aggregate Samples

Project Number 9608 Company C.S. McCrossan Asphalt Testing

Test 1-1				
Trial #	1	2	3	Date
Dish #	1307	1308	1309	
Tare	2.3066	2.3015	2.3121	4.26.94
Tare + Wet	45.5167	45.2811	45.7722	11.3.94
Wet	43.2101	42.9796	43.4601	
Dry	42.0383	41.8132	42.3715	
Dry + Tare	44.3449	44.1147	44.6836	11.4.94
% Moisture	2.71	2.71	2.50	

Test 1-2				
Trial #	1	2	3	Date
Dish #	1310	1311	1312	
Tare	2.3140	2.3085	2.3052	4.26.94
Tare + Wet	45.8864	45.5865	45.3881	11.3.94
Wet	43.5724	43.2780	43.0829	
Dry	42.4386	42.0895	41.9944	
Dry + Tare	44.7526	44.3980	44.2996	11.4.94
% Moisture	2.60	2.75	2.53	

Test 1-3				
Trial #	1	2	3	Date
Dish #	1313	1314	1315	
Tare	2.3096	2.3128	2.3375	4.26.94
Tare + Wet	45.5450	45.8189	45.7187	11.3.94
Wet	43.2354	43.5061	43.3812	
Dry	42.1742	42.5003	42.5364	
Dry + Tare	44.4838	44.8131	44.8739	11.4.94
% Moisture	2.45	2.31	1.95	

Summary Recycled Asphalt Product

	Mean	Deviation	% Error	
Test 1-1	2.64	.12	4.6	
1-2	2.63	.11	4.3	
1-3	2.24	.26	16.5	

Comments

RAP

$\frac{\text{Dry}}{\text{Wet}} * 100 =$ % Solids

100- % Solids = % Moisture

Signature Ted Gibbons Date 11.4.94

EPA METHOD 4 MOISTURE ANALYSIS

mmt environmental services, inc.

Sampling Train* Cold Box Setup		
Impinger	Type**	Initial Contents
1	M	100 ml H_2O
2	S	100 ml H_2O
3	M	empty
4	M	silica gel
5	---	not used
6	---	not used
7	---	not used

MMT Project Number: 9608
Company: C. S. McCrossan
Source: Scrubber Exhaust
Sample Acquisition:
Dates: 10-20-94
Technicians: TG - BA
Sample Recovery:
Date: 10-21-94
Technician: BA

* EPA Method 5 sampling train ** S: Standard (with orifice) M: Modified (straight tube)

Test-Run 1-1 | Box No: | Filter No: 8906

Impinger Number	Mass (g) or Volume (ml)		
	Initial	Final	Net Gain
1	100	298	198
2	100	131	31
3	0	2	2
4	760.1	773.0	13.0
5	---	---	0
6	---	---	0
7	---	---	0
Total mass of liquid collected, g			244.0

Description of liquid collected: Lt. Cloud

Test-Run 1-2 | Box No: | Filter No: 8907

Impinger Number	Mass (g) or Volume (ml)		
	Initial	Final	Net Gain
1	100	352	252
2	100	140	40
3	0	2	2
4	791.5	806.3	14.8
5	---	---	0
6	---	---	0
7	---	---	0
Total mass of liquid collected, g			308.8

Description of liquid collected: Lt. Cloud

Test-Run 1-3 | Box No: | Filter No: 8908

Impinger Number	Mass (g) or Volume (ml)		
	Initial	Final	Net Gain
1	100	300	200
2	100	135	35
3	0	3	3
4	757.2	770.3	13.1
5	---	---	0
6	---	---	0
7	---	---	0
Total mass of liquid collected, g			251.1

Description of liquid collected: Lt. Cloud

Test-Run | Box No: | Filter No:

Impinger Number	Mass (g) or Volume (ml)		
	Initial	Final	Net Gain
1	100		
2	100		
3	0		
4			
5	---	---	0
6	---	---	0
7	---	---	0
Total mass of liquid collected, g			

Description of liquid collected:

MMT form: S-LB-4b 5/9/84

mmt environmental services, inc.

EPA METHOD 3 LABORATORY REPORT
ORSAT ANALYSIS

Project Number: 9608
Company: C.S. McCrosson

Bag Id	Sample Identification	Gas Parameter Measured	Replicate #1 Buret ml Reading	Replicate #1 Percent Volume	Replicate #2 Buret ml Reading	Replicate #2 Percent Volume	Replicate #3 Buret ml Reading	Replicate #3 Percent Volume	Average Percent Volume	Fuel Factor Fo
Bag Id:	Submitted by: BA	Initial Reading	0.0		0.0		0.0			[illegible]
1-1	Submittal Date: 10.20.94 Time: 1040	Carbon Dioxide	3.1	3.1	3.1	3.1	3.1	3.1	3.1	NA
	Analyzed by: TG	Oxygen	19.2	16.1	19.1	16.0	19.1	16.0	16.03	
	Analysis Date: 10.21.94 Time: 1310	Carbon Monoxide	X							
Bag Id:	Submitted by: BA	Initial Reading	0.0		0.0		0.0			Not Applicable
1-2	Submittal Date: 10.20.94 Time: 1228	Carbon Dioxide	2.8	2.8	2.8	2.8	2.8	2.8	2.80	
	Analyzed by: TG	Oxygen	19.2	16.4	19.2	16.4	19.2	16.4	16.40	
	Analysis Date: 10.21.94 Time: 1316	Carbon Monoxide	X							
Bag Id:	Submitted by: BA	Initial Reading	0.0		0.0		0.0			Not Applicable
1-3	Submittal Date: 10.20.94 Time: 1402	Carbon Dioxide	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
	Analyzed by: TG	Oxygen	19.3	16.3	19.2	16.2	19.3	16.3	16.27	
	Analysis Date: 10.21.94 Time: 1325	Carbon Monoxide								
Bag Id:	Submitted by:	Initial Reading								
	Submittal Date: Time:	Carbon Dioxide								
	Analyzed by:	Oxygen								
	Analysis Date: Time:	Carbon Monoxide								

Percent Volume Calculations:
$\%CO_2 = 100 * (CO_2 - IR) / (100 - IR)$
$\%O_2 = 100 * (O_2 - CO_2) / (100 - IR)$
$\%CO = 100 * (CO - O_2) / (100 - IR)$
where IR, CO_2, O_2 & CO are buret ml values

$Fo = (20.9 - \%O_2 + 0.5*\%CO) / (\%CO_2 + \%CO)$
Fuel factor Fo is a quality control check which is only valid for pure combustion sources. The EPA Method 3B list of acceptable Fo ranges for various fuels is presented to the right.

Anthracite coal:	1.016 - 1.130
Bituminous coal:	1.083 - 1.230
Lignite coal:	1.016 - 1.130
Wood:	1.000 - 1.120
Wood bark:	1.003 - 1.130
[redacted]	
X Natural gas:	1.600 - 1.836
Propane gas:	1.434 - 1.586
Butane gas:	1.405 - 1.553

MMT form: S-LB-3a 5/9/94

Record buret readings to the nearest 0.1 ml. Record percent volume values to the nearest 0.01 percent.

APPENDIX D: CALIBRATION DATA

Page: SSQA-1-42

CALIBRATION
DRY TEST METER/ORIFICE METER

Date: Friday 10.21.94 Barometric Pressure, in. Hg. (Pb): 28.47

EQUIPMENT IDENTIFICATION			
Control Unit 5	Dry Test Meter	Wet Test Meter	Calibration Type
Mfg: mmt	Mfg: Rockwell	Mfg: GCA Corporation	General: X
Model: Universal	Model:	Model: Precision	Post-test: X
SN: 92-9093	SN: [redacted]	SN: 11 AH 12	

EQUIPMENT CALIBRATION

Orifice Pressure Drop in. WC H	Pump Vac. in.Hg	Wet Test Meter Volume, CF Initial V_{wi}	Wet Test Meter Volume, CF Final V_{wf}	Wet Test Meter Temp. °F T_w	Dry Test Meter Volume, CF Initial V_{di}	Dry Test Meter Volume, CF Final V_{df}	Dry Test Meter Temperature, °F Inlet Initial T_{ii}	Dry Test Meter Temperature, °F Inlet Final T_{if}	Dry Test Meter Temperature, °F Outlet Initial T_{oi}	Dry Test Meter Temperature, °F Outlet Final T_{of}	Elapsed Time, min. Q
1.4	15	zero	5.482	71	209.808	215.534	67	69	75	69	8
1.4	15	5.482	11.662	71	215.534	222.003	69	74	82	71	9
1.4	15	11.662	21.936	71	222.003	232.602	71	81	88	73	15

COMPUTER PRINTOUT

Pl. #9608 $\bar{x}$ ΔH = 1.42 max vacuum = 15 in. Hg

H	Vw	Tw	Vd	Td	Θ	C	Hθ
1.4	5.482	71	5.726	70.0	8.0	0.9521	1.7661
1.4	6.180	71	6.469	74.0	9.0	0.9573	1.7456
1.4	10.274	71	10.799	78.3	15.0	0.9609	1.7406

AVERAGE CORRECTION FACTOR: C = 0.9568
AVERAGE ORIFICE CONSTANT: Hθ = 1.7508

EQUATIONS:
Vw = Vwf - Vwi
Vd = Vdf - Vdi
Td = (Tii + Tif + Toi + Tof) / 4
C = Vw * Pb * (Td+460) / (Vd * (Pb+H/13.6) * (Tw+460))
Hθ = 0.0317 * H * ((Tw+460)*θ/Vw)^2 / (Pb * (Td+460))

Pre & Post Test $\bar{x}$ C = .9612

Calibration Performed by:
(Print) Ted Gibbons

CALIBRATION
DRY TEST METER/ORIFICE METER

Date: 10-8-94 Barometric Pressure, in. Hg. (Pb): 28.67

EQUIPMENT IDENTIFICATION			
Control Unit 5	Dry Test Meter	Wet Test Meter	Calibration Type
~~Mfg:~~ mmt	Mfg: Rockwell	Mfg: GCA Corporation	General: X
Model: Universal	Model:	Model: Precision	Post-test: X
SN: 92-9093	SN: [redacted]	SN: 11 AH 12	

EQUIPMENT CALIBRATION

Orifice Pressure Drop in. WC H	Pump Vac. in.Hg	Wet Test Meter Volume, CF Initial V_{wi}	Wet Test Meter Volume, CF Final V_{wf}	Wet Test Meter Temp. °F T_w	Dry Test Meter Volume, CF Initial V_{di}	Dry Test Meter Volume, CF Final V_{df}	Dry Test Meter Temperature, °F Inlet Initial T_{ii}	Dry Test Meter Temperature, °F Inlet Final T_{if}	Dry Test Meter Temperature, °F Outlet Initial T_{oi}	Dry Test Meter Temperature, °F Outlet Final T_{of}	Elapsed Time, min. Q
~~1.0~~	3	zero	8.063	71	65.093	73.5A	70	70	85	71	14
~~1.0~~	3	8.063	15.470	71	73.5A	81.288	85	71	93	73	13
~~1.0~~	3	15.470	20.015	71	81.288	86.077	92	73	95	74	8
~~1.0~~	0										

COMPUTER PRINTOUT

Pr.# 9659 average orifice P = 1.0 in W.C., max vac. = 3" Hg

H	Vw	Tw	Vd	Td	Q	C	Ha
1.0	8.063	71	8.426	74.0	14.0	0.9599	1.7601
1.0	7.407	71	7.769	80.5	13.0	0.9680	1.7768
1.0	4.545	71	4.789	83.5	8.0	0.9689	1.7772

AVERAGE CORRECTION FACTOR: C = 0.9656
AVERAGE ORIFICE CONSTANT: Ha = 1.7714

EQUATIONS:

$Vw = Vwf - Vwi$
$Vd = Vdf - Vdi$
$Td = (Tii + Tif + Toi + Tof) / 4$
$C = Vw * Pb * (Td+460) / (Vd * (Pb+H/13.6) * (Tw+460))$
$Ha = 0.0317 * H * ((Tw+460)*Q/Vw)^2 / (Pb * (Td+460))$

Calibration Performed by:
(Print) T. Gibson

CALIBRATION

S-TYPE PITOT TUBE

Probe ID: 126-"

Date: 3.23.94 TUE

S-Type Pitot Tube ID No.: 96"

Ambient Temperature, °F: 65

Standard Pitot Tube ID No.: 1.5 ft

Barometric Pressure, in. Hg.: 28.8

Standard Pitot Tube Coefficient: .990

PITOT TUBE EXAMINATION		
Alignment Check	Pitot Tube Dimensions	Pitot Assembly Intercomponent Spacings
✓ $\alpha 1 < 10°$	External tubing diameter (D_t): 3/8	Pitot to ____ nozzle (X): NA
✓ $\alpha 2 < 10°$	Base to Side A opening plane (P_A): .56	Pitot to probe sheath (Y): NA
✓ $\beta 1 < 5°$	Base to Side B opening plane (P_B): .55	Pitot to thermocouple, along probe (W): NA
✓ $\beta 2 < 5°$		Pitot to thermocouple, perpendicular to probe (Z): NA
✓ Q < 1/8 in.		
✓ R < 1/32 in.		

DESIRED CALIBRATION POINT		SIDE A CALIBRATION		SIDE B CALIBRATION	
Velocity ft/sec	P_{std} in. WC	P_{std} in. WC	P_s in. WC	P_{std} in. WC	P_s in. WC
20	0.09	.11	.15	.14	.19
✓ 40	0.37	.36	.51	.39	.52
60	0.82	.84	1.18	.82	1.1
80	1.45	1.5	2.1	1.5	2.1
100	2.30				

COMPUTER PRINTOUT

SIDE A CALIBRATION				SIDE B CALIBRATION			
Pstd	Ps	Cp	Cp-Cp(A)	Pstd	Ps	Cp	Cp-Cp(B)
0.110	0.150	0.848	0.010	0.140	0.190	0.850	0.000
0.360	0.510	0.832	-0.006	0.390	0.520	0.857	0.008
0.840	1.180	0.835	-0.003	0.820	1.100	0.855	0.005
1.500	2.100	0.837	-0.001	1.500	2.100	0.837	-0.013
Cp(A) = 0.838				Cp(B) = 0.850			

Side A (P_{op} std dev)$_{SA}$ = .006 Side B($_{SA}$ = .008)

Calibration Performed by:

(Print) Bill + Ted

(Signature) Bill + Ted

CALIBRATION

NOZZLE DIAMETER

Nozzle Number	Nominal Diameter, in.	Measured Diameter, in. D1	D2	D3	Nozzle* Diameter, in.
L-1		.174	.175	.175	.175
L-2		.249	.248	.249	.249
L-3		.355	.355	.355	.355
L-4		.489	.488	.489	.489
L-5		.125	.125	.125	.125
L-6		.300	.300	.300	.300
L-7		.175	.175	.176	.175
L-8		.489	.490	.491	.490
L-10		.245	.246	.245	.245
L-11		.250	.250	.250	.250
L-12		.247	.248	.248	.248
L-13		.240	.240	.239	.240
L-14		.199	.199	.199	.199

* Nozzle diameter = (D1 + D2 + D3)/3

Calibration Performed by:

(Print) Bill Anderson

(Signature) Bill Anderson

Date: 3-18-94

FORM: SSQA-3

VISIBLE EMISSIONS EVALUATOR

This is to certify that

Ted M. Gibbons

met the specifications of Federal Reference Method 9 and qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, North Carolina. This certificate is valid for six months from date of issue.

Thomas Lore
President

245699
Certificate Number

Vice President

Minneapolis
Location

David B. Savage, Jr.
Program Manager

October 5, 1994
Date of Issue

APPENDIX E: PROCESS DATA

ASPHALT PLANT OPERATING CONDITIONS DURING PERFORMANCE TEST

must environmental services, inc.

Project No: 1608 Date: 12-2-94

Company: C.S. McCrossan

Location: Maple Grove, MN

The Minnesota Pollution Control Agency requires that the following information be included in the performance test report. The agency may reject any report without this completed form duly certified by a company representative.

Asphalt Plant Description

Mfg: Standard Steel

Model: 1064

Type: ☐ Drum Mix ☐ Conventional ☐ Other (specify):

Class: ☒ Stationary ☐ Portable

Pollution Control Equipment

Mfg: Standard Steel

Model: RM-290

Type: ☐ Baghouse ☐ Cyclone ☐ Multiclone ☐ Venturi Scrubber ☒ Wet Scrubber ☐ Other:

Fuel Description

Itemize all fuels and materials added to the combustion process during the test period (if oil specify type):

Natural gas

Is the above listed fuel the "dirtiest" that the plant is allowed to burn? ☐ Yes ☒ No #2 fuel oil

Is the above fuel substantially the highest sulfur containing fuel normally burned? ☐ Yes ☒ No #2 fuel oil

Production specific fuel usage determination method:

☐ Measured _____ cu.ft./ton hot mix

☐ Calculated _____ gal/ton hot mix

Number of burners in system dryer: 1

Burner rating: 202 10^6Btu = 100% control setting

Control Equipment Operating Parameters

Was control equipment operating normal during the test period? ☒ Yes ☐ No

Normal system pressure drop, in WC: 3.1

Normal system air flow rate, acfm: 75000

For Baghouse systems:	Design	At Test
Cleaning cycles		
Air-to-Cloth Ratio		
For Wet Scrubbing systems:		
% scrubbing water recycled	100	100
Number of spray bars		
Water delivery pressure, psi	110	110
Water flow rate, gpm	250	250

Heat Input Data (specify units)

Test Run Number	Fuel Usage Rate /Hr	Fuel Heat Content Btu/	Total Heat Input Rate 10^6Btu/Hr
1			
2			
3			

Control Equipment Cleaning/Maintenance

Date and procedure of last maintenance or cleaning of the pollution control equipment:

Aggregate and Recycle Material Usage

Test Number	Virgin Aggregate ton/hr	Recycle Material ton/hr	Liquid Asphalt ton/hr	Process Weight Rate* ton/hr	Recycle Percentage** %	Aggregate & Recycle Moisture Content: Virgin Aggregate % moisture	Recycle Material % moisture	Combined Material % moisture
1	294	126	16	436	30	3.8	2.6	3.4
2	294	126	16	436	30	2.9	2.5	2.8
3	294	126	16	436	30	2.8	2.2	2.6

* Process Weight Rate = Total of all materials introduced into the process equipment = Aggregate + Recycle + Asphalt

** % Recycle = 100 x Recycle / (Aggregate + Recycle) Asphalt excluded as per Minn. Dept. of Transportation mix basis calculation

Describe location of the thermocouples reading the dryer gas exit temperature:

Affidavit: I certify that the information recorded above is accurate and correctly describes the plant equipment and operating conditions during the indicated performance test period.

By (print): Robert Donesky Position: Tech

Signature: _____ Phone: 425-486-1

MPCA Form: E-PD-11 Rev 5/20/94

mmt environmental services, inc.

ASPHALT PLANT OPERATING DATA LOG

(Record Data at 15 Minute Intervals)

Project No: 9608 Date: 10-20-94

Company: C.S. McCrossan

Location:

Time of Day Hr : Min	Burner Setting %	Material Processing Rate, Tons Per Hour: Aggregate Material	Recycle Material	Total Solid Materials	Liquid Asphalt	Total All Materials	Dryer Exhaust Gas Temp. °F	Dust Collector Pressure Drop inches water	Wet Scrubber Water: Flow Rate gpm	Pressure psi		
10:15 AM	40%	294	126	420	17.2	437.2	275°	3.0	250	110		
10:30	40%	294	126	420	15.5	435.5	275°	3.2	250	110		
10:45	40%	294	126	420	15.5	435.5	275°	3.1	250	110		
11:00	40%	294	126	420	15.5	435.5	275°	3.2	250	110		
11:15	40%	294	126	420	15.5	435.5	275°	3.2	250	110		

#1

Affidavit: I certify that the information recorded above is accurate and correctly describes plant operating conditions during the indicated period. I also certify that the above data was recorded by myself or by personnel under my direct supervision.

By (print): Bob Donegan Position: Eng Mgr

Signature: Phone: 425-4167

MMT form: S-PD-1a Rev.5/20/94

50

mmt environmental services, inc.

ASPHALT PLANT OPERATING DATA LOG

(Record Data at 15 Minute Intervals)

Project No: 9608 Date: 10-20-94

Company: C.S. McCrossan

Location: _____

Time of Day Hr : Min	Burner Setting %	Material Processing Rate, Tons Per Hour					Dryer Exhaust Gas Temp. °F	Dust Collector Pressure Drop inches water	Wet Scrubber Water			
		Aggregate Material	Recycle Material	Total Solid Materials	Liquid Asphalt	Total All Materials			Flow Rate gpm	Pressure psi		
12:00	40%	294	126	420	15.5	435.5	260°	3.1	250	110		
12:15	40%	294	126	420	15.5	435.5	275°	3.1	250	110		
12:30	40%	294	126	420	15.5	435.5	275°	3.0	250	110		
12:45	40%	294	126	420	15.5	435.5	275°	3.2	250	110		
1:00	40%	294	126	420	15.5	435.5	275°	3.0	250	110		

#2

Affidavit: I certify that the information recorded above is accurate and correctly describes plant operating conditions during the indicated period. I also certify that the above data was recorded by myself or by personnel under my direct supervision.

By (print): [illegible] Position: Pr. Mgr.

Signature: [illegible] Phone: 425-4125

MMT form: S-PD-1a Rev.5/20/94

mmt environmental services, inc.

ASPHALT PLANT OPERATING DATA LOG

(Record Data at 15 Minute Intervals)

Project No: 9608 Date: 10-20-94

Company: C.S. McCrossan

Location:

Time of Day Hr : Min	Burner Setting %	Material Processing Rate, Tons Per Hour					Dryer Exhaust Gas Temp. °F	Dust Collector Pressure Drop inches water	Wet Scrubber Water			
		Aggregate Material	Recycle Material	Total Solid Materials	Liquid Asphalt	Total All Materials			Flow Rate gpm	Pressure psi		
1:40 PM	40%	294	126	420	15.5	435.5	275°	3.0	250	110		
1:55	40%	294	126	420	15.5	435.5	275°	3.1	250	110		
2:10	40%	294	126	420	15.5	435.5	275°	3.1	250	110		
2:25	40%	294	126	420	15.5	435.5	275°	3.1	250	110		
2:40	40%	294	126	420	15.5	435.5	275°	3.2	250	110		

#2

Affidavit: I certify that the information recorded above is accurate and correctly describes plant operating conditions during the indicated period. I also certify that the above data was recorded by myself or by personnel under my direct supervision.

By (print): Bob Dangerfield Position: Eng. Mgr

Signature: Bob Dangerfield Phone: 425-4167

MMT form: S-PD-1a Rev.5/20/94

APPENDIX F: TEST PLAN

Minnesota Pollution Control Agency

October 28, 1994

Mr. Robert Dongoske
C.S. McCrossan Construction, Inc.
Box 1240
7865 Jefferson Highway North
Maple Grove, Minnesota 55369

RE: August 1, 1994, Test Plan Submittal for the October 20, 1994, Performance Test on the Asphalt Plant

Dear Mr. Dongoske:

This letter concludes the pretest requirements for the C. S. McCrossan (Company) facility located in Maple Grove, Minnesota, as discussed during our pretest meeting with Charles McCrossan and yourself of C.S. McCrossan, Al Trowbridge of MMT Environmental and Dave Crowell and myself of the Minnesota Pollution Control Agency (MPCA) on October 3, 1994.

The Air Quality Division staff of the Minnesota Pollution Control Agency (MPCA) has reviewed the submittal, and has approved the test plan with the following provisions:

For the Asphalt Plant Portion of the Performance Testing

1. The water scrubber flow rate will be determined by adding the two water flow meter values. Designation of these two flow meters will be Upper and Lower scrubber flow rates. Company was informed the scrubber water flow rate determined during the performance test will become the scrubber water flow rate for daily operation as specified in Minn. Rules pt. 7017.2001 to 7017.2060.

2. Company was informed that Percent Recycle (%R) is determined by taking the total amount of Recycle (in tons) dividing by the total amount of throughput (which includes the virgin aggregate, recycle aggregate, and the asphalt oil) and multiplying by 100. This is represented in the following equation:

$$\%R = [(\text{Recycle}_{\text{in tons}}) / (\text{Recycle+Virgin+Asphalt Oil})_{\text{in tons}}] \times 100$$

3. Company was informed that performance test must be conducted at highest production rate of asphalt. Operational limits will be established on facility once compliance determination has been made.

4. Company instructed that a water pressure gauge must be installed on the upper scrubber water reservoir prior to conducting the performance test.

These provisions are modifications to the test plan, and are to be incorporated into the proposed test.

Copies of the Asphalt Plant Operation Conditions During Stack Testing and Soil Roasting/Remediaiton Operating Conditions During Stack Testing, Certifications Required For Performance Test Reports, and Microfiche Submittal forms were distributed at the meeting. These forms will help you to comply with the submittal requirements of Minn. Rules pt. 7017.2035 and 7017.2040. **A copy of the test plan, including this letter, must be included as part of the performance test report.**

Remember, it is not the Testing Consultant's responsibility to submit the Company report or microfiche or to certify that the microfiche submitted is an exact copy of the original test report by the deadlines specified in the applicable compliance document (i.e., Permit, Stipulation Agreement, Administrative Penalty Order, etc.). The responsibility for these submittals lies solely with the Company.

If you have any questions or comments on the content of this letter, please contact me at (612)297-8301.

Sincerely,

Craig D. Averman
Performance Test Coordinator
Compliance Determination Unit
Compliance and Enforcement Section
Air Quality Division

CDA:mln

cc: David Crowell, Air Quality Division
Jerry Liefert, Air Quality Division
AQD File No. 785A

mmt environmental services, inc.

August 1, 1994

Pretest Meeting
10/3/94 9AM
Craig Averman, MPCA
Alan McCrossan
Bob Dongoske
David Crowell, MPCA
Al Trowbridge

Mr. Craig D. Averman
Compliance and Enforcement Section
Air Quality Division
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

Re: Compliance Test Schedule - C.S. McCrossan

Dear Mr. Averman:

MMT Environmental, Inc. (MMT) has been contracted by C.S. McCrossan, Inc. to perform a source emission compliance test at their asphalt production/soil roasting facility in Maple Grove, Minnesota. The source to be tested is identified as Emission Point #1 in Minnesota Air Emission Permit Number 785A-93-OT-3.

Enclosed is MMT test plan #9608 for testing Emission Point #1 when operated as a hot-mix asphalt plant. The asphalt plant's scrubber exhaust will be tested for particulate and visible emissions using standard EPA and MPCA test methods. Subject to your approval, the test has been scheduled for Tuesday, October 4, 1994.

Enclosed is MMT test plan #9609 for testing Emission Point #1 when operated as a soil roaster. The soil roaster's scrubber exhaust will be tested for particulate, lead, VOC, BTEX and visible emissions using standard EPA and MPCA test methods. Subject to your approval, the test has been scheduled for Thursday, October 6, 1994.

We would like to set up a pre-test meeting as soon as possible. Please contact either Robert Dongoske at C.S. McCrossan (425-4167) or myself (483-9595) at your earliest convenience.

Sincerely,

Alan L. Trowbridge
Director of Technical Services

enclosures
cc: Robert Dongoske, C.C. McCrossan, Inc.

4610 N. Churchill St. • St. Paul, MN 55126-5892 • 612 / 483-9595 • FAX 612 / 483-2699

mmt environmental services, inc.

SOURCE EMISSION COMPLIANCE TEST PLAN
ASPHALT PLANT TEST PLAN #9608

Date Test Plan Written/Revised	MPCA Pre-Test Meeting Date	Scheduled Test Date(s)
July 28, 1994	to be determined	October 4, 1994

PART I. GENERAL INFORMATION

1: Emission Facility: ..... C.S. McCrossan, Inc.
P.O. Box 1240
7865 Jefferson Highway
Maple Grove, MN 55311-6240

2: Facility Contact Person: ..... Robert Dongoske
Phone: (612) 425-4167 Fax: (612) 425-1235

3: MPCA file/permit number: ..... Permit #785A-93-OT-3

4: Reason For Test: ..... Permit Requirement. The MPCA and C.S. McCrossan have agreed that this test program should not have to be repeated when the permit is renewed in 1995.

5: Source to be Tested:..... Emission Point #1
Asphalt Plant Scrubber Exhaust
See Figure 1 for sampling location data

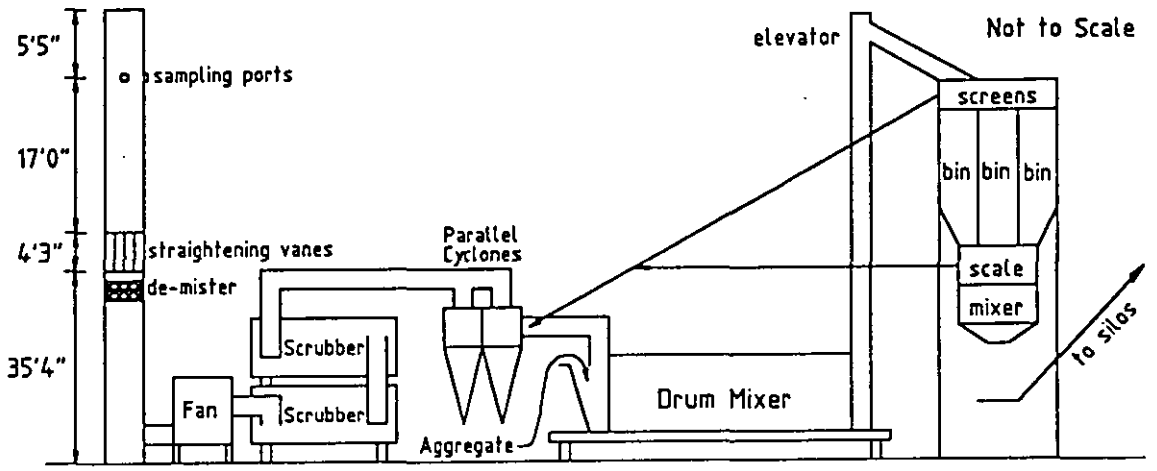
6: Physical Location of Source: ..... Stationary
7865 Jefferson Highway
Maple Grove, MN 55311-6240

7: Testing Company: ..... MMT Environmental Services, Inc.
4610 N. Churchill Street, St. Paul, MN 55126-5892
Phone: (612) 483-9595 Fax: (612) 483-2699
Contact: Alan Trowbridge

8: Test Plan Discussions: ..... Pre-test meeting

9: Out-of-State Compliance Test: ..... Not Applicable

Figure 1: Process and sampling site schematic



EPA Method 1 Sampling Location Data:

102" diameter circular stack

204" (2.0 diameters) of straight, undisturbed flow before sampling ports

65" (0.64 diameters) of straight, undisturbed flow after sampling ports

24 points required for particulate test

2 sampling ports

12 sampling points per port

PART II. TESTING REQUIREMENTS

1. Pollutants to be tested, applicable emission limits, and governing regulations:

Emission Point	Pollutant	Emission Limit	Applicable Rule or Regulation (Emission point #1 defined as an existing source)
1	Particulate Matter	Variable: not to exceed 46 lb/hr and 0.3 gr/dscf. Exhaust gas particulate concentration must be less than 0.30 gr/dscf and at least one of the following two conditions must be met: 1) Particulate emission rate (lb/hr) must not exceed the amount permitted in MN Rule 7011.0730 for the allocated process weight. 2) Particulate concentration (gr/dscf) must not exceed the amount permitted in MN Rule 7011.0735 for the appropriate source gas volume.	MPCA permit #785A-93-OT-3. MN Rule 7011.0905, subpart A which references MN Rules 7011.0700 through 7011.0735 MN Rule 7011.0730: Allowable particulate emission rate is process weight rate dependent; P = Process Weight Rate, ton/hr E = Allowable Emission Rate, lb/hr $E = 3.59 * P^{0.62}$ for $P \leq 30$ $E = 17.31 * P^{0.16}$ for $P > 30$ MN Rule 7011.0735: Allowable particulate concentration is source gas volumetric flow rate dependent; Q = Source gas flow rate, dscfm C = Allowable concentration, gr/dscf $C = 0.100$ for $Q \leq 7000$ $C = 1.7669 \bullet Q^{-0.3244}$ for $7000 < Q < 1,000,000$ $C = 0.020$ for $Q \geq 1,000,000$
1	Opacity	Exhaust gases must not exhibit greater than 20% opacity, except that a maximum of 40% opacity shall be permissible for not more than four minutes in any 30-minute period and a maximum of 60% opacity shall be permissible for not more than four minutes in any 60-minute period.	MPCA permit #785A-93-OT-3. MN Rule 7011.0905, subpart B

The emission test must be conducted with the asphalt plant's burner operating on the lowest quality (highest emitting) fuel listed in or allowed by the facility's permit.

The fuel to be used during the test on Emission Point #1 is **Number 2 fuel oil**.

2. Fuel sampling and analysis (Applicable to solid and liquid fuels only):

Required as part of the compliance demonstration. The MPCA will not accept test reports without an analysis of fuel samples collected during the test period. Sampling and analytical procedures are describe in MPCA Exhibit D which is also known as Part 11 of the MPCA Air Emission Permit.

1) Sampling - One tap sample is collected during each particulate test run. In order to be representative of the fuel burned during the test period, the fuel sampling location must be as close as possible to the burner. The minimum sample size is one pint.

2) Analysis - The individual fuel samples are to be combined together into a single composite sample which is to be analyzed for:
   a) Sulfur content, % by weight
   b) Ash content, % by weight
   c) Moisture content (solid fuels only), % by weight
   d) Gross heating value, Btu/gal or Btu/lb

3. Moisture Content of the Aggregate

Required as part of the compliance demonstration. The MPCA will not accept test reports without moisture content analyses of aggregate samples collected during the test period.

1) Sampling - Collect two or more samples of raw material during each particulate test run. In order to be representative of the material processed during the test period, the samples must be collected as close to the drum mixer/dryer as possible. If recycled material is included in the aggregate then , if possible, collect the samples after the virgin and recycled materials have been mixed. Otherwise collect separate samples of the virgin and recycled materials.

For each particulate test run, mix the individual samples into a single composite. If separate virgin and recycled material samples were collected, then combine the individual samples to obtain one virgin-composite and one recycled-composite for each particulate test run.

2) Analysis - Each composite sample is to be analyzed for moisture content per ASTM or other recognized methodologies. If separate virgin and recycled samples were collected, then a mass-weighted average aggregate moisture content must be calculated based on the virgin/recycled proportions processed during the test period.

Note: The facility owner/operator must provide (for inclusion in the test report) a copy of the manufacturer's specifications which define the design capacity of the plant as a function of the aggregate moisture content.

PART III. OPERATING CONDITIONS

1. General operating parameters for each emission point to be tested:

Note that the asphalt plant, pollution control equipment and all related equipment must be operated by the facilities regular operators using their normal operating procedures.

Emission Point #1	
	Process Equipment Description:
	Equipment ..... Counterflow Rotary Drum Asphalt Batch Plant
	Manufacturer/Model ..... Standard Steel model #1064
	Rated Capacity .....450 ton/hr @ 5 % moisture
	Process Rates and Operating Conditions during Test:
	Process weight rate:
	Aggregate, virgin .....298 ton/hr
	Aggregate, recycle .....(30%) 135 ton/hr
	Asphalt .....(3.7%) 17 ton/hr
	Total process weight rate .....450 ton/hr
	Fuel Type .....#2 Fuel Oil
	Control Equipment Description:
	Equipment ..... Wet Scrubber
	Manufacturer/Model ..... Standard Steel model RM-290
	Control Equipment Operating Parameters:
	Normal Pressure Drop ..... total across both scrubbers 2.8 in. WC
	Scrubbing Water Flow Rate ..... 150 gpm
	Scrubbing Water Delivery Pressure.....110 psi

Upper Scrubber flow & pressure
Lower Scrubber

2. Explanation of why the proposed test conditions are considered to be the worst case in accordance with Minnesota Rules part 7017.2025, subpart 2:

Emission Point	Rationale For Worst Case
1	Worst case is generally considered to be 1) operation at maximum production level 2) burning of worst quality fuel 3) maximum ratio of recycled to virgin aggregate

3. Definition of the normal range of process or operating rates for each emission unit:

Emission Point	Normal Range of Process or Operating Rates
1	Normal production rates vary between 250 and 440 tons per hour. Aggregate moisture content varies between 3 and 12 percent.

4. For each piece of process and control equipment listed in section III.1. above, the following are the descriptions of how air pollution control and process equipment will be monitored:

Emission Point	Process Equipment Description	Description Of Process Monitoring During Test Period
1	Asphalt plant	Process data will be recorded by plant personnel. Aggregate feed rate monitored by belt scales. Asphalt feed rate determined by calculation. Fuel usage determined by tank depth measurement. Dryer gas temperature monitored by thermocouple and indicating meter.

Emission Point	Control Equipment Description	Description Of Control Equipment Monitoring During Test Period
1	Scrubber	Process data will be recorded by plant personnel. Scrubber pressure drop measured by magnehelic gauge. Scrubber water flow rate measured by flow meter. Scrubber water delivery pressure measured by psi gauge.

PART IV. TEST METHODS

1. Specific Test Plan

   A) Three (3) replicate particulate emission test runs per EPA Methods 1, 2, 3, 4 and 5.
   B) One (1) hour of plume opacity observations per EPA Method 9. The opacity observations shall be performed concurrent with one (1) of the particulate emission tests.

2. General Test Methodology

   The following is a general listing of test requirements:

   A: EPA Method 1 for the location of sampling ports and sampling points.

   A check for cyclonic flow must be done whenever there is a cyclonic type of device directly upstream of the sampling location. The check must be performed even if flow straightening vanes have been installed.

   If the sampling location does not meet the minimum requirements of EPA Method 1, then the testing firm must conduct flow pattern evaluation and testing according to the alternative procedures in part 2.5 of EPA Method 1. Flow pattern documentation is required.

   Previously documented flow pattern tests are acceptable providing that no changes have occurred that would affect the flow pattern.

   B: EPA Method 2 for velocity and volumetric flow rate determination. Three (3) test runs are required; one concurrent with each pollutant emission test run.

   C: EPA Method 3 for gas analysis (CO_2 & O_2). Three (3) determinations are required; one integrated sample concurrent with each pollutant emission test run.

   D: EPA Method 4 for determination of moisture in the flue gases. Three (3) test runs are required; one concurrent with each pollutant emission test run.

   E: EPA Method 5 as amended by Minnesota Rules 7017.2060 and 7011.0725 for the determination of particulate matter emissions. Particulate analysis will include back catch condensable organic matter. Three (3) test runs are required and each run must represent a minimum sampling time of 60 minutes and a minimum sample volume of 32 dry standard cubic feet.

   F: EPA Method 9 as amended in Minnesota Rule 7017.2060 for the determination of visible emissions. Normally one (1) sixty-minute test is required. However, if this is an initial compliance test subject to NSPS regulations, then three (3) sixty-minute tests are required.

   If particulate emission testing is being performed, then the opacity test(s) must be performed concurrent with one or more of the EPA Method 5 test runs. Note: weather conditions may make it impossible to obtain valid opacity observations concurrent with the particulate test. If such circumstances exist, the visible emission test will be rescheduled for a later time/date and will be performed at similar load conditions.

3. Reference to any compliance document, federal regulation, or Minnesota rule or statute requiring use of specific methods or procedures, shall be stated in this section. **NONE**
4. Proposed alternative/equivalent test methods: **NONE**
5. Non-reference test method: For each proposed non-reference test method, include a statement of the detection limit and the degree of accuracy of that method at the expected emission rate and under the conditions of the performance test. **NOT APPLICABLE**

NOTE: Sampling times and rates must be increased if necessary to ensure that the detection limit for each pollutant is below the applicable emission limit, using the equation in Minn. Rules pt. 7017.2045, Subpart 6.

PART V. CEMS RELATIVE ACCURACY TEST

Testing of continuous emission monitoring systems is **not** included in this test program.

PART VI. OTHER

For each process unit to be tested the following are specified:

1. Pollutant(s) emissions must be reported in same terms as the emission limit(s).
2. Special averaging times for emission limits: NOT APPLICABLE
3. Plant personnel must complete the following two forms and give them to the testing firm representative for inclusion in the test report. A copy of each form is included at the end of this test plan.
   A) Asphalt Plant Operating Conditions During Stack Testing
   B) Asphalt Plant Operating Data Log
4. One complete test report (one hard copy) shall be submitted to the MPCA within 45 days after the date on which the on-site testing was completed. The test report **must** be submitted to the agency regardless of the test results. Note that submittal of the report to the MPCA is the responsibility of the owner/operator and not of the testing firm.
5. A microfiche copy of the report shall be submitted to the MPCA within 105 days after the date on which the on-site testing was completed. The microfiche copy **must** be submitted to the agency regardless of the test results. Note that submittal of the microfiche copy to the MPCA is the responsibility of the owner/operator and not of the testing firm.
6. All submittals shall be addressed to:

   Supervisor, Compliance Determination Unit
   Compliance and Enforcement Section
   Air Quality Division
   Minnesota Pollution Control Agency
   520 Lafayette Road
   St. Paul, Minnesota 55155-4194

PART VII. MPCA WARNING TO OWNER/OPERATOR

Given the seriousness of exceeding an emission limit, the Company is hereby provided notice that enforcement action will be taken for a first performance test failure . This enforcement action will not be initiated until the results of the retest have been reviewed by MPCA staff and will require the Company to pay a civil penalty.

Please be advised that upon receiving written notice of a second performance test failure, the Company will be required to either shut down the tested process unit(s) or to submit a compliance plan, subject to MPCA approval, which indicates specific measures-to-be-taken which are expected to make all the unit(s) operate in compliance with the applicable emission limitations . The plan must also include specific measures the facility will take to minimize emissions until compliance is demonstrated. However, if the unit(s) continue to operate, they will be considered to be operating in violation of the applicable limits from the date of the performance test until a retest has been conducted that demonstrates compliance .

Please note that results of a performance test are not final until MPCA staff provides a written compliance determination.

mmt environmental services, inc.

ASPHALT PLANT OPERATING DATA LOG

(Record Data at 15 Minute Intervals)

Project No: _____ Date: _____

Company: _____

Location: _____

Time of Day Hr : Min	Burner Setting %	Material Processing Rate, Tons Per Hour					Dryer Exhaust Gas Temp. °F	Dust Collector Pressure Drop inches water	Wet Scrubber Water			
		Aggregate Material	Recycle Material	Total Solid Materials	Liquid Asphalt	Total All Materials			Flow Rate gpm	Pressure psi		

Affidavit: I certify that the information recorded above is accurate and correctly describes plant operating conditions during the indicated period. I also certify that the above data was recorded by myself or by personnel under my direct supervision.

By (print): _____ Position: _____

Signature: _____ Phone: _____

MMT form: S-PD-1a Rev.3/20/94

ASPHALT PLANT OPERATING CONDITIONS DURING PERFORMANCE TEST

mmt environmental services, inc.

Project No: _____ **Date:** _____

Company: _____

Location: _____

The Minnesota Pollution Control Agency requires that the following information be included in the performance test report. The agency may reject any report without this completed form duly certified by a company representative.

Asphalt Plant Description

Mfg: _____

Model: _____

Type: ☐ Drum Mix ☐ Conventional ☐ Other (specify):

Class: ☐ Stationary ☐ Portable

Pollution Control Equipment

Mfg: _____

Model: _____

Type: ☐ Baghouse ☐ Cyclone ☐ Multiclone ☐ Venturi Scrubber ☐ Wet Scrubber ☐ Other:

Fuel Description

Itemize all fuels and materials added to the combustion process during the test period (if oil specify type):

Is the above listed fuel the "dirtiest" that the plant is allowed to burn? ☐ Yes ☐ No

Is the above fuel substantially the highest sulfur containing fuel normally burned? ☐ Yes ☐ No

Production specific fuel usage determination method:

☐ Measured _____ cu.ft./ton hot mix

☐ Calculated _____ gal/ton hot mix

Number of burners in system dryer: _____

Burner rating: _____ 10^6Btu = 100% control setting

Control Equipment Operating Parameters

Was control equipment operating normal during the test period? ☐ Yes ☐ No

Normal system pressure drop, in WC: _____

Normal system air flow rate, acfm: _____

For Baghouse systems:	Design	At Test
Cleaning cycles		
Air-to-Cloth Ratio		
For Wet Scrubbing systems:		
% scrubbing water recycled		
Number of spray bars		
Water delivery pressure, psi		
Water flow rate, gpm		

Heat Input Data (specify units)

Test Run Number	Fuel Usage Rate ____/Hr	Fuel Heat Content Btu/____	Total Heat Input Rate 10^6Btu/Hr
1			
2			
3			

Control Equipment Cleaning/Maintenance

Date and procedure of last maintenance or cleaning of the pollution control equipment:

Aggregate and Recycle Material Usage

Aggregate & Recycle Moisture Content

Test Number	Virgin Aggregate ton/hr	Recycle Material ton/hr	Liquid Asphalt ton/hr	Process Weight Rate ton/hr*	Recycle Percentage %**	Virgin Aggregate % moisture	Recycle Material % moisture	Combined Material % moisture
1								
2								
3								

* Process Weight Rate = Total of all materials introduced into the process equipment = Aggregate + Recycle + Asphalt

** % Recycle = 100 x Recycle / (Aggregate + Recycle) Asphalt excluded as per Minn. Dept. of Transportation mix basis calculation

Describe location of the thermocouples reading the dryer gas exit temperature:

Affidavit: I certify that the information recorded above is accurate and correctly describes the plant equipment and operating conditions during the indicated performance test period.

By (print): _____ **Position:** _____

Signature: _____ **Phone:** _____

MMT form: S-PD-1b Rev.5/20/94