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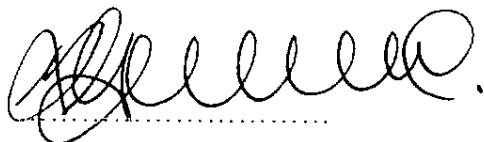
**PARTICULATE EMISSION MONITORING**  
**AGGREGATE INDUSTRIES UK LIMITED**  
**EXPRESS ASPHALT**  
**COVENTRY**  
**WARWICKSHIRE**

Report on Particulate Emission Monitoring  
to  
Determine the Levels of Particulate Emission  
from the  
Parker Asphalt Plant  
at  
Aggregate Industries UK Limited  
Express Asphalt  
Coventry  
Warwickshire

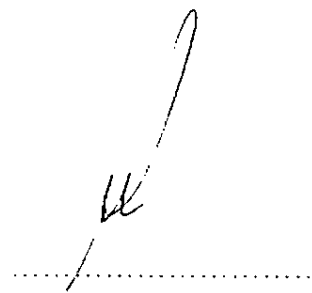
**Report Submitted to:**

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**Report Prepared By:**

  
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**Date:**

14 October 2003

**CONTENTS**

- 1. INTRODUCTION**
- 2. BACKGROUND**
- 3. MONITORING CONTRACTOR**
- 4. MONITORING PROTOCOL**
  - 4.1 Test Method and References**
    - 4.1.1 Accuracy of reference standards
  - 4.2 Sampling Procedure**
    - 4.2.1 Sampling equipment
    - 4.2.2 Preparation for sampling
    - 4.2.3 Sample collection
    - 4.2.4 Analysis of samples
    - 4.2.5 Calculation of results
  - 4.3 Sampling Results**
  - 4.4 Comments**
- 5. SAMPLING LOCATION**
  - 5.1 Process Plant Layout**
  - 5.2 Sampling Positions**
- 6. SUMMARY REPORT**
- 7. SAMPLING RECORDS**



1. **INTRODUCTION**

On 12 September 2003, particulate emission testing was undertaken by Advance Environmental at Aggregate Industries UK Limited, Express Asphalt, Coventry. During the test, the weather was noted as dry and overcast with an ambient air temperature of 20 °C.

The purpose of the emission testing was to ensure compliance with the requirements of the Authorisation issued by Coventry City Council under Part I of the Environmental Protection Act 1990.

2. **BACKGROUND**

Part 1 of the Environmental Protection Act, 1990 came into force on the 1st. April, 1991 and introduced enhanced Industrial Pollution Control for HMIP (now the Environment Agency) and Local Authorities. Schedule 1 of the Environmental Protection (Prescribed Processes and Substances) Regulations 1991 (as amended), prescribed Part B processes for Local Authority Air Pollution Control.

Part 3 of the schedule covers mineral industries and the associated processes, which are operated by Aggregate Industries UK Limited at Express Asphalt, Coventry. The authorisation of these processes by local authorities has introduced emission monitoring requirements in accordance with the following process guidance note:-

- PG3/15(96) Secretary of State's Guidance - Mineral Drying and Roadstone Coating Processes.

### 3. MONITORING CONTRACTOR

The emissions test was co-ordinated by Mr K Gough, Company Principal, Advance Environmental. Mr Gough has 18 years experience of undertaking particulate emission testing on plant used in the quarrying and allied industries. All Advance Environmental staff involved in source emissions monitoring are in the process of gaining personal MCERTS accreditation.

### 4. MONITORING PROTOCOL

#### 4.1 Test method and references

Isokinetic sampling of the contained emission sources was undertaken using the B.C.U.R.A. (British Coal Utilisation Research Association) test equipment and the monitoring protocols utilised followed the procedures given within the following British Standards and Technical Guidance Notes:-

- **BS 3405: 1983** Measurement of Particulate Emissions including grit and dust;
- **Environmental Protection Act Technical Guidance Note (Monitoring) M1** Sampling facility requirements for the monitoring of particulates in gaseous releases to atmosphere; and
- **Environmental Protection Act Technical Guidance Note (Monitoring) M2** Monitoring emissions of pollutants at source.

#### 4.1.1 Accuracy of reference standards

According to BS 3405: 1983 the accuracy of the monitoring methods utilised will be about +/- 25% of the particulate concentration under defined conditions. However, in practice the level of accuracy will be much improved than that described by the standard given the experience and competence of the sampling personnel.

#### 4.2 Sampling Procedure

##### 4.2.1 Sampling equipment

The equipment used during the sampling procedure was the Airflow Developments Limited BCURA isokinetic particulate sampling equipment, which meets the requirement of the BS3405: 1983 standard method for the measurement of particulate emissions. The equipment was comprised of:-

- Probe;
- cyclone separator;
- sampling nozzle;
- grit hopper;
- filter holder;
- filter medium;
- pump;
- flexible hose; and
- flow rate control equipment.

Ancillary equipment used included a temperature probe, pitot-static tube, micro-manometer and balance, all of which meet the requirements specified in the standard method.

All equipment was inspected in the laboratory before being taken on to site to ensure it was in good condition. Tests were also undertaken to verify that there would be no leaks from the sampling train. The filter medium, which was comprised of 12 mm Dalfratex glass wool was prepared, conditioned and pre-weighed before use, as were the grit hoppers.

#### **4.2.2 Preparation for sampling**

No site visit was undertaken prior to undertaking the sampling procedure, as monitoring had previously been undertaken at the site, during which time the sampling position, working platform, sampling ports, access and safety precautions were found to be satisfactory.

Before sampling commenced, a preliminary velocity and temperature survey was undertaken using a pitot-static tube, Airflow Developments PVM100 micro manometer and Comark Limited KM450S temperature probe, the latter two instruments have current certificates of calibration. The micro manometer was zeroed before, during and after the sampling.

The internal dimensions of the flue were known from the previous monitoring undertaken. However, a further measurement was taken to check that the internal diameter had not been reduced by build-up of particulate matter.

#### **4.2.3 Sample collection**

During the sample collection procedure, samples were taken from four sampling points at the centre of four equal areas along two sampling planes at 90° to each other.

Four sampling points were chosen because the flue area was less than 2.5 m<sup>2</sup>.

Cumulative sampling was undertaken along each sampling plane and the sampling duration at each sampling point was four minutes.

After the first set of samples were taken, the velocity and temperature measurements were repeated to ensure that the conditions were still within the required range. A duplicate set of samples were then taken, as outlined above. Velocity and temperature measurements were also undertaken at the end of the sampling procedure.

At all times during the sampling procedure the sampling technicians were in contact with the process operator to ensure that the plant was in full production and there were no changes in the process that might affect the representative nature of the samples collected.

Prior to commencement of sampling, the Alpha continuous particulate emission monitor was switched to manual mode and the average emission in  $\text{mg}/\text{m}^3$  and gain settings were recorded whilst the first and second sets of samples were being collected. These were later reported to the manufacturer who advised on any necessary adjustments to the gain settings in order to calibrate the monitor.

#### **4.2.4 Analysis of samples**

On returning to the laboratory, the cyclone separator was washed and the residue was dried. The filters and grit hoppers were also dried, conditioned in a desiccator and weighed. The weighing equipment used was a Sartorius Research R180D analytical balance, capable of weighing to five decimal places. The balance is calibrated annually and a current certificate of calibration is held.

#### **4.2.5 Calculation of results**

The calculations were made using the formula specified for cumulative sampling in section 10 of BS 3405: 1983.



The recorded filter weights, velocity, temperature, sampling duration and internal flue dimensions were used to calculate:-

- The mass rate of solids emission in kg/hr; and
- The solids concentration in  $\text{mgm}^{-1}$

#### 4.3 Sampling Results

The Authorisation for the Parker asphalt plant specifies an emission limit of  $100 \text{ mg/m}^3$  expressed at standard conditions of 273 K and 101.3 kPa without correction for water vapour content.

At the time of sampling, a mean particulate matter concentration of  $34.7 \text{ mg/m}^3$  was recorded. It can be concluded, therefore, that the emission from the Parker asphalt plant complies with the emission limit currently imposed.

#### 4.4 Comments

During each sampling period, the average results from the Alpha continuous emission monitor were logged. Readings of between  $33.648 \text{ mg/m}^3$  (Test 1) and  $29.093 \text{ mg/m}^3$  (Test 2) were recorded during the measurement periods. It can be concluded that the monitor is operating accurately and adjustment of the gain setting is not required.

The full procedural requirements of BS 3405: 1983 could not be achieved due to:-

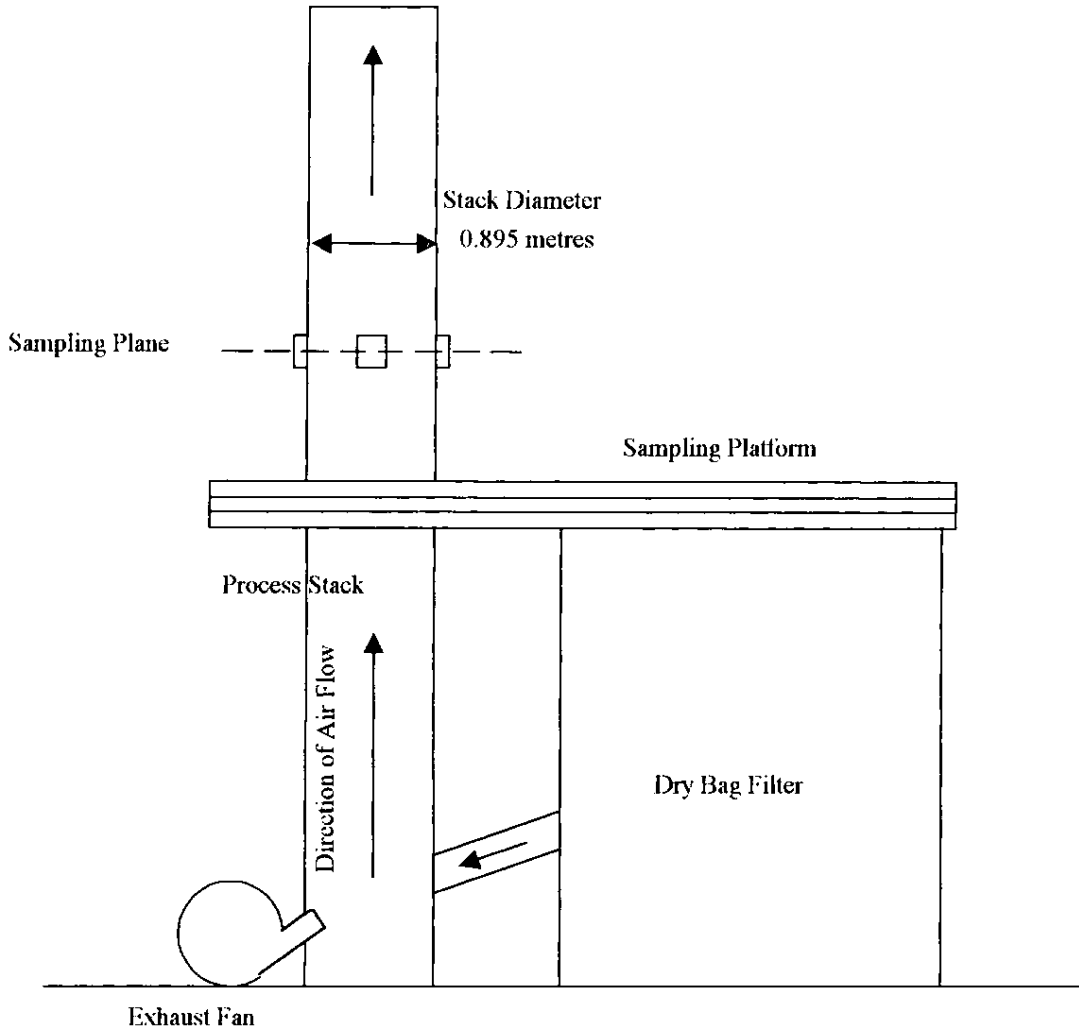
- clause 8.3, low particulate loading;

The quoted efflux velocity is measured at the sampling position, not at discharge.

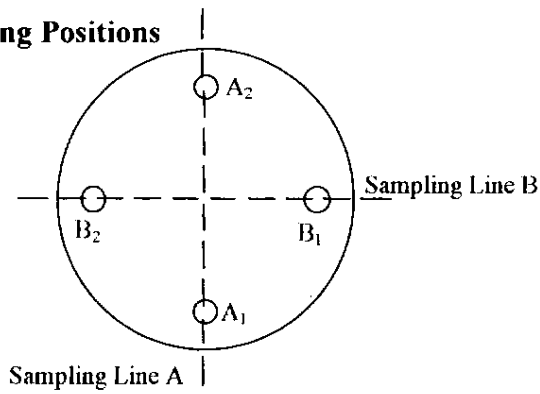
Full details of the sampling location, conditions and measurements taken are provided in the following sections.

## 5. SAMPLING LOCATION

### 5.1 Process Plant Layout



### 5.2 Sampling Positions



6. SUMMARY REPORT



ADVANCE ENVIRONMENTAL  
PARTICULATE EMISSION TEST  
SUMMARY REPORT

SITE : Express Asphalt - Coventry	PLANT : Parker	EQUIPMENT : Dry bag filter system	DATE OF TEST : 12.09.03
Weather: Dry and overcast		Ambient Air Temperature (°C): 20	
METEOROLOGICAL CONDITIONS			
PLANT DETAILS			
Operating Conditions: Continuous production of coated roadstone during the period of test.			
LABORATORY ANALYSIS			
Cyclone No.	A	B	
Lab. Ref. No.			
Final Wt. (g)			
Initial Wt. (g)			
Total Wt. (g)	0.0128	0.0151	
Filter No.	7	8	
Lab. Ref. No.	AE/F/20003	AE/F/20103	
Final Wt. (g)	127.4595	133.3081	
Initial Wt. (g)	127.4327	133.2963	
Total Wt. (g)	0.0268	0.0118	0.0000
% Wt. Cyclone (g)	0.0055	0.0026	
Total Wt. (g) A	0.0323	0.0144	0.0000
Hopper No.	7	8	
Lab. Ref. No.	AE/H/20003	AE/H/20103	
Final Wt. (g)	46.6012	48.0166	
Initial Wt. (g)	46.5659	47.9609	
Total Wt. (g)	0.0353	0.0557	0.0000
% Wt. Cyclone (g)	0.0073	0.0125	
Total Wt. (g) B	0.0426	0.0682	0.0000
Total A + B	0.0749	0.0826	0.0000

Position	Plane A	Plane B
1	14.7	15.4
2	15.0	15.7
3	15.0	15.9
4	15.5	15.2
5	15.6	15.2
6	15.5	15.1
7	15.6	15.0
8	15.8	15.3
9	15.7	14.8
10	14.1	12.9

VARIAION OF PITOSTATIC AIR VELOCITY

Parameter	Test 1	Test 2	Mean
Gas Temperature (°C)	82.5	83	
Nozzle Size (m²)	0.0002	0.0002	
Total Sampling Time (mins)	16	16	
Gas Flow Rate (m³/min)	443	448	
Solids Emission Rate (Kg/hr)	0.88	0.97	0.93
Solids Concentration (mg/m³)	33.2	36.2	34.7
Efflux Velocity (m/s)			15.2
Gas Flow Rate At Operating Temperature (m³/min)			574

**COMMENTS:**  
The current maximum permitted concentration of solids in the flue gas for this plant is given in the EPA Authorisation Document, which states a limit of 100 mg/m³. The measured emission of 34.7 mg/m³ was therefore below this limit at the time of the test. The requirements of BS 3405: 1983 could not be achieved due to low particulate loading.  
Note: The efflux velocity quoted is measured at the sampling position not at the point of discharge.

K Gough - ADVANCE Environmental

7. SAMPLING RECORDS



## Preliminary Velocity and Temperature Survey

Sample Point No.	Sample Line A			Sample Line B		
	Distance Along Line (m)	Gas Velocity (ms <sup>-1</sup> )	Gas Temperature (°C)	Distance Along Line (m)	Gas Velocity (ms <sup>-1</sup> )	Gas Temperature (°C)
1	0.05	14.7	79	0.05	15.4	81
2	0.15	15.0	79	0.15	15.7	81
3	0.25	15.0	79	0.25	15.9	81
4	0.35	15.5	79	0.35	15.2	81
5	0.45	15.6	79	0.45	15.2	81
6	0.55	15.5	79	0.55	15.1	80
7	0.65	15.6	79	0.65	15.0	80
8	0.75	15.8	79	0.75	15.3	80
9	0.85	15.7	79	0.85	14.8	80
10	0.95	14.1	79	0.95	12.9	80
Mean			79 (1)			80.5 (2)

Mean gas temperature 1 = 79 °C

Mean gas temperature 2 = 80.5 °C

Mean gas temperature (in K)  $T_p = \frac{\text{mean (1)} + \text{mean (2)}}{2} + 273 = 353$

Permitted range of gas temperature readings (in °C) =  $(0.9T_p - 273)$  to  $(1.1T_p - 273)$   
= 45 to 115

Highest gas velocity reading (either sampling line) (in ms<sup>-1</sup>) = 15.9

Lowest gas velocity reading (either sampling line) (in ms<sup>-1</sup>) = 12.9

Ratio highest/lowest = 1.2:1 (maximum permitted ratio = 3:1)

With a circular duct of 0.895 m, the flue area = 0.629 m<sup>2</sup>

Sampling can be undertaken at the selected location and samples to be taken at 4 sampling points located on two sampling lines.

### Test 1

SAMPLING POINT		GAS VELOCITY		GAS TEMPERATURE	
Sample Position	Distance Along Line (m)	Initial $v_1$ ( $ms^{-1}$ )	Final $v_2$ ( $ms^{-1}$ )	Initial $t_1$ ( $^{\circ}C$ )	Final $t_2$ ( $^{\circ}C$ )
A <sub>1</sub>	0.15	15.0	15.0	79	84
A <sub>2</sub>	0.85	15.7	16.1	79	85
B <sub>1</sub>	0.15	15.7	16.0	81	85
B <sub>2</sub>	0.85	14.8	14.8	80	85
		Total		Mean85	
		61.2	61.9	80	85
		$t_m = 82.5$			

Permitted range of total  $v_2 = 0.95$  (total  $v_1$ ) to  $1.05$  (total  $v_1$ ) = 58 to 64

Sample Position	Nozzle Area ( $m^2$ )	Duration of Sampling ( $s^{-1}$ )	Cyclone DP (kPa)
A <sub>1</sub>	0.0002	240	2.00
A <sub>2</sub>	0.0002	240	2.20
B <sub>1</sub>	0.0002	240	2.30
B <sub>2</sub>	0.0002	240	1.90

Cumulative Sampling Undertaken

Sample Container	Ref. Number	Initial Weight (g)	Final Weight (g)	Collected Solids (g)	Mass of Collected Solids (g)
Filter 7	AEF20003	127.4327	127.4595	0.0268	0.0749
Grit Pot 7	AEH20003	46.5659	46.6012	0.0353	
Cyclone A				0.0128	

**Test 2**

SAMPLING POINT		GAS VELOCITY		GAS TEMPERATURE	
Sample Position	Distance Along Line (m)	Initial $v_1$ ( $\text{ms}^{-1}$ )	Final $v_2$ ( $\text{ms}^{-1}$ )	Initial $t_1$ ( $^{\circ}\text{C}$ )	Final $t_2$ ( $^{\circ}\text{C}$ )
A <sub>1</sub>	0.15	15.0	15.4	84	81
A <sub>2</sub>	0.85	16.1	15.8	85	82
B <sub>1</sub>	0.15	16.0	16.3	85	81
B <sub>2</sub>	0.85	14.8	15.3	85	82
		<b>Total</b>		<b>Mean</b>	
		61.9	62.8	85	81.5
				$t_m = 83$	

Permitted range of total  $v_2 = 0.95$  (total  $v_1$ ) to  $1.05$  (total  $v_1$ ) = 59 to 65

Sample Position	Nozzle Area ( $\text{m}^2$ )	Duration of Sampling ( $\text{s}^{-1}$ )	Cyclone DP (kPa)
A <sub>1</sub>	0.0002	240	2.10
A <sub>2</sub>	0.0002	240	2.20
B <sub>1</sub>	0.0002	240	2.10
B <sub>2</sub>	0.0002	240	1.90

**Cumulative Sampling Undertaken**

Sample Container	Ref. Number	Initial Weight (g)	Final Weight (g)	Collected Solids (g)	Mass of Collected Solids (g)
Filter 8	AEF20103	133.2963	133.3081	0.0118	0.0826
Grit Pot 8	AEH20103	47.9609	48.0166	0.0557	
Cyclone B				0.0151	



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### Test Results

	Result of Test 1	Result of Test 2	Ratio of higher result to lower result	Mean result if ratio is not more than 1.5:1
Mass rate of Solids Emission, M (Kg/hr)	0.88	0.97	1.1:1	0.93
Solids Concentration, C (mg/m <sup>3</sup> )	33.2	36.2	1.1:1	34.7