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

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

AP42 Section: 11.1

Reference Number: 81

Title: Braun Intertec Report Number CMXX-94-0518, Braun Intertec Corporation, Mendota Heights, MN,

October 10, 1994.

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Minnesota Pollution Control Agency Division of Air Quality

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Braun Intertec Report Number CMXX-94-0518

CERTIFICATIONS

1. **Certification of sampling procedures by the team leader of the personnel conducting the sampling procedures:**

"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 below."

Signature: Jeffrey Jax
Title: Air Quality Scientist
Printed Name of Person Signing: Jeffrey Jax
Date: 10/10/94

2. **Certification of analytical procedures by the person responsible for the laboratory analysis of field samples:**

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 for use in the test report were, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

Signature: for David Rappath
Title: Manager, Source Testing
Printed Name of Person Signing: Bruce Randall
Date: 10/10/94

3. **Certification of test report by the senior staff person at the testing company who is responsible for compiling and checking the test report:**

I certify under penalty of law that this test 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 sampling and analysis 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 below."

Signature:
Title: Manager, Source Testing
Printed Name of Person Signing: Bruce Randall
Date: 10/10/94

4. **Certification of test report by owner or operator of the emission facility:**

I certify under penalty of law that the information submitted in this test 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 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 below."

Signature: Sigurd R. Langerud
Title: VICE PRESIDENT
Printed Name of Person Signing: Sigurd R. LANGERUD
Date: 10-14-94

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INTRODUCTION

This report presents the results of an EPA Method 5 & Method 9 source test performed by Braun Intertec, on September 9, 1994, at the Hard Drives hot mix facility located in St. Cloud, Minnesota. The test was performed at the exhaust stack of the hot mix baghouse in order to determine emission rates of Total Suspended Particulate (TSP) matter and the opacity of emissions and to demonstrate compliance with MPCA permit number 4C-90-OT-1.

All source sampling, laboratory analysis (of Method 5 samples), data reduction and report preparation was performed by the Braun Intertec test team. The test team consisted of:

Team Leader:	Jeffrey Jax
Sampling Technician:	Jayson Olson
Laboratory Analyst:	David Rappath

An oil sample was collected as described in the test plan and analyzed by Twin Ports Testing, Superior, WI. Percent Moisture analysis of the aggregate was performed by Independent Testing, Sauk Rapids, MN.

Wally Stang, Hard Drives plant operator, gathered operational data and the required oil and aggregate samples during the test.

DESCRIPTION OF TEST PROGRAM

Sampling was performed following EPA required procedures, as referenced in Code of Federal Regulations, Title 40 Part 60, Appendix A, Methods 1-5 & 9 and Method 202, Part 51, Appendix M. July, 1992. The test methods utilized are presented in Table 1.

Method #	Purpose
1	Determination of Traverse Point Locations, Verification of Absence of Cyclonic Flow Conditions
2	Determination of Duct Velocity and Volume Flow Rate
3	Determination of Duct Fixed Gas Content
4	Determination of Duct Moisture Content
5	Determination of Particulate Matter Emissions
9	Visual Determination of The Opacity of Emissions From Stationary Sources
202	Determination of Condensible PM Emissions

RESULTS

PLANT: Hard Drives, St. Cloud, MN.

SAMPLE LOCATION: Hot Mix Stack

TEST DATE: September 9, 1994

SAMPLE METHODS: EPA 1-5, 9 & 202

Sample Time: 60 min

PROCESS CONDITIONS,		RUN 1	RUN 2	RUN 3	AVG
Average Temperature (°F)	:	255	253	255	254
Average Velocity (ft/s)	:	57.8	57.2	55.8	56.9
Moisture Content (%vol.)	:	15.2	21.9	20.4	19.2
Wet Molecular Weight (g/gmole)	:	27.33	26.73	26.89	26.98
Volume Flow Rate (ACFM)	:	48,100	48,100	46,900	47,700
Volume Flow Rate (SCFM)	:	36,200	36,300	35,200	35,900
Volume Flow Rate (DSCFM)	:	30,700	28,400	28,100	29,067
SAMPLE VOLUME (SDCF)	:	50.677	44.480	43.686	46.281
PARTICULATE CONCENTRATION					
Filterable (gr/dscf):		0.0074	0.0106	0.0108	0.0096
Aqueous Condensible (gr/dscf)	:	0.0112	0.0105	0.0106	0.0108
Organic Condensible (gr/dscf)	:	0.0040	0.0057	0.0058	0.0052
Total (gr/dscf)	:	0.0225	0.0268	0.0273	**0.0255**
PARTICULATE EMISSION RATE					
Filterable (lb/hr)	:	1.95	2.59	2.61	2.38
Aqueous Condensible (lb/hr)	:	2.94	2.55	2.56	2.68
Organic Condensible (lb/hr)	:	1.05	1.39	1.40	1.28
Total (lb/hr)	:	5.94	6.52	6.57	**6.34**
Highest Six Minute Opacity (%) (concurrent with run # 3)	:			**1.5**	
% of Isokinetic Sample Rate	:	108.8	103.4	102.7	105.0

Table 2: Hot Mix Data Summary

DISCUSSION OF RESULTS

The visual emissions determination was done concurrently with run # 3. During the transport of the sample train to the recovery area at the completion of the third run, the sample line was inadvertently contaminated. Therefore, no line rinse was performed for the third run. No other incidents of note occurred.

SAMPLING PROCEDURE

Determination of Particulate Concentration and Emission Rate (Mass Flow Rate)

REF:Code of Federal Regulations, Title 40, Part 60, Appendix A, Methods 1-5, 9 July, 1991.
Code of Federal Regulations, Title 40, Part 51, Appendix M, Method 202

Apparatus:

A "goose-neck" nozzle constructed of stainless steel was connected via a "Swage-Lok" fitting to a heated glass probe liner. The probe liner was attached to a heated glass filter holder containing a glass fiber mat filter. The back half of the filter holder was connected via a length of Teflon tubing to the impinger train which consisted of a set of pre-weighed impinger/absorbers connected in series and immersed in an ice bath. The absorption train was followed in series by a carbon vane pump, a dry test meter and calibrated orifice connected to an inclined manometer. When sampling a combustion source, the pressure side of the calibrated orifice was connected to a Tedlar bag via a "T" and pinch clamp. Type K thermocouple were used to measure the following temperatures: probe heater, filter heater, impinger outlet, and dry test meter inlet and outlet.

A combination Stausscheibe (Type S) pitot tube and type K thermocouple were used to measure duct velocity head and temperature. The pitot tube was connected via flexible tubing to an inclined manometer. The thermocouple was connected to a digital potentiometer.

Sampling Procedure:

Prior to sampling, traverse points were selected based on Method 1 requirements. The locations of the traverse points are presented in the reduced field data sheets. A preliminary traverse of the duct was performed to determine duct velocity head and temperature distributions, as well as duct static pressure. Initial duct moisture and fixed gas content were assumed based on previous test data. Based on this information, a sample nozzle of appropriate inside diameter was selected, and the impinger train charged as presented in the reduced field data sheets. Traverse points were marked on the probe using a permanent marking pen. Sample time per traverse point was estimated in order that a minimum of 32 SDCF of sample would be collected.

The apparatus was assembled as completely as possible in the staging area and transported to the sample site. Potential contamination of the sample train was prevented by sealing all openings with aluminum foil. Once in the sampling area, the probe and filter heaters were brought to temperatures of 250 $\pm$ 25°F, and the apparatus was leak checked. Upon successful completion of the leak check, the initial dry test meter reading was recorded, and the probe inserted at the first traverse point.

Sampling Procedure:

The duct temperature, dry test meter temperature and duct velocity head were measured and recorded on the data sheet. The isokinetic sampling rate in terms of pressure drop across the calibrated orifice was calculated and recorded on the data sheet. The pump and timer were turned on, and the sample rate adjusted to correspond to the calculated isokinetic rate. Once the sample rate was set, the following data was recorded:

- Dry test meter outlet temperature
- Sample vacuum
- Probe heater temperature
- Filter heater temperature
- Impinger outlet temperature

After all data was recorded, the line to the Tedlar bag was opened, and the bag allowed to fill for five seconds. Thus, an integrated sample was collected for duct fixed gas content analysis.

At the end of the sample time for the first point, the probe was moved to the next point, and the measurements, calculations and recording of data was repeated. Upon completion of sampling from a port, the pump was turned off and the dry test meter reading recorded. The probe was removed from the duct, and placed in the next sample port. The previously described procedure was repeated for each sample port.

When the sample run was completed, the final dry test meter reading was recorded and the probe removed from the port. A post-test leak check was performed at a vacuum at least 5"Hg higher than the highest sample vacuum measured during the sample run. The final leak rate was recorded on the data sheet. The sample line was detached from the back of the filter holder, and rinsed into the first impinger using a known volume of distilled water. The sample train was sealed from contamination and transported to the staging area for recovery.

Sample Recovery:

Sample was recovered in two fractions: filterable and condensible. The filterable fraction consisted of the filter itself as well as acetone rinses and brushings of: the nozzle and connector to the probe liner; the probe liner; and the front half of the filter holder. The filter was recovered to either a glass or plastic labeled petri dish. Acetone rinses were recovered to a labeled, clean polyethylene bottle. The liquid level in the polyethylene bottle was marked upon completion of recovery.

Prior to recovery of the condensible fraction, the exterior of each impinger/absorber was cleaned and dried, and the net weight gain of each was determined to the nearest gram. The condensible fraction consisted of the liquid impinger catches and rinses of the impingers and all connecting glassware. Glassware rinses were recovered to a clean polyethylene bottle. The liquid level of the polyethylene bottle was marked upon completion of recovery.

At the conclusion of each day of sampling, reagent and recovery solvent blanks were collected into the same types of containers as were used for sample recovery. The blank containers were clearly labeled, and the liquid levels marked.

Analytical Procedure:

The Tedlar bag was analyzed by Orsat according to Method 3 requirements.

The filterable fraction and rinse blank were analyzed gravimetrically. Filters were placed in a 105°C oven for two to three hours, then cooled in a desiccator. Filter weighings were repeated until two consecutive weighings agreed to within 0.5 mg. Prior to analysis, the filterable rinses were checked for liquid loss, and the liquid volume of each sample bottle determined. The liquid samples from each run and blanks were transferred to individual tared weighing dishes, and the liquid allowed to evaporate at ambient temperature and pressure. The weighing dishes were then desiccated for twenty four hours and weighed until consecutive weighings agreed to within 0.5 mg.

The condensible fraction and blank were extracted with methylene chloride and analyzed gravimetrically. Prior to analysis, condensible fractions and blanks were checked for liquid loss, and the liquid volume of each sample bottle determined. Each sample was extracted three times with 25 ml of methylene chloride in a separatory funnel. After each extraction, the organic (methylene chloride) fraction was decanted. The organic fractions were placed in individual tared weighing dishes, and evaporated at ambient temperature and pressure. After evaporation, the sample weighing dishes were desiccated for 24 hours, and weighed hourly until consecutive weighings agreed to within 0.5 mg. The aqueous fractions were retained in the event that additional analysis is required.

Visual Emissions Determinations

The " Visual Determination of The Opacity of Emissions From Stationary Sources " was conducted according to CFR pt. 60 App.A, Method 9. Concurrently with run # 3. The highest six minute opacity average reported was calculated using a twenty four point rolling average.

EQUATIONS

Equation 1a - Dry Molecular Weight:

$$MW_d = 0.440(\%CO_2) + 0.320(\%O_2) + 0.280(\%N_2 + \%CO)$$

Equation 1b - Wet Molecular Weight:

$$MW_w = MW_d(1-B_{ws}) + 18.0(B_{ws})$$

Equation 2a - Meter Volume at Standard Conditions:

$$V_{m(std)} = V_m Y \frac{(T_{std})(P_{bar} + \Delta H/13.6)}{(T_m)(P_{std})}$$

Equation 2b - Volume of Water Vapor Condensed:

$$V_{wc(std)} = K_1(W_f - W_i)$$

Equation 2c - Moisture Content:

$$B_{ws} = V_{wc(std)}/(V_{wc(std)} + V_{m(std)})$$

Equation 3a - Velocity at a Traverse Point:

$$V_d = K_p C_p (T_s \Delta P / P_s MW_w)^{1/2}$$

Equation 3b - Volumetric Flow Rate (Actual Basis):

$$Q = V_{d(avg)} A_d \, 60$$

Equation 3c - Volumetric Flow Rate (Standard Basis):

$$Q_{std} = Q \frac{(T_{std})(P_s)}{(T_s)(P_{std})}$$

Equation 3d - Volumetric Flow Rate (Standard Dry Basis):

$$Q_{std(dry)} = Q_{std}(1-B_{ws})$$

Equation 4a - Isokinetic Sampling Nozzle Inside Diameter:

$$D_n = \left\{ \frac{(0.0358) Q_m P_m}{T_m C_p (1-B_{ws})} \left(\frac{T_s MW_w}{P_s \Delta P} \right)^{0.5} \right\}^{0.5}$$

Equation 4b - Isokinetic Sampling "X" Factor:

$$X = 846.72 \times D_n^4 \times \Delta H@_i \times C_p^2 \times (1-B_{ws})^2 \times \frac{(MW_d \times P_s)}{(MW_w \times P_m)}$$

Equation 4c - Orifice Pressure Drop at Isokinetic Sampling Rate:

$$\Delta H = X \times \Delta P \times \frac{(T_m)}{(T_s)}$$

Equation 4d - Sample Percentage of Isokinetic:

$$\%ISO = \frac{(T_{savg} V_{mstd} P_{std} 100)}{(T_{std} V_{davg} \theta A_n P_s 60(1-B_{ws}))}$$

Equation 4e - Particulate Concentration:

$$Co = \frac{M \times 0.0154}{V_{mstd}}$$

Equation 4f - Particulate Emission Rate (Mass Flow Rate):

$$ER = Co \times 0.00858 \times Q_{std(dry)}$$

SYMBOL IDENTIFICATION

A_n	=	Nozzle area (ft^2)
A_d	=	Area of duct (ft^2)
B_{ws}	=	Water vapor in gas stream, proportional by volume
Co	=	Total suspended particulate matter concentration (grains/DSCF)
C_p	=	Pitot tube calibration factor (unitless)
D_n	=	Inside diameter of sample nozzle (inches)
ER	=	Total suspended particulate matter emission rate (lb/hr)
K_1	=	Constant (0.04715 ft^3/g)
K_p	=	Constant (85.49)
M	=	Net mass of total suspended particulate matter collected (mg)
MW_d	=	Duct gas dry molecular weight (lb/lb-mole)
MW_w	=	Duct gas wet molecular weight (lb/lb-mole)
P_{bar}	=	Barometric pressure ("Hg)
P_m	=	Meter pressure (assumed to be 30"Hg)
P_s	=	Absolute stack pressure ("Hg)
P_{std}	=	Standard pressure (29.92"Hg)
Q	=	Duct volumetric flow rate (actual cfm)
Q_m	=	Assumed sampling rate (cfm)
Q_{std}	=	Duct volumetric flow rate (scfm)
$Q_{std(dry)}$	=	Duct volumetric flow rate (dscfm)
T_m	=	Absolute temperature at meter (°R)
T_s	=	Absolute temperature of duct gas (°R)
T_{std}	=	Standard temperature (528°R)
V_d	=	Duct velocity at a traverse point (ft/s)

Symbol Identification (Continued)

V_m	=	Dry test meter volume (cf)
$V_{m(std)}$	=	Dry test meter volume at standard conditions (scf)
$V_{wc(std)}$	=	Volume of water vapor condensed at standard conditions (scf)
W_f	=	Final weight of impinger/absorber train (g)
W_i	=	Initial weight of impinger/absorber train (g)
X	=	Isokinetic orifice pressure drop sampling coefficient
Y	=	Dry test meter calibration factor (unitless)
$\%CO_2$	=	Duct gas carbon dioxide content (%volume)
%CO	=	Duct gas carbon monoxide content (%volume)
%ISO	=	Sample percentage of isokinetic (must be $100 \pm 10\%$)
$\%N_2$	=	Duct gas nitrogen content (%volume)
$\%O_2$	=	Duct gas oxygen content (%volume)
%R	=	TSP percent removal
a	=	Flow angle (degrees)
θ	=	Total sample time (minutes)
ΔH	=	Pressure drop across orifice ("H_2O)
$\Delta H@i$	=	Orifice calibration coefficient ("H_2O)
ΔP	=	Pressure drop across pitot tube ("H_2O)

Faxed 7/19/94

BRAUN INTOTEC SEP 21 1994

ASPHALT PLANT OPERATING CONDITIONS DURING STACK TESTING

Test Date(s) _____

Plant Mfr. & Model C.M.I Type(circle one): (Drum Mix) Conventional

This plant is (circle one): portable stationary Other: _____

Pollution Control Equipment(circle one): (Baghouse) Venturi Scrubber Wet Scrubber Cyclone Multiclone

If wet scrubbing: ____ %scrubber water recycled

List Model: H & B

Normal pressure drop across control equipment is 4-5 inches water

Was control equipment operating normally during test? Yes

Date & procedure of last maintenance/cleaning of control equipment: 9-8-94

Fuel:

Itemize all fuels and materials added to the combustion process during the test period. List fuel type used during testing (if oil, specify type) Waste oil. If other units of measure are used, specify and calculate appropriate heat input.

Test No.____	Fuel Input (Gal/hr)	Btu/gal(As Received)	Heat Input (Btu/hr)
Run 1	Aprox. 340		
Run 2	Aprox. 340		
Run 3	Aprox. 340		

Is the above fuel substantially the highest sulfur containing fuel normally burned? Yes

Production specific fuel usage: (circle one) measured or calculated: ____ cubic foot/ton hot mix 1.5 gal/ton hot mix

No. of burners: 1 Burner(s) rating: _____ MMBTU/HR=100% setting

Test No.____	% Recycle %R=Recycle ÷ (Aggregate + Recycle+Asphalt)	Estimated % moisture of aggregate (or aggregate & recycle)
Run 1	50	5.7
Run 2	50	5.7
Run 3	50	5.7

Other Control Equipment Parameters	Design	During Testing
Cleaning Cycles	14 Sec.	14 Sec.
Air to Cloth Ratios	4.8-1	4.8-1
No. of spray bars including delivery pressure		

Describe the location of the thermocouples reading exiting dryer temperature: in Exhaust Stack Stack Exhaust temps.

Plant Operator's Certification: I certify that the information submitted herein is accurate and correct and that no information requested was withheld from the Division Manager.

By: Wally Stang, Phone: (612) 252-7768

Note: All information required must be completed and submitted as part of the performance test. Failure to submit the required information will result in an incomplete performance test report.

Time in 15 min. intervals	Burner Setting %	Aggregate Material TPH	Recycle Material TPH	Asphalt Material TPH	Total Material TPH (Aggregate +Recycle+Asphalt)	Temperature of Gases Exiting Dryer deg F	Dust Collector Pressure Drop inches water	Scrubber Water Flow Rate GPM	Water Supply Pressure psi	Other (list)	Other (list)
11:30	30 90	100	100	6.8	207	250	5.1				
11:45	31 90	100	100	6.8	207	251	5.1				
12:00	30	100	102	6.8	209	251	5.1				
12:15	31	101	102	6.8	210	251	5.1				
12:30	31	101	102	6.8	210	254	5.1				
1:30	29	102	100	6.8	209	250	5.1				
1:45	30	100	100	6.8	207	250	5.1				
2:00	30	100	100	6.8	207	252	5.1				
2:15	30	99	101	6.8	207	251	5.1				
2:30	31	100	101	6.8	209	250	5.1				
3:30	30	99	101	6.8	207	249	5.0				
3:45	30	100	100	6.8	207	251	5.1				
4:00	29	101	99	6.8	207	251	5.1				
4.15	29	102	100	6.8	209	250	5.1				
4:30	28	100	99	6.8	206	251	5.1				
4:45	29	100	99	6.8	206	252	5.1				
5:00	28	100	100	6.8	207	251	5.1				

Plant Operator's Certification: I certify that the information submitted herein is accurate and correct and that no information requested was withheld from the Division Manager.

By: Wally Stay, Position PLANT OPERATOR. Phone: (612) 252 - 2419

Reduced Particulate Field Data

Plant:	Hard Drives	Bws(assumed):	0.06	Meter Box #:	80664
Sample Loc:	Stack	MWs(assumed):	28.90	dH@i:	2.001
Run #:	1	MWd(assumed):	29.6	Gamma:	0.998
Date:	9/9/94	Pstatic ("H2O):	-0.25	Pitot #:	5-1
Pbar ("Hg):	30.50	Probe Mat:	Glass	Cp:	0.838
Ps ("Hg):	30.48	Nozzle Mat:	Glass	X-Factor:	4.273
Sample time/pt:	2.5	Dn (in.):	0.250	# of Ports:	4

PORT:		1	Duct Data			Meter Data		Heater Data		Impinge	Meter	Theo.	Quick
Point	Time		Td	dP	Tmi	Tmo	Vac.	Probe	Filter	Outlet	Volume	dH	
#	hr	mi	(F)	("H2O)	(F)	(F)	("Hg)	(F)	(F)	(F)	(CF)	("H2O	%iso
6	11	38	253	1.60	80	79	9.0	256	248	60	373.128	5.18	
5	11	40.5	251	1.40	81	79	9.0	257	267	47		4.55	
4	11	43	250	1.10	83	80	8.0	256	262	48		3.59	
3	11	45.5	250	1.45	84	80	9.0	254	250	54		4.75	
2	11	48	249	1.30	87	81	9.0	259	255	60		4.29	
1	11	50.5	249	1.29	89	82	9.0	258	251	68		4.27	
	11	53									389.572		
Run Time:		15	250	1.36	84	80	8.8	257	256	56	16.444	4.44	98.8

PORT:		2	Duct Data			Meter Data		Heater Data		Impinge	Meter	Theo.	Quick
Point	Time		Td	dP	Tmi	Tmo	Vac.	Probe	Filter	Outlet	Volume	dH	
#	hr	mi	(F)	("H2O)	(F)	(F)	("Hg)	(F)	(F)	(F)	(CF)	("H2O	%iso
6	11	55	254	1.40	87	83	9.0	255	256	68	389.572	4.58	
5	11	57.5	255	1.10	90	83	8.0	254	256	66		3.62	
4	12	0	255	0.60	92	84	5.0	258	250	65		1.98	
3	12	2.5	256	0.47	92	5	4.0	253	254	64		1.55	
2	12	5	256	0.40	92	85	4.0	257	249	62		1.32	
1	12	7.5	254	0.36	92	85	3.0	253	250	58		1.19	
	12	10									401.357		
Run Time:		15	255	0.72	91	71	5.5	255	253	64	11.785	2.37	99.5

PORT:		3	Duct Data			Meter Data		Heater Data		Impinge	Meter	Theo.	Quick
Point	Time		Td	dP	Tmi	Tmo	Vac.	Probe	Filter	Outlet	Volume	dH	
#	hr	mi	(F)	("H2O)	(F)	(F)	("Hg)	(F)	(F)	(F)	(CF)	("H2O	%iso
6	12	13	257	0.88	89	86	6.0	254	252	59	401.357	2.88	
5	12	15.5	260	0.66	93	87	5.0	258	257	53		2.17	
4	12	18	260	0.44	94	88	4.0	255	252	53		1.45	
3	12	20.5	258	0.45	95	88	4.0	259	247	54		1.49	
2	12	23	257	0.48	96	89	4.0	256	242	54		1.59	
1	12	25.5	255	0.40	95	88	4.0	257	261	54		1.33	
	12	28									412.077		
Run Time:		15	258	0.55	94	88	4.5	257	252	55	10.720	1.82	100.7

PORT:		4	Duct Data			Meter Data		Heater Data		Impinge	Meter	Theo.	Quick
Point	Time		Td	dP	Tmi	Tmo	Vac.	Probe	Filter	Outlet	Volume	dH	
#	hr	mi	(F)	("H2O)	(F)	(F)	("Hg)	(F)	(F)	(F)	(CF)	("H2O	%iso
6	12	30	254	0.92	92	89	6.0	254	256	55	412.077	3.04	
5	12	32.5	257	0.92	94	88	6.0	257	251	48		3.04	
4	12	35	261	0.84	93	88	6.0	254	252	46		2.75	
3	12	37.5	263	0.78	94	88	6.0	255	248	47		2.55	
2	12	40	259	0.64	95	88	5.0	254	250	46		2.11	
1	12	42.5	254	0.46	94	88	4.0	253	250	47		1.53	
	12	45									424.722		
Run Time:		15	258	0.76	94	88	5.5	255	251	48	12.645	2.50	100.8

Post Test Leak Rate: 0.016 CFM @ 7 "Hg

Summary	60	255		91	82	6	256	253	56	51.594	2.78	ERR

PARTICULATE RESULTS

Plant:	Hard Drives	Tstd:	68	MWw:	27.33
Sample Loc:	Stack	Pstd:	29.92	An:	0.0003 sq. ft.
Date:	9/9/94	Vmstd:	50.677	%ISO:	108.8
Run #:	1				

IMPINGER ANALYSIS

TYPE	CONTENTS	Wf (g)	Wi (g)	Net (g)
Greenberg Smith	100 ml H2O	828.0	570.0	258.0
Greenberg Smith	100 ml H2O	646.0	600.0	46.0
Greenberg Smith	Empty	458.0	451.0	7.0
Greenberg Smith	Silica Gel	724.0	709.0	15.0
	Line Rinse			-134.0
			TOTAL	192

FIXED GAS ANALYSIS

%CO2:	2.5
%O2:	14.9
%CO:	0.0
%N2	82.6
Bws:	0.152

Concentration and Emission Rate Data

	Final (grams)	Tare (grams)	Net (grams)
Filterable Fraction:			
Filter:	0.3388	0.3253	0.0135
Glassware Rinse:	80.5654	80.5544	0.0110
Less Acetone Blank:			-0.0002
Total:			0.0243
Condensable Fraction:			
Aqueous:	79.1642	79.1273	0.0369
Less Water Blank:			-0.0002
Aqueous Total:			0.0367
Organic:	79.5213	79.5082	0.0131
Less MeCl2 Blank:			0.0000
Organic Total:			0.0131
TOTAL			0.0741

Particulate Concentration, (gr/DSCF)	
Filterable:	0.0074
Aqueous Condensable:	0.0112
Organic Condensable:	0.0040
Total:	0.0225

Particulate Emission Rate, (lb/hr)	
Filterable:	1.95
Aqueous Condensable:	2.94
Organic Condensable:	1.05
Total:	5.94

VELOCITY TRAVERSE AND VOLUME FLOW RATE DATA

Plant:	Hard Drives	Time:	11:38 - 12:45
Sample Location:	Stack		
Date:	9/9/94	Run #:	1

Duct Diameter (in.):	58.0	Ps ("Hg):	30.48
Rectangular Duct:	33.5	Bws:	0.152
Area (sq.ft.):	13.5	MWw:	27.33
		Tstd (F):	68
		Pstd ("Hg):	29.92
		Cp:	0.84

		Port: 1			Port: 2			Port: 3			Port: 4		
Point #	In. From Edge	dP ("H2O)	Ts (F)	Vd (ft/s)	dP ("H2O)	Ts (F)	Vd (ft/s)	dP ("H2O)	Ts (F)	Vd (ft/s)	dP ("H2O)	Ts (F)	Vd (ft/s)
6	4.8	1.60	253	83.8	1.40	254	78.5	0.88	257	62.3	0.92	254	63.6
5	14.5	1.40	251	78.3	1.10	255	69.6	0.66	260	54.1	0.92	257	63.7
4	24.2	1.10	250	69.4	0.60	255	51.4	0.44	260	44.2	0.84	261	61.1
3	33.8	1.45	250	79.6	0.47	256	45.5	0.45	258	44.6	0.78	263	58.9
2	43.5	1.30	249	75.4	0.40	256	42.0	0.48	257	46.0	0.64	259	53.2
1	53.2	1.29	249	75.1	0.36	254	39.8	0.40	255	42.0	0.46	254	45.0

RESULTS:

Average Duct Velocity = 59.5 at 255 deg. F and 30.48 "Hg

Q	=	48.1 x1000	ACFM
Qstd	=	36.2 x1000	SCFM
Qstd(dry)	=	30.7 x1000	DSCFM

Reduced Particulate Field Data

Plant:	Hard Drives	Bws(assumed):	0.20	Meter Box #:	80664
Sample Loc:	Stack	MWs(assumed):	28.90	dH@i:	2.001
Run #:	2	MWd(assumed):	29.6	Gamma:	0.998
Date:	9/9/94	Pstatic ("H2O):	-0.25	Pitot #:	5-1
Pbar ("Hg):	30.50	Probe Mat:	Glass	Cp:	0.838
Ps ("Hg):	30.48	Nozzle Mat:	Glass	X-Factor:	3.279
Sample time/pt:	2.5	Dn (in.):	0.250	# of Ports:	4

PORT:		1	Duct Data			Meter Data		Heater Data		Impinge	Meter	Theo.	Quick
Point	Time		Td	dP	Tmi	Tmo	Vac.	Probe	Filter	Outlet	Volume	dH	
#	hr	mi	(F)	("H2O)	(F)	(F)	("Hg)	(F)	(F)	(F)	(CF)	("H2O	%iso
6	13	37	243	1.60	80	86	7.0	257	255	63	425.454	4.03	
5	13	39.5	251	1.50	86	86	7.0	256	253	51		3.78	
4	13	42	252	0.86	87	86	5.0	257	254	53		2.17	
3	13	44.5	252	1.35	89	87	6.0	254	235	57		3.41	
2	13	47	254	1.30	91	87	6.0	257	249	59		3.29	
1	13	49.5	249	1.10	93	87	6.0	254	266	62		2.81	
	13	52									439.828		
Run Time:		15	250	1.29	88	87	6.2	256	252	58	14.374	3.25	100.9

PORT:		2	Duct Data			Meter Data		Heater Data		Impinge	Meter	Theo.	Quick
Point	Time		Td	dP	Tmi	Tmo	Vac.	Probe	Filter	Outlet	Volume	dH	
#	hr	mi	(F)	("H2O)	(F)	(F)	("Hg)	(F)	(F)	(F)	(CF)	("H2O	%iso
6	13	56	251	1.25	89	86	6.0	237	246	66	439.828	3.16	
5	13	58.5	254	0.98	91	86	5.0	246	256	58		2.48	
4	14	1	255	0.49	92	87	4.0	240	245	61		1.24	
3	14	3.5	256	0.42	92	88	3.0	235	248	60		1.06	
2	14	6	257	0.39	93	88	3.0	257	252	60		0.99	
1	14	8.5	254	0.37	94	88	3.0	256	259	59		0.94	
	14	11									449.823		
Run Time:		15	255	0.65	92	87	4.0	245	251	61	9.995	1.65	100.9

PORT:		3	Duct Data			Meter Data		Heater Data		Impinge	Meter	Theo.	Quick
Point	Time		Td	dP	Tmi	Tmo	Vac.	Probe	Filter	Outlet	Volume	dH	
#	hr	mi	(F)	("H2O)	(F)	(F)	("Hg)	(F)	(F)	(F)	(CF)	("H2O	%iso
6	14	13	257	0.92	90	87	5.0	253	248	66	449.823	2.31	
5	14	15.5	257	0.64	92	87	4.0	256	258	61		1.62	
4	14	18	256	0.56	92	87	4.0	256	251	58		1.42	
3	14	20.5	256	0.54	92	87	4.0	254	230	56		1.37	
2	14	23	254	0.50	92	87	4.0	257	260	56		1.27	
1	14	25.5	253	0.41	92	88	3.0	253	260	56		1.04	
	14	28									459.625		
Run Time:		15	256	0.60	92	87	4.0	255	251	59	9.802	1.50	101.1

PORT:		4	Duct Data			Meter Data		Heater Data		Impinge	Meter	Theo.	Quick
Point	Time		Td	dP	Tmi	Tmo	Vac.	Probe	Filter	Outlet	Volume	dH	
#	hr	mi	(F)	("H2O)	(F)	(F)	("Hg)	(F)	(F)	(F)	(CF)	("H2O	%iso
6	14	30	252	0.85	91	87	5.0	252	265	61	459.625	2.16	
5	14	32.5	253	0.94	93	88	5.0	255	255	57		2.39	
4	14	35	253	0.92	94	88	5.0	254	254	56		2.34	
3	14	37.5	254	0.86	94	88	5.0	255	255	57		2.19	
2	14	40	253	0.60	95	88	4.0	256	256	58		1.53	
1	14	42.5	252	0.49	95	88	4.0	253	253	57		1.25	
	14	45									470.868		
Run Time:		15	253	0.78	94	88	4.7	254	256	58	11.243	1.98	100.8
Post Test Leak Rate:				0.008	CFM @	13	"Hg						
Summary		60	253	0.83	91	87	5	253	253	59	45.414	2.09	100.94

PARTICULATE RESULTS

Plant:	Hard Drives	Tstd:	68	MWw:	26.73
Sample Loc:	Stack	Pstd:	29.92	An:	0.0003 sq. ft.
Date:	9/9/94	Vmstd:	44.480	%ISO:	103.4
Run #:	2				

IMPINGER ANALYSIS

TYPE	CONTENTS	Wf (g)	Wi (g)	Net (g)
Greenberg Smith	100 ml H2O	874.0	548.0	326.0
Greenberg Smith	100 ml H2O	568.0	549.0	19.0
Greenberg Smith	Empty	460.0	458.0	2.0
Greenberg Smith	Silica Gel	735.0	724.0	11.0
	Line Rinse			-94.0
			TOTAL	264

FIXED GAS ANALYSIS

%CO2:	3.2
%O2:	16.5
%C0:	0.0
%N2	80.3
Bws:	0.219

Concentration and Emission Rate Data

	Final (grams)	Tare (grams)	Net (grams)
Filterable Fraction:			
Filter:	0.3363	0.3245	0.0118
Glassware Rinse:	68.0364	68.0173	0.0191
Less Acetone Blank:			-0.0002
Total:			0.0307
Condensable Fraction:			
Aqueous:	78.5819	78.5515	0.0304
Less Water Blank:			-0.0002
Aqueous Total:			0.0302
Organic:	77.6138	77.5973	0.0165
Less MeCl2 Blank:			0.0000
Organic Total:			0.0165
TOTAL			0.0774

Particulate Concentration, (gr/DSCF)	
Filterable:	0.0106
Aqueous Condensable:	0.0105
Organic Condensable:	0.0057
Total:	0.0268

Particulate Emission Rate, (lb/hr)	
Filterable:	2.59
Aqueous Condensable:	2.55
Organic Condensable:	1.39
Total:	6.52

VELOCITY TRAVERSE AND VOLUME FLOW RATE DATA

Plant: Hard Drives
Sample Location: Stack
Date: 9/9/94

Time: 13:37 - 14:45
Run #: 2

Duct Diameter (in.): 58.0
Rectangular Duct: 33.5
Area (sq.ft.): 13.5

Ps ("Hg): 30.48
Bws: 0.219
MWw: 26.73
Tstd (F): 68
Pstd ("Hg): 29.92
Cp: 0.84

		Port: 1			Port: 2			Port: 3			Port: 4		
Point #	In. From Edge	dP ("H2O)	Ts (F)	Vd (ft/s)	dP ("H2O)	Ts (F)	Vd (ft/s)	dP ("H2O)	Ts (F)	Vd (ft/s)	dP ("H2O)	Ts (F)	Vd (ft/s)
6	4.8	1.60	243	84.2	1.25	251	74.8	0.92	257	64.5	0.85	252	61.7
5	14.5	1.50	251	82.0	0.98	254	66.4	0.64	257	53.8	0.94	253	65.0
4	24.2	0.86	252	62.1	0.49	255	47.0	0.56	256	50.3	0.92	253	64.3
3	33.8	1.35	252	77.8	0.42	256	43.5	0.54	256	49.4	0.86	254	62.2
2	43.5	1.30	254	76.5	0.39	257	42.0	0.50	254	47.4	0.60	253	51.9
1	53.2	1.10	249	70.1	0.37	254	40.8	0.41	253	42.9	0.49	252	46.9

RESULTS:

Average Duct Velocity = 59.5 at 253 deg. F and 30.48 "Hg

Q = 48.1 x1000 ACFM
Qstd = 36.3 x1000 SCFM
Qstd(dry) = 28.4 x1000 DSCFM

Reduced Particulate Field Data

Plant:	Hard Drives	Bws(assumed):	0.20	Meter Box #:	80664
Sample Loc:	Stack	MWs(assumed):	28.90	dH@i:	2.001
Run #:	3	MWd(assumed):	29.6	Gamma:	0.998
Date:	9/9/94	Pstatic ("H2O):	-0.25	Pitot #:	5-1
Pbar ("Hg):	30.50	Probe Mat:	Glass	Cp:	0.838
Ps ("Hg):	30.48	Nozzle Mat:	Glass	X-Factor:	3.279
Sample time/pt:	2.5	Dn (in.):	0.250	# of Ports:	4

PORT:		1	Duct Data			Meter Data		Heater Data		Impinge	Meter	Theo.	Quick
Point	Time		Td	dP	Tmi	Tmo	Vac.	Probe	Filter	Outlet	Volume	dH	
#	hr	mi	(F)	("H2O)	(F)	(F)	("Hg)	(F)	(F)	(F)	(CF)	("H2O	%iso
6	15	54	252	1.20	87	87	5.0	244	248	66	472.610	3.02	
5	15	56.5	257	1.10	87	87	5.0	255	251	64		2.75	
4	15	59	262	0.98	88	88	4.0	255	261	62		2.44	
3	16	1.5	262	1.40	88	87	6.0	255	259	64		3.48	
2	16	4	261	1.20	89	87	5.0	253	249	65		3.00	
1	16	6.5	258	1.10	89	87	5.0	249	246	66		2.76	
	16	9									486.238		
Run Time:		15	259	1.16	88	87	5.0	252	252	65	13.628	2.91	100.8

PORT:		2	Duct Data			Meter Data		Heater Data		Impinge	Meter	Theo.	Quick
Point	Time		Td	dP	Tmi	Tmo	Vac.	Probe	Filter	Outlet	Volume	dH	
#	hr	mi	(F)	("H2O)	(F)	(F)	("Hg)	(F)	(F)	(F)	(CF)	("H2O	%iso
6	16	11	260	1.05	89	87	5.0	233	252	67	486.238	2.63	
5	16	13.5	260	0.90	90	88	5.0	253	259	67		2.25	
4	16	16	261	0.62	90	89	4.0	256	255	67		1.55	
3	16	18.5	260	0.54	90	88	3.0	254	251	67		1.35	
2	16	21	257	0.38	90	88	3.0	258	253	67		0.96	
1	16	23.5	256	0.36	90	88	3.0	255	249	66		0.91	
	16	26									496.389		
Run Time:		15	259	0.64	90	88	3.8	252	253	67	10.151	1.61	102.6

PORT:		3	Duct Data			Meter Data		Heater Data		Impinge	Meter	Theo.	Quick
Point	Time		Td	dP	Tmi	Tmo	Vac.	Probe	Filter	Outlet	Volume	dH	
#	hr	mi	(F)	("H2O)	(F)	(F)	("Hg)	(F)	(F)	(F)	(CF)	("H2O	%iso
6	16	28	255	0.78	89	87	4.0	254	258	68	496.389	1.96	
5	16	30.5	256	0.62	89	88	4.0	259	257	66		1.56	
4	16	33	256	0.52	90	88	4.0	251	250	66		1.31	
3	16	35.5	257	0.50	90	89	3.0	255	244	67		1.26	
2	16	38	258	0.48	91	89	3.0	257	256	67		1.21	
1	16	40.5	256	0.38	91	89	3.0	257	252	67		0.96	
	16	43									505.900		
Run Time:		15	256	0.55	90	88	3.5	256	253	67	9.511	1.38	102.5

PORT:		4	Duct Data			Meter Data		Heater Data		Impinge	Meter	Theo.	Quick
Point	Time		Td	dP	Tmi	Tmo	Vac.	Probe	Filter	Outlet	Volume	dH	
#	hr	mi	(F)	("H2O)	(F)	(F)	("Hg)	(F)	(F)	(F)	(CF)	("H2O	%iso
6	16	45	251	0.91	89	88	5.0	256	257	58	505.900	2.30	
5	16	47.5	249	0.85	89	88	5.0	257	254	67		2.16	
4	16	50	246	0.82	91	88	5.0	256	249	67		2.10	
3	16	52.5	246	0.84	92	89	5.0	257	248	67		2.15	
2	16	55	245	0.60	93	90	4.0	257	245	68		1.54	
1	16	57.5	241	0.49	93	90	3.0	257	270	68		1.27	
	17	0									517.110		
Run Time:		15	246	0.75	91	89	4.5	257	254	66	11.210	1.92	102.1
Post Test Leak Rate:				0.05 CFM @		6 "Hg							
Summary		60	255		90	88	4	254	253	66	44.500	1.95	ERR

PARTICULATE RESULTS

Plant:	Hard Drives	Tstd:	68	MWw:	26.89
Sample Loc:	Stack	Pstd:	29.92	An:	0.0003 sq. ft.
Date:	9/9/94	Vmstd:	43.686	%ISO:	102.7
Run #:	3				

IMPINGER ANALYSIS

TYPE	CONTENTS	Wf (g)	Wi (g)	Net (g)
Greenberg Smith	100 ml H2O	770.0	567.0	203.0
Greenberg Smith	100 ml H2O	578.0	556.0	22.0
Greenberg Smith	Empty	466.0	463.0	3.0
Greenberg Smith	Silica Gel	675.0	666.0	9.0
			TOTAL	237

FIXED GAS ANALYSIS

%CO2:	3.2
%O2:	16.4
%C0:	0.0
%N2	80.4
Bws:	0.204

Concentration and Emission Rate Data

	Final (grams)	Tare (grams)	Net (grams)
Filterable Fraction:			
Filter:	0.3363	0.3245	0.0118
Glassware Rinse:	68.0364	68.0173	0.0191
Less Acetone Blank:			-0.0002
Total:			0.0307
Condensable Fraction:			
Aqueous:	78.5819	78.5515	0.0304
Less Water Blank:			-0.0002
Aqueous Total:			0.0302
Organic:	77.6138	77.5973	0.0165
Less MeCl2 Blank:			0.0000
Organic Total:			0.0165
TOTAL			0.0774

Particulate Concentration, (gr/DSCF)	
Filterable:	0.0108
Aqueous Condensable:	0.0106
Organic Condensable:	0.0058
Total:	0.0273

Particulate Emission Rate, (lb/hr)	
Filterable:	2.61
Aqueous Condensable:	2.56
Organic Condensable:	1.40
Total:	6.57

VELOCITY TRAVERSE AND VOLUME FLOW RATE DATA

Plant:	Hard Drives	Time: 15:54 - 17:00	
Sample Location:	Stack		
Date:	9/9/94	Run #:	3

Duct Diameter (in.):	58.0	Ps ("Hg):	30.48
Rectangular Duct:	33.5	Bws:	0.204
Area (sq.ft.):	13.5	MWw:	26.89
		Tstd (F):	68
		Pstd ("Hg):	29.92
		Cp:	0.84

		Port: 1			Port: 2			Port: 3			Port: 4		
Point #	In. From Edge	dP ("H2O)	Ts (F)	Vd (ft/s)	dP ("H2O)	Ts (F)	Vd (ft/s)	dP ("H2O)	Ts (F)	Vd (ft/s)	dP ("H2O)	Ts (F)	Vd (ft/s)
6	4.8	1.20	252	73.1	1.05	260	68.8	0.78	255	59.1	0.91	251	63.6
5	14.5	1.10	257	70.3	0.90	260	63.7	0.62	256	52.7	0.85	249	61.4
4	24.2	0.98	262	66.6	0.62	261	52.9	0.52	256	48.3	0.82	246	60.2
3	33.8	1.40	262	79.6	0.54	260	49.3	0.50	257	47.4	0.84	246	60.9
2	43.5	1.20	261	73.6	0.38	257	41.3	0.48	258	46.5	0.60	245	51.5
1	53.2	1.10	258	70.3	0.36	256	40.2	0.38	256	41.3	0.49	241	46.4

RESULTS:

Average Duct Velocity = 57.9 at 255 deg. F and 30.48 "Hg

Q	=	46.9 x1000	ACFM
Qstd	=	35.2 x1000	SCFM
Qstd(dry)	=	28.1 x1000	DSCFM

BRAUN INTERTEC ENVIRONMENTAL INC.
PARTICULATE FIELD DATA
PROJECT NUMBER: CMXX-94-0518

Plant:	Hendrix	Bws (assumed):	0.06	Meter Box#:	80664
Sample Location:	stack	MWwet(assumed):	28.90/29.60	dH@i:	2.001
Run #:	1	Pstatic("H2O):	-0.25	Gamma:	0.996
Date:	9/9/94	Ps ("Hg):	30.48	Pitot #:	S-1
Ambient T (F):	80	Probe Mat.:	SS	Cp:	0.838
Pbar ("Hg):	30.50	Probe Heater Setting:	250	Nozzle Mat.:	SS
		Filter Heater Setting:	250	Dn:	B-1 .250

Pre-test leak rate: 0.008 CFM at 9 "Hg Post-test leak rate: 0.018 CFM at 15 "Hg X=4.273

2.5 min/pt

		DUCT DATA		METER DATA				HEATER BOX DATA		IMPINGER	DRY TEST
		TEMP	dP	TEMPi	TEMPo	dH	VAC	PROBE	FILTER	OUTLET	METER VOL
POINT	TIME	(F)	("H2O)	(F)	(F)	("H2O)	("Hg)	(F)	(F)	(F)	(CF)
6	11:38	253	1.60	80	79	5.18	9	256	248	60	373.128
5		251	1.40	81	79	4.55	9	257	267	47	
4		250	1.10	83	80	3.59	8	256	262	48	
3		250	1.45	84	80	4.79	9	254	250	54	
2		249	1.30	87	81	4.29	9	259	255	60	
1	11:53	249	1.25	89	82	4.14	9	258	251	68	389.572
	↳										
6	11:55	254	1.40	87	83	4.58	9	255	256	68	389.572
5		255	1.10	90	83	3.62	8	254	256	66	
4		255	0.66	92	84	2.18	5	258	250	65	
3		256	0.47	92	85	1.55	4	253	254	64	
2		256	0.40	92	85	1.32	4	257	249	62	
1	12:10	254	0.36	92	85	1.19	3	253	256	58	401.357
	↳										
6	12:13	257	0.88	89	86	2.88	6	254	252	59	401.357
5		260	0.66	93	87	2.17	5	258	257	53	
4		260	0.44	94	88	1.45	4	255	252	53	
3		258	0.45	95	88	1.49	4	259	247	54	
2		257	0.48	96	89	1.59	4	256	242	54	
1	12:28	255	0.40	95	88	1.33	4	257	261	54	412.077
	↳										
6	12:30	254	0.92	92	89	3.04	6	254	256	55	412.077
5		257	0.92	94	88	3.04	6	257	251	48	
4		261	0.84	93	88	2.75	6	254	252	46	
3		263	0.78	94	88	2.55	6	255	248	47	
2		259	0.64	95	88	2.11	5	254	250	46	
1		254	0.46	94	88	1.53	4	253	250	47	
	12:45										424.722

Comments:

Test Observers:

BRAUN INTERTEC ENVIRONMENTAL INC.
PARTICULATE FIELD DATA
PROJECT NUMBER: CMXX-94-0518

PLANT: Hard drives DATE: 9/9/94

SAMPLE LOCATION: stack RUN#: 1

RUN TIME: 60 min

Absorber Type	Contents	Final Weight (grams)	Tare Weight (grams)	Net H2O (grams)
GS	100 mL DI H_2O	628	570	
MGS	100 mL DI H_2O	646	600	
GS	empty	458	451.	
GS.	Silica gell	724	709	
	line Rinse			- ~~134~~ 14
				- 134
			TOTAL	

11K 0.3253.

ORSAT ANALYSIS	CO2 (%vol.)	O2 (%vol.)	N2 (%vol.)
Run 1:	2.5	14.9	
Run 2:			
Run 3:			
Average:			
Air Audit:			

At 255
0.76
3.279.
X_2

BRAUN INTERTEC ENVIRONMENTAL INC.
PARTICULATE FIELD DATA
PROJECT NUMBER: CMXX-94-0518

Plant:	Hardrives	Bws (assumed):	~~0.06~~ 0.20	Meter Box#:	80664
Sample Location:	Stack	MWwet(assumed):	~~28.90~~ 28.11	dH@i:	2.001
Run #:	2	Pstatic("H2O):	-0.25	Gamma:	0.998
Date:	9/1/94	Ps ("Hg):	30.48	Pitot #:	S-1
Ambient T (F):	80	Probe Mat.:	SS	Cp:	0.838
Pbar ("Hg):	30.50	Probe Heater Setting:	250	Nozzle Mat.:	SS.
		Filter Heater Setting:	250	Dn:	0.250 - 8-1

Pre-test leak rate: 0.012 CFM at 11 "Hg Post-test leak rate: 0.008 CFM at 13 "Hg X = ~~4.273~~ 3.279

	POINT	TIME	DUCT DATA TEMP (F)	DUCT DATA dP ("H2O)	METER DATA TEMPi (F)	METER DATA TEMPo (F)	METER DATA dH ("H2O)	METER DATA VAC ("Hg)	HEATER BOX DATA PROBE (F)	HEATER BOX DATA FILTER (F)	IMPINGER OUTLET (F)	DRY TEST METER VOL. (CF)
vest	1 6	13:37	243	1.60	86	86	4.07	7	257	255	63	425.454
	5		251	1.50	86	86	3.78	7	256	253	51	
	4		252	0.86	87	86	2.17	5	257	254	53	
	3		252	1.35	89	87	3.41	6	254	235	57	
	2		254	1.30	91	87	3.29	6	257	249	59	
	1	13:52	249	1.10	93	87	3.81	6	254	266	62	
		↳										434.828
2	6	13:56	251	1.25	89	86	3.16	6	237	246	66	
	5		254	0.98	91	86	2.48	5	246	256	58	
	4		255	0.49	92	87	1.24	4	240	245	61	
	3		256	0.42	92	88	1.06	3	235	248	60	
	2		257	0.39	93	88	0.99	3	257	252	60	
	1		254	0.37	94	88	0.94	3	256	259	59	
		14:11										449.833
3	6	14:13	257	0.92	90	87	2.31	5	253	248	66	
	5		257	0.64	92	87	1.62	4	256	258	61	
	4		256	0.56	92	87	1.42	4	256	251	58	
	3		256	0.54	92	87	1.37	4	254	230	56	
	2		254	0.50	92	87	1.27	4	257	260	56	
	1		253	0.41	92	88	1.04	3	253	260	56	
		14:28										459.625
east	4 6	14:30	252	0.85	91	87	2.16	5	252	265	61	
	5		253	0.94	93	88	2.39	5	255	255	57	
	4		253	0.92	94	88	2.34	5	254	254	56	
	3		254	0.86	94	88	2.19	5	255	248	57	
	2		253	0.60	95	88	1.53	4	256	247	58	
	1		252	0.49	95	88	1.25	4	253	248	57	
		14:45										470.868

Comments:

Test Observers:

BRAUN INTERTEC ENVIRONMENTAL INC.
PARTICULATE FIELD DATA
PROJECT NUMBER: CMXX-94-0518

PLANT: Hard drives DATE: 9/9/94

SAMPLE LOCATION: Stack Run 2 RUN#:

RUN TIME:

Absorber Type	Contents	Final Weight (grams)	Tare Weight (grams)	Net H2O (grams)
G/S	100 mL DI	874	548	
G/S	11 "	568	549	
	mT	460	458	
	silica gel	735	724	
	line Rinse			-94.
			TOTAL	

QI

ORSAT ANALYSIS	CO2 (%vol.)	O2 (%vol.)	N2 (%vol.)
Run 1:	3.2	16.5	
Run 2:			
Run 3:			
Average:			
Air Audit:			

BRAUN INTERTEC ENVIRONMENTAL INC.
PARTICULATE FIELD DATA
PROJECT NUMBER: CMXX-94-0518

Plant:	Hard drives	Bws (assumed):	0.20	Meter Box#:	80664
Sample Location:	Stack	MWwet(assumed):		dH@i:	2.001
Run #:	3	Pstatic("H2O):	-0.25	Gamma:	0.998
Date:	9/9/94	Ps ("Hg):	30.48	Pitot #:	5-9
Ambient T (F):	85	Probe Mat.:	SS	Cp:	0.838
Pbar ("Hg):	30.50	Probe Heater Setting:	250	Nozzle Mat.:	SS
		Filter Heater Setting:	250	Dn:	6-1 0.250

Pre-test leak rate: 0.010 CFM at 6 "Hg Post-test leak rate: 0.050 CFM at 6 "Hg X = 3.279

	POINT	TIME	DUCT DATA TEMP (F)	DUCT DATA dP ("H2O)	METER DATA TEMPi (F)	METER DATA TEMPo (F)	METER DATA dH ("H2O)	METER DATA VAC ("Hg)	HEATER BOX DATA PROBE (F)	HEATER BOX DATA FILTER (F)	IMPINGER OUTLET (F)	DRY TEST METER VOL. (CF)
west	1 6	15:54	252	1.20	87	87	3.02	5	244	248	66	472.610
	5		257	1.10	87	87	2.75	5	255	251	64	
	4		262	0.98	88	88	2.44	4	255	261	62	
	3		262	1.40	88	87	3.48	6	255	259	64	
	2		261	1.20	89	87	3.00	5	253	249	65	
	1		258	1.10	89	87	2.76	5	249	246	66	
		16:09										486.238
2	6	16:11	260	1.05	89	87	2.63	5	233	252	67	
	5		260	0.90	90	88	2.25	5	253	259	67	
	4		261	0.62	90	89	1.55	4	256	255	67	
	3		260	0.54	90	88	1.35	3	254	251	67	
	2		257	0.38	90	88	0.96	3	258	253	67	
	1		256	0.36	90	88	0.91	3	255	249	66	
		16:26										496.380
3	6	16:28	255	0.78	89	87	1.96	4	254	258	68	
	5		256	0.62	89	88	1.56	4	259	257	66	
	4		256	0.52	90	88	1.31	4	251	250	66	
	3		257	0.50	90	89	1.26	3	255	244	67	
	2		258	0.48	91	89	1.21	3	257	256	67	
	1		256	0.38	91	89	0.96	3	257	252	67	
		16:43										505.400
east	4 6	16:45	251	0.91	89	88	2.30	5	256	257	68	
	5		249	0.85	89	88	2.16	5	257	254	67	
	4		246	0.82	91	88	2.10	5	256	249	67	
	3		246	0.84	92	89	2.15	5	257	248	67	
	2		245	0.60	93	90	1.54	4	257	245	68	
	1		241	0.49	93	90	1.27	3	257	270	68	
		17:00										517.110

Comments:

Test Observers:

BRAUN INTERTEC ENVIRONMENTAL INC.
PARTICULATE FIELD DATA
PROJECT NUMBER: CMXX-94-

PLANT: Hand drier DATE: 9/9/94

SAMPLE LOCATION: Hot mix RUN#: 3

RUN TIME: 60 m.

Absorber Type	Contents	Final Weight (grams)	Tare Weight (grams)	Net H2O (grams)
G/S	100 mL DI	770	567	
MG/S	100 mL DI	578	556	
G/S		466	463	
G/S	silica gel	675	666	
	No line Rinse			~~-94~~
	line got dirty on descent.			
			TOTAL	

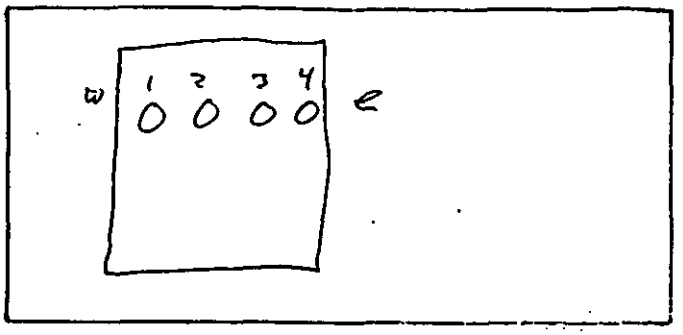
11 5

ORSAT ANALYSIS

	CO2 (%vol.)	O2 (%vol.)	N2 (%vol.)
Run 1:	3.2	16.4	
Run 2:			
Run 3:			
Average:			
Air Audit:			

Braun Intertec Corporation Project # CMBX 94-0514

Client: Hard Drives
Source:
Run #: Initial Date: 9/9/94
Stack Dim: 54" in.
Pbar: 30.50 "Hg Pstatic: -0.25 "H2O
Sampled By: JO.
Pitot #: S-2 Cp:
Console #: 80664 Y:
H@i:



W 1 2 3 4 E
0 0 0 0

	Traverse Point #	Distance from Stack Wall (in)	Distance from End of Port (in)	ΔP ("H2O)	Cyclonic Flow Angle	Td (°F)
		Port Length:	2 in.	Start Time:		hrs
1	1 6	4.8	6.8	1.35	0	188
	2 5	14.5	16.5	1.70	0	193
	3 4	24.2	26.2	1.50	0	195
	4 3	32.8	35.8	1.70	0	198
	5 2	43.5	45.5	1.75	0	200
	6 1	53.2	55.2	1.55	0	202
2	1			0.45	0	228
	2			0.48	0	228
	3			0.55	0	229
	4			0.85	0	228
	5			1.10	0	225
	6			1.20	0	222
3	1			0.48	0	225
	2			0.5	0	225
	3			0.5	0	222
	4			0.48	0	224
	5			0.5	0	215
	6			0.8	0	210
4	1			0.65	0	218
	2			0.60	0	220
	3			0.65	0	220
	4			1.20	0	221
	5			0.80	0	216
	6			0.85	0	215

INTERTEC

Particulate Sample Analysis

Client: Hand drives

Project No.:

Sample Location: Exhaust stack Run #1

Log-in No.:

Sample Date: 9/9/94

Analysis Date: 9/13/94

Analyst: PWR

Log-In #	Tare (grams)	W1 (grams)	W2 (grams)	W3 (grams)	W4 (grams)	Net (grams)	Liquid Weight (grams)
Filters:		9/14/94 10:30	9/14/94 11:30				
F 11K	0.3253	0.3382	0.3388			0.0135	
Acetone Rinses:		9/16/94 13:15	9/16/94 14:45	9/16/94 15:45			
P 220	80.5544	80.5651	80.5659	80.5654		0.0110	107.3(
		9/16/94 10:30	9/16/94 11:30				
Blank: A3	76.6586	77.6586	77.6588			0.0002	92.23
Aqueous Conden:		9/20/94 10:00	9/20/94 11:00				
C 13m	79.1273	79.1644	79.1642			0.0369	517.47
		9/16/94 13:15	9/16/94 14:45				
Blank: C8	72.0016	72.0013	72.0018			0.0002	211.67
Organic Conden:		9/16/94 13:15	9/16/94 14:45				
C W15	79.5092	79.5208	79.5213			0.0121	75
		9/16/94 10:30	9/16/94 11:30				
Blank B	67.4957	67.4957	~~67.4958~~	67.4957		0.0000	74

Comments:

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INTERTEC

Particulate Sample Analysis

Client: Hard drives

Project No.:

Sample Location: Exhaust stack Run #2

Log-in No.:

Sample Date: 9/9/94

Analysis Date: 9/12/94

Analyst: DJK

Log-In #	Tare (grams)	W1 (grams)	W2 (grams)	W3 (grams)	W4 (grams)	Net (grams)	Liquid Weight (grams)
Filters:		9/14/94 10:30	9/14/94 11:30				
R2F 95	0.3669	0.3719	0.3719			0.0050	
Acetone Rinses:		9/16/94 13:15	9/16/94 14:45				
R2P P19	71.7366	71.7521	71.7525			0.0159	116.31
Blank:							
Aqueous Conden:		9/20/94 10:00	9/20/94 11:00				
R2C P20	79.5915	79.6312	79.6314			0.0399	455.5
Blank:							
Organic Conden:		9/16/94 10:30	9/16/94 11:30				
R2L C	79.2081	79.2169	79.2170			0.0089	74
Blank							

Comments:

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INTERTEC

Particulate Sample Analysis

Client: Hardtrives

Sample Location: Exhaust stack Run #3

Sample Date: 9/9/94

Analyst: DWC

Project No.:

Log-in No.:

Analysis Date: 9/12/94

Log-In #	Tare (grams)	W1 (grams)	W2 (grams)	W3 (grams)	W4 (grams)	Net (grams)	Liquid Weight (grams)
Filters:		9/14/94 10:30	9/14/94 11:30				
R3- 115	0.3245	0.3358	0.3363			0.0118	
Acetone Rinses:		9/16/94 13:15	9/16/94 14:45	9/16/94 15:45			
R3 P2	68.0173	68.0360	68.0368	68.0364		0.0191	117.34
Blank:							
Aqueous Conden:		9/20/94 10:00	9/20/94 11:00				
R3C 110	78.5615	78.5814	79.5819			0.0304	413.53
Blank:							
Organic Conden:		9/16/94 10:30	9/16/94 11:30				
R3C C2	77.5973	77.6136	77.6138			0.0165	74
Blank							

Comments:

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PITO TUBE CALIBRATION

UNIT: 5-1 CALIBRATED BY: JDO

DATE: 7\15\94

A SIDE CALIBRATION

RUN No.	dPstd "H20	dP(s) "H20	CP(s)	DEVIATION Cp(s)-Cp(A)
1	0.65	0.92	0.832	0.002
2	0.64	0.92	0.826	0.008
3	0.66	0.91	0.843	0.009
		Cp(A)	0.834	

B SIDE CALIBRATION

RUN No.	dPstd "H20	dP(s) "H20	CP(s)	DEVIATION Cp(s)-Cp(B)
1	0.65	0.91	0.837	0.006
2	0.64	0.89	0.840	0.003
3	0.66	0.89	0.853	0.010
		Cp(B)	0.843	

AVG DEVIATION (A)	0.006	|Cp(A)-Cp(B)|	0.009
AVG DEVIATION (B)	0.006	Cp	0.838

DRY GAS METER CALIBRATIONS

DATE: 8/4/94 Meter box: 80664

Barometric press: 29.31 Calibrated by JDO

Orifice setting (dH) in. H2O	Gas volume Wet tes meter (Vw) L	Wet test meter (Vw) ft^3	Dry gas meter (Vd) ft^3	Temperatures Wet test meter average (tw) C	Wet test meter average (tw) F	Dry gas meter average (td) F	Time min.	Yi	dH@i in. H2O
0.5	initial 726.18 final 867.83	5.002	initial 954.437 final 959.486	23.3	74	81	13.0	1.002	1.925
1	initial 571.91 final 722.63	5.322	initial 948.938 final 954.307	23.3	74	82	10.0	1.004	2.009
2	initial 395.63 final 566.58	6.036	initial 942.644 final 948.735	23.3	74	81	8.0	0.999	2.002
3	initial 260.53 final 389.62	4.558	initial 937.830 final 942.442	23.3	74	78	5.0	0.988	2.069

Average:	0.998	2.001
Deviation:	0.010	0.076

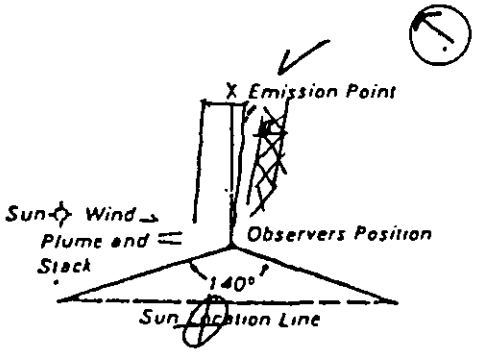
Visible Emission Observation Form

SOURCE NAME	Hand Drives Hot mix
ADDRESS	
CITY	St Cloud
STATE	MN
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	Hot Mix
OPERATING MODE	Normal 250T/hr
CONTROL EQUIPMENT	Baghouse
OPERATING MODE	
DESCRIBE EMISSION POINT START	48' x 30' rectangular stack
DESCRIBE EMISSION POINT STOP	
HEIGHT ABOVE GROUND LEVEL START	60'
HEIGHT ABOVE GROUND LEVEL STOP	60'
HEIGHT RELATIVE TO OBSERVER START	60'
HEIGHT RELATIVE TO OBSERVER STOP	60'
DISTANCE FROM OBSERVER START	200'
DISTANCE FROM OBSERVER STOP	200'
DIRECTION FROM OBSERVER START	ENE
DIRECTION FROM OBSERVER STOP	ENE
DESCRIBE EMISSIONS START	Very light grey
DESCRIBE EMISSIONS STOP	V Light grey
EMISSION COLOR START	grey
EMISSION COLOR STOP	grey
PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☑	
WATER DROPLETS PRESENT: NO ☑ YES ☐	
IF WATER DROPLET PLUME: NA ATTACHED ☐ DETACHED ☐	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED START	2 Ft above stack
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED STOP	2 Ft above stack
DESCRIBE BACKGROUND START	Blue sky
DESCRIBE BACKGROUND STOP	Blue sky
BACKGROUND COLOR START	Blue
BACKGROUND COLOR STOP	Blue
SKY CONDITIONS START	
SKY CONDITIONS STOP	
WIND SPEED START	10-15
WIND SPEED STOP	10-15
WIND DIRECTION START	E
WIND DIRECTION STOP	E
AMBIENT TEMP. START	80
AMBIENT TEMP. STOP	80
WET BULB TEMP.	
RH, percent	

OBSERVATION DATE	START TIME	STOP TIME
9/1/94	15:59	16:59

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	0	5	0	0	31	0	0	0	0
2	0	0	5	0	32	0	0	0	0
3	5	0	5	5	33	0	5	0	0
4	0	5	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	5	0
6	0	0	5	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	5	0	5	0	38	0	0	0	0
9	5	0	0	0	39	5	0	0	0
10	0	0	0	0	40	0	0	0	5
11	0	5	0	0	41	0	0	0	0
12	0	0	0	5	42	0	0	0	0
13	0	0	5	0	43	0	0	0	0
14	0	0	0	0	44	0	0	5	0
15	0	0	0	0	45	0	0	0	0
16	0	5	0	0	46	0	0	0	0
17	0	0	5	0	47	5	0	5	0
18	0	0	5	0	48	5	5	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	5	0	0	52	0	0	0	0
23	0	0	0	0	53	5	0	0	0
24	0	0	5	0	54	0	5	0	0
25	0	0	0	0	55	0	0	0	5
26	0	0	0	5	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	5	0	0	0	59	0	0	5	0
30	0	0	0	0	60	0	0	0	0

Source Layout Sketch — Draw North Arrow



AVERAGE OPACITY FOR HIGHEST PERIOD	NUMBER OF READINGS ABOVE 5 % WERE 0
RANGE OF OPACITY READINGS MINIMUM	0 MAXIMUM 5
OBSERVER'S NAME (PRINT)	Jeffrey Jax
OBSERVER'S SIGNATURE	Jeffrey Jax
DATE	9/9/94
ORGANIZATION	Braun Enterprises
CERTIFIED BY	ETA
DATE	
VERIFIED BY	
DATE	
COMMENTS	
I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS SIGNATURE	
TITLE	
DATE	

METHOD 9 REDUCED FIELD DATA
PROJECT NUMBER: CMXX-94-0518

Test Date:	September 9, 1994	Start Time:	15:59
Facility:	Hard Drives	End Time:	16:59
Location:	St. Cloud		
Process:	Hot mix		

Test Results:

Maximum 6 Minute Averag	1.5 %
Average Opacity:	0.7 %
Maximum Opacity:	5.0 %
Minimum Opacity:	0.0 %
# of Readings >20%:	0
Number of Readings:	240

Interval	0	15	30	45
1	0	5	0	0
2	0	0	5	0
3	5	0	5	5
4	0	5	0	0
5	0	0	0	0
6	0	0	5	0
7	0	0	0	0
8	5	0	5	0
9	5	0	0	0
10	0	0	0	0
11	0	5	0	0
12	0	0	0	5
13	0	0	5	0
14	0	0	0	0
15	0	0	0	0
16	0	5	0	0
17	0	0	5	0
18	0	0	5	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	5	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	5
27	0	0	0	0
28	0	0	0	0
29	5	0	0	0
30	0	0	0	0

Interval	0	15	30	45
31	0	0	0	0
32	0	0	0	0
33	0	5	0	0
34	0	0	0	0
35	0	0	5	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	5	0	0	0
40	0	0	0	5
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	5	0
45	0	0	0	0
46	0	0	0	0
47	5	0	5	0
48	5	5	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	5	0	0	0
54	0	5	0	0
55	0	0	0	5
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
59	0	0	5	0
60	0	0	0	0

VISIBLE EMISSIONS EVALUATOR

This is to certify that

Jeffrey Jay

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.

President	242994 Certificate Number
Vice President	Minneapolis Location
David B. Savage, Jr. Program Manager	April 7, 1994 Date of Issue

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Test Plan for an Asphalt Plant Performance Test

Date test plan written: August 15, 1994
Scheduled test date: August 26, 1994

Part 1: General Information

1. Name and address of emission facility: Hardrives, Inc.
Plant Number 701
518 - 72nd Avenue South
Waite Park, MN 56387

2. Emission facility contact person:

Amy Purfeest Director, Government Affairs Hardrives, Inc. 9724 10th Avenue N. Plymouth, MN 55441 (612) 542-9060	Plant Contact Wally Stang Plant Operator (612) 253-2419

3. Permit number: 4C-90-OT-1

4. Reason emission points are to be tested: Compliance demonstration as outlined in the permit. Hardrives, Inc. has agreed to a performance test for Particulate and Opacity between 6/1/94 and 9/1/94 and when required by the Director of Air Quality Division.

5. Drawing of emission points: See Attachment #1
24 traverse points (six in each of four ports) will be utilized.

6. Physical location of emission unit: Stationary, location per number 1, above.

7. Independent Testing Company Contact: Bruce Randall
Manager, Source Testing

Name of Independent Testing Company: Braun Intertec Corporation
1345 Northland Drive
Mendota Heights, MN 55120

Telephone Number: (612) 683-8790

Part II. Testing Requirements

1. The following is a description of each Pollutant to be tested, the applicable emission limits, and the applicable rule or regulation for each emission limit:

EP #	Pollutant	Emission Limit	Applicable Rule or Regulation	Fuel Type During Test
1	PM	0.04 grains per dscf	40 CFR 60, Subp. I., Minn. Rules pt. 7011.0910	100% Waste Oil
	Opacity	Not to equal or exceed 20% Opacity	Minn Rules pt. 7011.0910	100% Waste Oil

propose to utilize fuel analysis as provided by the vendor. This analysis will include:

Gross Heating Value
Sulfur, % by Weight
Ash, % by Weight
Density
Lead, % by weight
PCB's (ppm by weight)
Organic Halogens (% by weight)

In the event that this approach is not acceptable, we will collect and analyze fuel samples as described in Part III.

Part III. Operating Conditions

1. Process to be tested:

EP #	Process Equipment Description	Process Rate During Test	Control Equipment Description	Control Equipment Operating Parameter During Test
1	Astec Drum Dryer	55% Virgin aggregate (~137.5 tph) 45% RAP (~112.5 tph)	Filter Baghouse	ΔP = 2.5-3" H2O

Fuel Sampling and Analysis

n the event that analysis provided by the fuel vendor is not acceptable, we propose to collect and analyze fuel amples as follows:

. One tap sample per particulate test run will be taken. The sample will be taken as close as possible to the burner in order to be representative of the fuel burned at the time of the test. The sample will be taken in a pint-size container according to the procedures listed in Permit Exhibit D. The three samples will be mixed to form a composite.

b. The composite fuel sample will be analyzed as follows:

Parameter	Analytical Method
Gross Heating Value	ASTM Method D 240
Lead, % by weight	ASTM Method D 3605
Sulfur, % by Weight	ASTM Method D 1552 or D 129
PCB's (ppm by weight)	U.S. EPA document SW-846, Method 8080 or Method 8081
Ash, % by Weight	ASTM Method D 874
Organic Halogens (% by weight)	ASTM Method D 1317, modified to include ion chromatography as the analytical procedure for the Halogens, or ASTM Method D 808
Density	ASTM Method D 1481 or D 1298

Moisture content in the virgin and recycle aggregate

a. One sample each of the virgin and recycle aggregate shall be collected per test run of particulate. Sample will be taken as close as possible to the feeding conveyor and during the corresponding run. The samples of Virgin and recycle aggregate will be mixed in the same proportion as the enter the dryer to generate one composite aggregate sample per test run.

. The moisture content of each composite sample will be performed using ASTM Method D 3302.

Steve
Amy

Minnesota Pollution Control Agency

31 1994

HARDRIVES, INC.

August 30, 1994

Ms. Amy Purfeerst
Director, Government Affairs
Hardrives, Inc.
9724 10th Avenue North
Plymouth, Minnesota 55441

RE: August 15, 1994, Test Plan Submittal for the August 26, 1994, Performance Test on the Hot Mix Asphalt Plant

Dear Ms. Purfeerst:

This letter, which grants your request for a shortened notification period, and its enclosures conclude the pretest requirements for the Hardrives, Inc. (Company) facility located in Waite Park, Minnesota, as discussed during our telephone conversation of August 19, 1994.

The Air Quality Division (AQD) staff of the Minnesota Pollution Control Agency (MPCA) has reviewed the submittal, and find the test plan to be acceptable for the proposed test.

Copies of the Asphalt Plant Operating Conditions During Stack Testing, Certifications Required For Performance Test Reports, and Microfiche Submittal forms are enclosed. 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:sme

Enclosures

cc: Julie Hendricks, MPCA Brainerd Regional Office
Jerry Liefert, AQD
AQD File No. 4C

TSP EXAMPLE CALCULATIONS

PROJECT NUMBER: CMXX-94-0518

DATE: 9/22/94

PERFORMED BY: JN Jax **PAGE:** 1

EXAMPLES FOR RUN#: 2 Pt 2 Port 2 **UNLESS OTHERWISE NOTED**

Equation 1a - Dry Molecular Weight:

$MW_d = 0.440(\%CO_2) + 0.320(\%O_2) + 0.280(\%N_2 + \%CO)$

$\%CO_2 =$ 3.2 $\%O_2 =$ 16.5 $\%N_2 =$ 80.3 $\%CO =$ 0

$MW_d = 0.440($3.2$) + 0.320($16.5$) + 0.280($80.3$ + 0)$

$MW_d =$ 29.17

Equation 1b - Wet Molecular Weight:

$MW_w = MW_d(1-B_{ws}) + 18.0(B_{ws})$

$MW_d =$ 29.17 $B_{ws} =$ 0.219

$MW_w =$ 29.17 (1- 0.219) + 18.0(0.219)

$MW_w =$ 26.73

Equation 2a - Meter Volume at Standard Conditions:

$$V_{m(std)} = V_m Y \frac{(T_{std})(P_{bar} + \Delta H/13.6)}{(T_m)(P_{std})}$$

$V_m =$ 45.414 $Y =$ 0.998 $T_{std} =$ 528 °R $P_{bar} =$ 30.50

$\Delta H =$ 2.09 $T_m =$ 551 °R $P_{std} =$ 29.92

$$V_{m(std)} = \frac{(45.414)(0.998)(528)(30.50 + 2.09/13.6)}{(551)(29.92)}$$

$V_{m(std)} =$ 44.496

EXAMPLE CALCULATIONS

PROJECT NUMBER: CMXX-94-0518

DATE: 9/21/94

PERFORMED BY: J.N. Jax **PAGE:** 2

Equation 2b - Volume of Water Vapor Condensed:

$V_{wc(std)} = K_1(W_f - W_i)$

$K_1 = 0.04715$ $W_f =$ 2,543 $W_i =$ 2,279

$V_{wc(std)} = 0.04715$ (2,543 - 2,279)

$V_{wc(std)} =$ 12.448

Equation 2c - Moisture Content:

$B_{ws} = V_{wc(std)}/(V_{wc(std)} + V_{m(std)})$

$V_{wc(std)} =$ 12.448 $V_{m(std)} =$ 44.496

$B_{ws} =$ 12.448 / (12.448 + 44.496)

$B_{ws} =$ 0.219

Equation 3a - Velocity at a Traverse Point: **EXAMPLE FOR PORT** 2 **, POINT #:** 2

$V_d = K_p C_p (T_s \Delta P / P_s MW_w)^{1/2}$

$K_p = 85.49$ $C_p =$ 0.838 $T_s =$ 717 °R $\Delta P =$ 0.39 $MW_w =$ 26.73 (actual)

$V_d = (85.49)($ 0.838 $)($ 717 $)($ 0.39 $)$ / (30.48)(26.73))$^{1/2}$

$V_d =$ 41.97

Equation 3b - Volumetric Flow Rate (Actual Basis):

$Q = V_{d(avg)} A_d\ 60$

$V_{d(avg)} =$ 57.2 $A_d =$ 13.5

$Q =$ (57.2)(13.5)(60)

$Q =$ 46,312

EXAMPLE CALCULATIONS

PROJECT NUMBER: CMXX-94-0518

DATE: 9/21/94

PERFORMED BY: J.N. Jax **PAGE:** 3

Equation 3c - Volumetric Flow Rate (Standard Basis):

$$Q_{std} = \frac{Q(T_{std})(P_s)}{(T_s)(P_{std})}$$

$Q =$ 46,312 $T_{std} =$ 528 °R $P_s =$ 30.48 $T_s =$ 714 °R

$P_{std} =$ 29.92

$$Q_{std} = 46{,}312 \frac{(528)(30.48)}{(714)(29.92)}$$

$Q_{std} =$ 34,889

Equation 3d - Volumetric Flow Rate (Standard Dry Basis):

$$Q_{std(dry)} = Q_{std}(1-B_{ws})$$

$Q_{std} =$ 34,889 $B_{ws} =$ 0.219

$Q_{std} =$ 34,889 (1- 0.219)

$Q_{std} =$ 27,248

Equation 4a - Isokinetic Sampling Nozzle Inside Diameter:

$$D_n = \left[\frac{(0.0358)Q_m P_m}{T_m C_p(1-B_{ws})}\left[\frac{(T_s MW_w)}{(P_s \Delta P)}\right]^{0.5}\right]^{0.5}$$

$Q_m = 0.75$ $P_m = 30.00$ $T_m =$ 551 °R $C_p =$ 0.838 $B_{ws} =$ 0.219

$T_s =$ 714 °R $MW_w =$ 26.73 $P_s =$ 30.48 $\Delta P =$ 0.83

$$D_n = \left[\frac{(0.0358)(0.75)(30.00)}{(551)(0.838)(1-0.219)}\left[\frac{(714)(26.73)}{(30.48)(0.83)}\right]^{0.5}\right]^{0.5}$$

$D_n =$ 0.249

EXAMPLE CALCULATIONS

PROJECT NUMBER: CMXX-94-0518

DATE: 9/21/94

PERFORMED BY: J.N. Jax **PAGE:** 4

Equation 4b - Isokinetic Sampling "X" Factor:

$$X = 846.72 \times D_n^4 \times \Delta H@i \times C_p^2 \times (1-B_{ws})^2 \times \frac{(MW_d \times P_s)}{(MW_w \times P_m)}$$

D_n = 0.250 $\Delta H@i$ = 2.001 C_p = 0.838 B_{ws} = 0.20 assume

MW_d = 29.6 P_s = 30.48 MW_w = 28.90 Air P_m = 30.00

$$X = 846.72 \times (0.250)^4 \times 2.001 \times (0.832)^2 \times (1-0.20)^2 \times \frac{(29.6)(30.48)}{(28.90)(30.00)}$$

X = 3.095

Equation 4c - Orifice Pressure Drop at Isokinetic Sampling Rate:

EXAMPLE FOR PORT: 2 **, POINT#:** 2 Actual

$$\Delta H = X \times \Delta P \times \frac{(T_m)}{(T_s)}$$

X = 3.279 ΔP = 0.39 T_m = 553 °R T_s = 717 °R

$$\Delta H = 3.279 \times 0.39 \times \frac{(553)}{(717)}$$

ΔH = 0.99

EXAMPLE CALCULATIONS

PROJECT NUMBER: CmXX-94-0518

DATE: 9/27/94

PERFORMED BY: J.N. Jax **PAGE:** 5

Equation 4d - Sample Percentage of Isokinetic:

$$\%ISO = \frac{(T_{savg} V_{mstd} P_{std} 100)}{(T_{std} V_{davg} \theta A_n P_s 60(1-B_{ws}))}$$

T_{savg} = 713 °R V_{mstd} = 44.480 P_{std} = 29.92 T_{std} = 528 °R

V_{davg} = 59.5 θ = 60 A_n = 0.00034 P_s = 30.48

B_{ws} = 0.219

$$\%ISO = \frac{(713)(44.480)(29.92)(100)}{(528)(59.5)(60)(0.00034)(30.48)(60)(1-0.219)}$$

%ISO = 103.7

Equation 4e - Particulate Concentration:

$$Co = \frac{M \times 0.0154}{V_{mstd}}$$

M = 77.4 V_{mstd} = 44.480

$$Co = \frac{(77.4)(0.0154)}{(44.480)}$$

Co = 0.0268

Equation 4g - Particulate Emission Rate (lb/hr):

$$ER = Co \times 0.00858 \times Q_{std(dry)}$$

Co = 0.0268 $Q_{std(dry)}$ = 28,400

ER = 0.0268 x 0.00858 x 28,400

ER = 6.53

SINCE 1972
TWIN PORTS TESTING INC.
1301 NORTH THIRD STREET • SUPERIOR, WISCONSIN 54880
(715) 392-7114 • FAX (715) 392-7163
728 GARFIELD AVENUE • DULUTH, MINNESOTA 55802
(218) 722-1911 • FAX (218) 722-3295
8 INDUSTRIAL PARK ROAD • NEGAUNEE, MICHIGAN 49866
(906) 226-6653 • FAX (906) 226-3699

LABORATORY REPORT

Firm BRAUN INTERTEC

TPT Lab No. 2830-94C

Material OIL

Taken By CLIENT

Date Received 09/15/94

Date Tested 09/16/94

Sample Designation HARD DRIVES 1,2,3 FUEL COMPOSITE

DATA

HEATING VALUE (BTU/GAL):	141,714	ASTM D 240 MODIFIED
SULFUR (WT %):	0.54	ASTM D 129 MODIFIED
ASH (WT %):	0.55	ASTM D 874
HALOGENS (DETERMINED AS Cl^-, mg/L):	94	ASTM D 808
LEAD (ppm):	50	ASTM D 3605 MODIFIED
PCB (ppm):	< 2	
DENSITY (@ 15 °C):	0.8887	ASTM D 1298

PREPARED BY Karl L Mau **DATE** 9/30/94

REVIEWED BY Gary E Hage **DATE** 9/30/94

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SEP 1 9 1994
HARDRIVES

MOISTURE CONTENT

PROJECT #: 94-061

Report Date: September 14, 1994

CLIENT: Hardrives, Inc.

BORING #:				
SAMPLE #:	1	2	3	
DEPTH:				
LOCATION:	Off Belt	Off Belt	Off Belt	
TOTAL WET WEIGHT:				
TOTAL DRY WEIGHT:				
MOISTURE CONTENT %:	4.7%	4.2%	5.0%	
WEIGHT RETAINED:				
TOTAL % PASSING:				
SOIL DESCRIPTION:	Hardrives' Sand	Hardrives' Sand	Hardrives' Sand	

b:MC4061b.wpl

Submitted By: Dakers

SEP 1 9 1994
HARDRIVES, INC.

MOISTURE CONTENT

PROJECT #: 94-061

Report Date: September 14, 1994

CLIENT: Hardrives, Inc.

BORING #:				
SAMPLE #:	1	2	3	
DEPTH:				
LOCATION:	Off Belt	Off Belt	Off Belt	
TOTAL WET WEIGHT:				
TOTAL DRY WEIGHT:				
MOISTURE CONTENT %:	3.9%	5.6%	4.3%	
WEIGHT RETAINED:				
TOTAL % PASSING:				
SOIL DESCRIPTION:	RAP	RAP	RAP	

b:MC4061a.wpl

Submitted By: DaSilva