



7 East Bank Road, Sheffield, S2 3PT, UK  
Tel: +44 (0)114 272 8647

UKAS Testing Laboratory No 0144

## REPORT OF PERIODIC MONITORING OF EMISSIONS TO AIR

Part A2 Process: A2/1

### THE BROCKMOOR FOUNDRY COMPANY LIMITED

Leys Road  
Brockmoor  
Brierley Hill  
West Midlands  
DY5 3UJ

**Monitoring Dates:** 24<sup>th</sup> & 25<sup>th</sup> August 2016

**Cti Ref:** E52125  
**Customer Ref:** 45052/RB

Report Written By: Duncan Sharples  
MCERTS Registration No.: SIRA MM 12 1184  
Function: Monitoring Consultant

Report Approved By: Peter Holdsworth  
MCERTS Registration No.: SIRA MM 04 563  
Function: Monitoring Consultant

Signed: \_\_\_\_\_  
*[Signature]*

Signed: \_\_\_\_\_  
*Peter Holdsworth*

Date: \_\_\_\_\_  
14<sup>th</sup> October 2016



## CONTENTS

### EXECUTIVE SUMMARY REPORT

- 1.0 Monitoring Objectives
- 2.0 Monitoring Results
- 3.0 Operating Information
- 4.0 Monitoring Deviations

### SUPPORTING INFORMATION

- APPENDIX I General Information
  - A) Monitoring Organisation Staff Details
  - B) Monitoring Organisation Method Details
  - C) Monitoring Organisation Equipment Check List References

- APPENDIX II BRO 1 Coldbox Coremaking
- APPENDIX III BRO 3 4.5 MW Furnace
- APPENDIX IV BRO 5 Magnesium Treatment
- APPENDIX V BRO 7 Knockout & Sandplant
- APPENDIX VI BRO 28 Megaldi Cast/Cool LH vent
- APPENDIX VII BRO 29 Megaldi Cast/Cool RH vent

## EXECUTIVE SUMMARY REPORT

### 1.0 MONITORING OBJECTIVES

Sampling of emissions at The Brockmoor Foundry Company Ltd. was undertaken at the request of Mr Rob Barlow.

The aim of the monitoring campaign was to:

- undertake annual compliance monitoring
- collect data for comparison with particulate CEMS

in accordance with the Site Specific Protocol issued on 5<sup>th</sup> August 2016 (Cti Ref: E52125SSP).

The company is regulated as a Part A2 Process. The available guidance note applicable to the process is:

Sector Guidance Note IPPC SG3 Secretary of State's Guidance for the A2 ferrous Foundries Sector

Emission limits given in the results tables are taken from the requirements given in Permit Number A2/1. Tests were performed to quantify the levels of emissions from the following processes:

<b>Stack Ref</b>	<b>Emission Source</b>	<b>Substances Monitored</b>
BRO 1 (A1)	Coldbox Coremaking	Particulates
BRO 3 (A3)	4.5MW Induction Furnace	Particulates
BRO 5 (A5)	Magnesium Treatment	Particulates
BRO 7 (A7)	Knockout & Sandplant	Particulates
BRO 28 (A28)	Megaldi Cast/Cool LH vent	Particulates
BRO 29 (A29)	Megaldi Cast/Cool RH vent	Particulates

There were no special requirements applicable to the monitoring.

## 2.0 MONITORING RESULTS

Note: Uncertainty figures quote in this section represent the uncertainty at the 95% confidence level.

Stack Ref.: BRO 1 (A1) Coldbox Coremaking

Particulates	Test 1	Test 2	Emission Limit Value
<b>Concentration:</b>	9.4 mg m <sup>-3</sup>	6.3 mg m <sup>-3</sup>	20 mg m <sup>-3</sup>
<b>Mass Release:</b>	41 g hr <sup>-1</sup>	28 g hr <sup>-1</sup>	-
<b>Uncertainty:</b>	± 0.84 mg m <sup>-3</sup>	± 0.79 mg m <sup>-3</sup>	-
<b>Reference Conditions:</b>	273K and 101.3kPa, without correction for water vapour content		
<b>Date:</b>	24/08/16	24/08/16	-
<b>Test Period:</b>	14:38 to 14:54 14:56 to 15:12	15:46 to 16:02 16:04 to 16:20	-
<b>Duration:</b>	32 mins	32 mins	-
<b>Velocity:</b>	7.2 m s <sup>-1</sup>	7.2 m s <sup>-1</sup>	-
<b>Process Status:</b>	Normal	Normal	-
<b>Visibility:</b>	Outlet not visible	Outlet not visible	Free from persistent visible emission
<b>Monitoring Method:</b>	BS EN 13284-1:2002 Determination of low range mass concentrations of dust		
<b>Isokinetic Rate:</b>	101 %	100 %	95 % to 115 %
<b>Blank Value:</b>	-0.02 mg m <sup>-3</sup>		< 10 % ELV
<b>Cti Accreditation for Use of Method:</b>	MCERTS	MCERTS	-
<b>Accreditation Status of Test:</b>	MCERTS	MCERTS	-

Stack Ref.: BRO 3 (A3)

4.5 MW Induction Furnace

Particulates	Test 1	Test 2	Emission Limit Value
<b>Concentration:</b>	0.94 mg m <sup>-3</sup>	0.56 mg m <sup>-3</sup>	20 mg m <sup>-3</sup>
<b>Mass Release:</b>	31 g hr <sup>-1</sup>	18 g hr <sup>-1</sup>	-
<b>Uncertainty:</b>	± 0.54 mg m <sup>-3</sup>	± 0.57 mg m <sup>-3</sup>	-
<b>Reference Conditions:</b>	273K and 101.3kPa, without correction for water vapour content		
<b>Date:</b>	25/08/16	25/08/16	-
<b>Test Period:</b>	09:25 to 09:45 09:48 to 10:08	10:54 to 11:14 11:17 to 11:37	-
<b>Duration:</b>	40 mins	40 mins	-
<b>Velocity:</b>	15 m s <sup>-1</sup>	14 m s <sup>-1</sup>	-
<b>Process Status:</b>	Normal	Normal	-
<b>Visibility:</b>	No visible emissions	No visible emissions	Free from persistent visible emission
<b>Monitoring Method:</b>	BS EN 13284-1:2002 Determination of low range mass concentrations of dust		
<b>Isokinetic Rate:</b>	101 %	100 %	95 % to 115 %
<b>Blank Value:</b>	-0.20 mg m <sup>-3</sup>		< 10 % ELV
<b>Cti Accreditation for Use of Method:</b>	MCERTS	MCERTS	-
<b>Accreditation Status of Test:</b>	MCERTS	MCERTS	-

**Stack Ref.: BRO 5 (A5) Magnesium Treatment**

Particulates	Test 1	Test 2	Emission Limit Value
<b>Concentration:</b>	< 0.37 mg m <sup>-3</sup>	< 0.37 mg m <sup>-3</sup>	20 mg m <sup>-3</sup>
<b>Mass Release:</b>	< 3.4 g hr <sup>-1</sup>	< 3.4 g hr <sup>-1</sup>	-
<b>Uncertainty:</b>	± 0.67 mg m <sup>-3</sup>	± 0.68 mg m <sup>-3</sup>	-
<b>Reference Conditions:</b>	273K and 101.3kPa, without correction for water vapour content		
<b>Date:</b>	24/08/16	24/08/16	-
<b>Test Period:</b>	10:42 to 10:58 11:06 to 11:14 11:32 to 11:40	12:02 to 12:18 12:23 to 12:55	-
<b>Duration:</b>	32 mins	32 mins	-
<b>Velocity:</b>	6.4 m s <sup>-1</sup>	6.3 m s <sup>-1</sup>	-
<b>Process Status:</b>	Normal	Normal	-
<b>Visibility:</b>	No visible emissions	No visible emissions	Free from persistent visible emission
<b>Monitoring Method:</b>	BS EN 13284-1:2002 Determination of low range mass concentrations of dust		
<b>Isokinetic Rate:</b>	100 %	100 %	95 % to 115 %
<b>Blank Value:</b>	-0.04 mg m <sup>-3</sup>		< 10 % ELV
<b>Cti Accreditation for Use of Method:</b>	MCERTS	MCERTS	-
<b>Accreditation Status of Test:</b>	MCERTS	MCERTS	-

Stack Ref.: BRO 7 (A7)

Knockout &amp; Sandplant

Particulates	Test 1	Test 2	Emission Limit Value
Concentration:	1.1 mg m <sup>-3</sup>	0.54 mg m <sup>-3</sup>	20 mg m <sup>-3</sup>
Mass Release:	61 g hr <sup>-1</sup>	31 g hr <sup>-1</sup>	-
Uncertainty:	± 0.68 mg m <sup>-3</sup>	± 0.68 mg m <sup>-3</sup>	-
Reference Conditions:	273K and 101.3kPa, without correction for water vapour content		
Date:	25/08/16	25/08/16	-
Test Period:	10:05 to 10:45	11:05 to 11:45	-
Duration:	40 mins	40 mins	-
Velocity:	14 m s <sup>-1</sup>	14 m s <sup>-1</sup>	-
Process Status:	Normal	Normal	-
Visibility:	No visible emissions	No visible emissions	Free from persistent visible emission
Monitoring Method:	BS EN 13284-1:2002 Determination of low range mass concentrations of dust		
Isokinetic Rate:	103 %	102 %	95 % to 115 %
Blank Value:	-0.31 mg m <sup>-3</sup>		< 10 % ELV
Cti Accreditation for Use of Method:	MCERTS	MCERTS	-
Accreditation Status of Test:	MCERTS	MCERTS	-

**Stack Ref.: BRO 28 (A28) Megaldi Cast/Cool LH Vent**

Particulates	Test 1	Test 2	Emission Limit Value
<b>Concentration:</b>	0.46 mg m <sup>-3</sup>	0.74 mg m <sup>-3</sup>	20 mg m <sup>-3</sup>
<b>Mass Release:</b>	7.6 g hr <sup>-1</sup>	12 g hr <sup>-1</sup>	-
<b>Uncertainty:</b>	± 0.73 mg m <sup>-3</sup>	± 0.74 mg m <sup>-3</sup>	-
<b>Reference Conditions:</b>	273K and 101.3kPa, without correction for water vapour content		
<b>Date:</b>	24/08/16	24/08/16	-
<b>Test Period:</b>	10:31 to 10:47 10:51 to 11:07	11:24 to 11:40 11:43 to 11:59	-
<b>Duration:</b>	32 mins	32 mins	-
<b>Velocity:</b>	17 m s <sup>-1</sup>	17 m s <sup>-1</sup>	-
<b>Process Status:</b>	Normal	Normal	-
<b>Visibility:</b>	No visible emissions	No visible emissions	Free from persistent visible emission
<b>Monitoring Method:</b>	BS EN 13284-1:2002 Determination of low range mass concentrations of dust		
<b>Isokinetic Rate:</b>	99 %	98 %	95 % to 115 %
<b>Blank Value:</b>	- 0.55 mg m <sup>-3</sup>		< 10 % ELV
<b>Cti Accreditation for Use of Method:</b>	MCERTS	MCERTS	-
<b>Accreditation Status of Test:</b>	MCERTS	MCERTS	-



**Stack Ref.: BRO 29 (A29) Megaldi Cast/Cool RH Vent**

Particulates	Test 1	Test 2	Emission Limit Value
<b>Concentration:</b>	1.8 mg m <sup>-3</sup>	3.9 mg m <sup>-3</sup>	20 mg m <sup>-3</sup>
<b>Mass Release:</b>	41 g hr <sup>-1</sup>	93 g hr <sup>-1</sup>	-
<b>Uncertainty:</b>	± 0.56 mg m <sup>-3</sup>	± 0.68 mg m <sup>-3</sup>	-
<b>Reference Conditions:</b>	273K and 101.3kPa, without correction for water vapour content		
<b>Date:</b>	24/08/16	24/08/16	-
<b>Test Period:</b>	12:50 to 12:58 13:04 to 13:12 13:15 to 13:31	14:47 to 15:03 15:05 to 15:21	-
<b>Duration:</b>	32 mins	32 mins	-
<b>Velocity:</b>	22 m s <sup>-1</sup>	24 m s <sup>-1</sup>	-
<b>Process Status:</b>	Normal	Normal	-
<b>Visibility:</b>	No visible emissions	No visible emissions	Free from persistent visible emission
<b>Monitoring Method:</b>	BS EN 13284-1:2002 Determination of low range mass concentrations of dust		
<b>Isokinetic Rate:</b>	97 %	100 %	95 % to 115 %
<b>Blank Value:</b>	-0.21 mg m <sup>-3</sup>		< 10 % ELV
<b>Cti Accreditation for Use of Method:</b>	MCERTS	MCERTS	-
<b>Accreditation Status of Test:</b>	MCERTS	MCERTS	-

### 3.0 OPERATING INFORMATION

Stack Ref.	Date	Process Type	Process Duration	Fuel	Feedstock	Abatement Type & operational status if abnormal	Load	Substance	Periodic Monitoring Result	Units
BRO 1 (A1)	24/08/16	Continuous	-	N/A	Sand, binder	None	Normal	Particulates <sup>M</sup>	7.8	mg m <sup>-3</sup>
BRO 3 (A3)	25/08/16	Continuous	-	N/A	Melt	Dry bag filter	Normal	Particulates <sup>M</sup>	0.75	mg m <sup>-3</sup>
BRO 5 (A5)	24/08/16	Batch	~5 mins per batch, 3 - 4 batches per hour	N/A	Melt & magnesium	Dry bag filter and thermal plant	Normal	Particulates <sup>M</sup>	< 0.37	mg m <sup>-3</sup>
BRO 7 (A7)	25/08/16	Continuous	-	N/A	Sand	Dry bag filter	Normal	Particulates <sup>M</sup>	0.80	mg m <sup>-3</sup>
BRO 28 (A28)	24/08/16	Continuous	-	N/A	Castings	Dry bag filter	Normal	Particulates <sup>M</sup>	0.60	ng m <sup>-3</sup>
BRO 29 (A29)	24/08/16	Continuous	-	N/A	Castings	Dry bag filter	Normal	Particulates <sup>M</sup>	2.9	mg m <sup>-3</sup>

Accreditation Status of test – (M) MCERTS

## 4.0 MONITORING DEVIATIONS

Substances not monitored in accordance with Environment Agency TGN M2:

Stack Ref.	Emission Source	Substance	Reason
BRO 7 (A7)	Knockout & Sandplant	Particulates	Testing could only be conducted along one traverse. Number of sample points doubled to 8 in accordance with EA MID for BS EN 13284-1.

NOTE: According to the Environment Agency, if a deviation was out of our control, for instance due to unavoidable process or extraction system characteristics, the MCERTS accreditation of the associated test can be maintained. Where we deviate from the method due to issues directly within our control that could have been avoided, MCERTS accreditation cannot be claimed.

## SUPPORTING INFORMATION

### CONTENTS

APPENDIX I	General Information	
A)	Monitoring Organisation Staff Details	
B)	Monitoring Organisation Method Details	
C)	Monitoring Organisation Equipment Check List References	
D)	Sub-contract Analysis Details	
APPENDIX II	BRO 1 (A1)	Coldbox Coremaking
APPENDIX III	BRO 3 (A3)	4.5 MW Induction Furnace
APPENDIX IV	BRO 5 (A5)	Magnesium Treatment
APPENDIX V	BRO 7 (A7)	Knockout & Sandplant
APPENDIX VI	BRO 28 (A28)	Megaldi Cast/Cool LH
APPENDIX VII	BRO 29 (A29)	Megaldi Cast/Cool RH

# **APPENDIX I**

## **GENERAL INFORMATION**

## A) Monitoring Organisation Staff Details

The following Cti staff were involved in the monitoring work reported:

Name	MCERTS Registration	Personnel Competency					Function
			TE1	TE2	TE3	TE4	
Peter Holdsworth	SIRA MM 04 563	L2	✓	✓	✓	✓	Monitoring Consultant
Duncan Sharples	SIRA MM 12 1184	L2	✓	-	✓	✓	Monitoring Consultant

## B) Monitoring Organisation Method Details

The following methods were used for the monitoring work reported:

Substance	Standard Method	Cti OP	Accreditation
All	-	300, 303, 310	-
Moisture (Water Vapour)	BS EN 14790:2005	334	MCERTS
Velocity, Temperature & Pressure	BS EN ISO 16911-1:2013	311, 331 – 336, 361, 396	MCERTS
Particulates	BS EN 13284-1:2002	311, 331 – 336, 361	MCERTS

## C) Monitoring Organisation Equipment Check List References

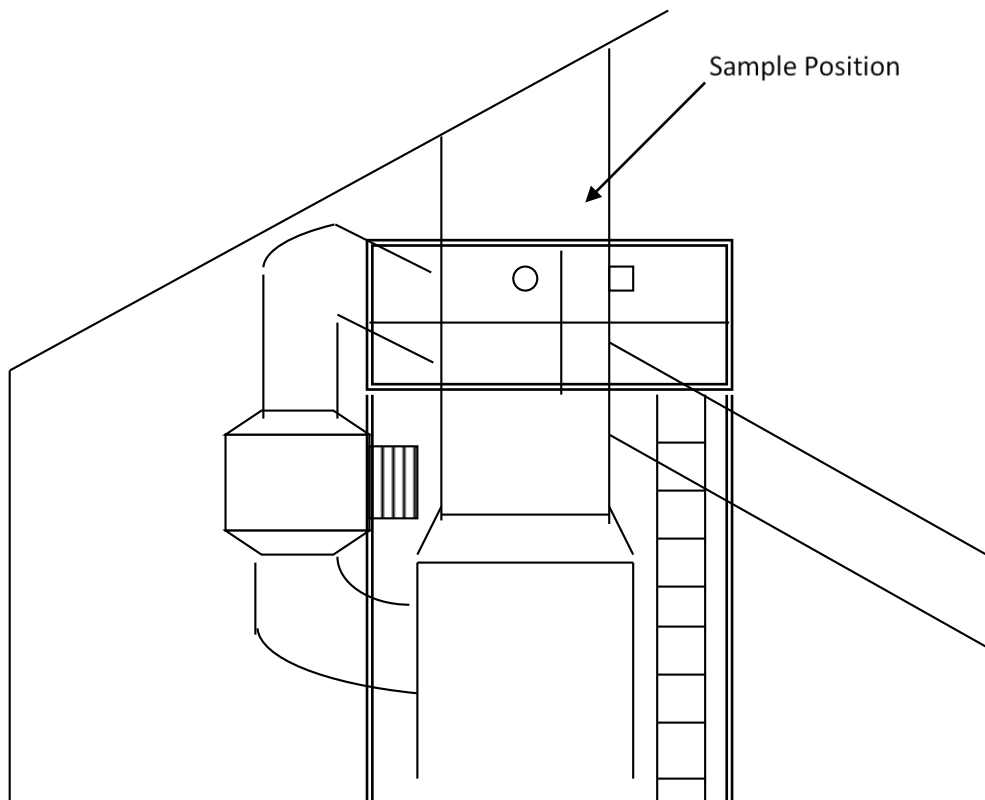
Specific equipment items used were recorded on site sampling datasheets during the monitoring campaign which are held in the Cti environmental monitoring files alongside the associated report

## **APPENDIX II**

### **Stack Ref.: BRO 1(A1) Coldbox Coremaking**

Emission Source            BRO 1 (A1)            Coldbox Coremaking  
 Substances monitored:    Particulates.  
 Arrestment:                None

<b>Emission Point Description:</b>			13284 Compliant
Duct dimensions:	0.495 m diameter		-
Location of sampling plane:	In vertical outlet stack		✓
Type of sampling port:	2 x 4 " BSP		✓
Number of sample lines:	Two		✓
Arrangement of sample lines:	90°		✓
Orientation of sample lines:	Horizontal		✓
Gas flow parameters	Flow: angle < 15°, > 5Pa, Ratio < 3:1, no -ve flow		✓









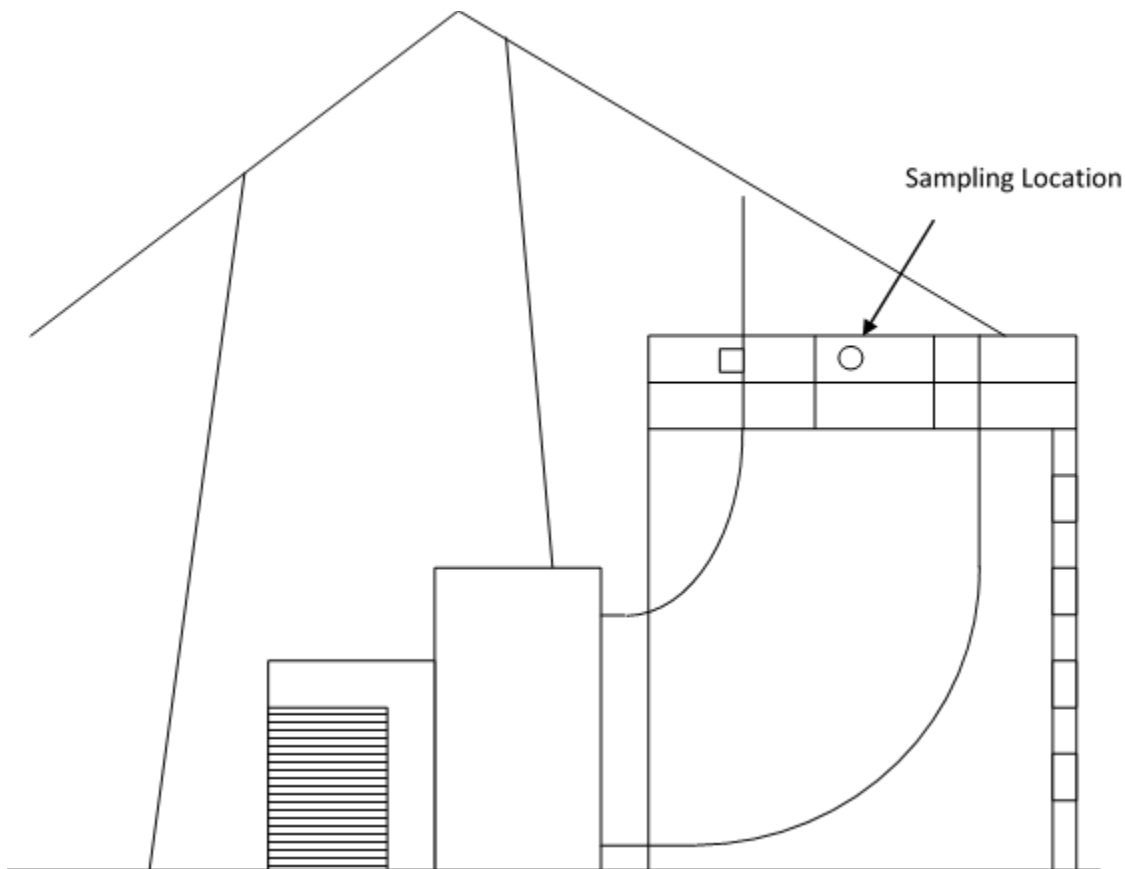
PARTICULATES						
Template Version 4 / Feb15 / TH						
Site:	Brockmoor Foundry		Plant:	Brierley Hill		
Units						
Stack diameter(Ds):	m	0.50	0.25			
Stack dimensions(Ds):	m	0.00	0.00			
Stack area(As):	m <sup>2</sup>	0.192				
Standard 9096 or 13284:		13284				
Filter ID:		1478	1479	1480		
Filter Size 37, 47, 110 or 4:		47	47	47		
Sample Ref:		BRO 1-1	BRO 1-2	BRO 1-B		
Filter weights:						
Tare Test One:	0.14538	Tare Test Two:	0.14637	Blank	0.14574	
Gross Test One:	0.15054	Gross Test Two:	0.14974		0.14566	
mass collected:	0.00515		0.00337		-0.00008	
Wash Out Weights:						
Tare Test One:	47.92851	Tare Test Two:	46.47798	Blank	48.29178	
Gross Test One:	47.92943	Gross Test Two:	46.47855		48.29148	
mass collected:	0.0009		0.0006		-0.0003	
Control Weights:						
Mass Change:	Filter:	0.00002	0.00002	0.00002		
Mass Change:	Beaker:	-0.00038	-0.00038	-0.00038		
DGM Cal factor(Yd):		1.0140	1.0138	Mass Emission with or without blank correction		
Avg Delta H(DH):	Pa	552	593	With = Y Without = N: n		
Barometric pressure(Pa):	Pa	100600	100550	9.4 6.3		
Reference pressure(P <sub>r</sub> ):	Pa	101325				
Avg DGM temp(Tm):	K	302.3	311.6			
Reference temp (Tr):	K	273				
Duct O <sub>2</sub> (O <sub>2</sub> ):	%					
Ref O <sub>2</sub> (O <sub>2</sub> ):	%					
Moisture(W <sub>2</sub> ):	%	1.20	0.73			
Gas vol sampled(V <sub>m</sub> ):	m <sup>3</sup>	0.74	0.77			
Gas vol corrected(V <sub>c</sub> ):	m <sup>3</sup>	0.68	0.68			
Moles Dry Gas(M <sub>d</sub> ):	M	30.30	30.39			
Particulates collected, (Mass):	mg	6.44	4.31			
Concentration at STP dry(C <sub>m</sub> ):	mg/m <sup>3</sup>	9.49	6.33			
Concentration at STP wet(C <sub>w</sub> ):	mg/m <sup>3</sup>	9.38	6.28			
Concentration at ref O <sub>2</sub> (C-O <sub>2</sub> ):	mg/m <sup>3</sup>	9.49	6.33			
Minus Blank:	mg	6.46	4.32			
	mg/m <sup>3</sup>	9.51	6.35			
	mg/m <sup>3</sup>	9.40	6.30			
	mg/m <sup>3</sup>	9.51	6.35			
				% of limit Value		
Overall Test Blank:	mg	-0.02	-0.02			
	mg/m <sup>3</sup>	-0.02	-0.02	-0.1%	-0.1%	
	mg/m <sup>3</sup>	-0.02	-0.02	-0.1%	-0.1%	
	mg/m <sup>3</sup>	-0.02	-0.02	-0.1%	-0.1%	
Acetone Blank:	mg	0.08	0.08			
	mg/m <sup>3</sup>	0.12	0.12			
	mg/m <sup>3</sup>	0.12	0.12			
	mg/m <sup>3</sup>	0.12	0.12			
Emission Limit:	mg/m <sup>3</sup>	20				
Test Detection limit:						
Particulates collected, (Mass):	mg	0.29	0.29			
Concentration at STP dry(C <sub>m</sub> ):	mg/m <sup>3</sup>	0.42	0.42			
Concentration at STP wet(C <sub>w</sub> ):	mg/m <sup>3</sup>	0.41	0.42			
Concentration at ref O <sub>2</sub> (C-O <sub>2</sub> ):	mg/m <sup>3</sup>	0.42	0.42			
Impinger weights:	g	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5
Before Test One:		580.6				
After Test One:		587.2				
H <sub>2</sub> O collected:		6.6	Moles H <sub>2</sub> O:	0.37		
			Imp 1	Imp 2	Imp 3	Imp 4
Before Test Two:		587.2				
After Test Two:		591.2				
H <sub>2</sub> O collected:		4.0	Moles H <sub>2</sub> O:	0.22		
Test DGM readings:	I					
Before Test One:		3090.7200	Before Test Two:	3844.2500	Metric Millenium Inst	
After Test One:		3833.2100	After Test Two:	4612.1600	Meter	
Sampled vol:		742.490		767.910		
% Isokinetic:	Test One:		Test Two:			
Nozzle Dia:	"	0.3315	0.3315			
Sample time / point:	mins	8	8			
Sample Duration:	mins	32	32			
Theoretical vol @ STP:	m <sup>3</sup>	0.682	0.685			
% Isokinetic:		101	In Range	100	In Range	
Number of traverses:		2	2			
Theoretical Number of Traverses:		2	2			
Theoretical Points / Traverse:		2	2			
Actual Points / Traverse:		2	2			
Standard Uncertainty:	+/-	0.4	mg/m <sup>3</sup>	0.4		
Expanded Uncertainty:	+/-	0.84	mg/m <sup>3</sup>	0.79		
% of ELV:		4.2		4.0		

## **APPENDIX III**

**Stack Ref.: BRO 3 (A3) 4.5MW Induction Furnace**

Emission Source            BRO 3 (A3)            4.5MW Induction Furnace  
 Substances monitored:    Particulates.  
 Arrestment:                Dry Bag Filter

<b>Emission Point Description:</b>			13284 / 16911 Compliant
Duct dimensions:	1.0 m diameter		-
Location of sampling plane:	In vertical outlet stack		✓
Type of sampling port:	2 x 4 " BSP		✓
Number of sample lines:	Two		✓
Arrangement of sample lines:	90°		✓
Orientation of sample lines:	Horizontal		✓
Gas flow parameters	Flow: angle < 15°, > 5Pa, Ratio < 3:1, no -ve flow		✓





PARTICULATES											
Template Version 4 / Feb15 / TH											
VELOCITY CALCULATION											
Site:	Brockmoor Foundry	Plant:	Brierley Hill	Date:	25/08/2016						
Stack diameter(Ds):	m	1.00									
Stack dimensions(L,W):	m			0.00							
Stack area(As):	m <sup>2</sup>	0.785									
Reference temp(Tr):	K	273									
Reference Pressure (Pr):	Pa	101300									
Barometric Pressure (Pb):	mb	1002	100200	Pa							
Static Pressure (Ps):	*H <sub>2</sub> O	-18.6	-4633	Pa							
	mmH <sub>2</sub> O		0	Pa							
Pitot coefficient(Cp):		0.83	Note: Use 1 if raw data corrected								
TEST ONE:											
	Delta Hs (mm)	Pitot mm H <sub>2</sub> O	Pa	Stack Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m <sup>3</sup> /s	STP V(m/s)	Vol Flow m <sup>3</sup> /s	Vol Flow m <sup>3</sup> /min
	87	21	141	45	29	29	15	11	12	9.3	556
	87	21	141	47	31	29					
	67	16	107	49	33	29					
	66	16	106	47	34	29		Vol Flow		Vol Flow	
	80	19	129	49	34	30		cfm		cfm	
	82	19	131	45	35	30					
	62	15	99	45	35	30		24321		19620	
	63	15	102	43	36	31					
		Mean	119	46		32					
		Std	16	2.0							
			Pa	Temp, °C		DGM					
TEST TWO:											
Barometric Pressure (Pb):	mb	1002	100200	Pa							
Static Pressure (Ps):	*H <sub>2</sub> O	-18.6	-4633	Pa							
	mmH <sub>2</sub> O		0	Pa							
Pitot coefficient(Cp):		0.83									
TEST TWO:											
	Delta Hs (mm)	Pitot mm H <sub>2</sub> O	Pa	Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m <sup>3</sup> /s	STP V(m/s)	Vol Flow m <sup>3</sup> /s	Vol Flow m <sup>3</sup> /min
	56	13	88	40	32	32	14	11	11	8.8	527
	56	13	88	40	34	32					
	45	11	71	41	35	32					
	69	16	109	42	36	32					
	42	10	66	43	36	32		Vol Flow		Vol Flow	
	98	23	154	45	35	32		cfm		cfm	
	75	17	118	45	36	32		22826		18615	
	91	21	142	45	37	32					
	72	17	114	44	37	33					
	78	18	122	43	37	33					
	72	17	113	43	37	33					
		Mean	108	43		34					
		Std	26	1.8							
			Pa	Temp, °C		DGM					
EFFLUX VELOCITY CALCULATIONS											
Performed in accordance with HMIP Technical Guidance Note D1											
Stack area (As)		0.79		Heat Release	Momentum	Minimum Velocity					
Efflux velocity		14.6	m/s								
Discharge gas temperature		319.3	*K	0.1	10	10					
Vol discharge rate of gases		11.48	m <sup>3</sup> /s	0.2	20	11					
Ambient temperature(K)		283	*K	0.3	30	11					
				0.4	40	12					
				0.5	50	12					
Heat release.				0.6	60	13					
	Q=	0.45	MW	0.7	70	13					
				0.8	80	14					
Momentum.				0.9	90	14					
	M=	149		1	100	15					
CONTINUOUS MONITOR CALIBRATION CALCULATIONS											
Test No.	Iso test mgm	Duration mins	Meter mgm	Duration mins	Ave Iso	Ave Meter	Old Gain:	0.124			
1	0.9	40	0.3063	20	0.75	0.30	New Gain:	0.315			
2	0.6	40	0.3988	20							
			0.1832	20							
			0.2928	20							



PARTICULATES		Template Version 4 / Feb15 / TH				
Site:	Brockmoor Foundry	Plant:	Brierley Hill		Date:	25-Aug-16
Stack diameter(Ds):	Units m	1.00	0.50			
Stack dimensions(Ds):	m	0.00	0.00			
Stack area(As):	m <sup>2</sup>	0.785				
Standard 9096 or 13284:		13284				
Filter ID:		1510	1511	1512		
Filter Size 37, 47, 110 or 4:		47	47	47		
Sample Ref:		BRO 3-1	BRO 3-2	BRO 3-B		
Filter weights:						
Tare Test One:		0.15397	Tare Test Two:	0.14709	Blank	
Gross Test One:		0.15445	Gross Test Two:	0.14731	0.14682	
mass collected:		0.00048		0.00022	-0.00010	
Wash Out Weights:						
Tare Test One:		46.93085	Tare Test Two:	48.37608	Blank	
Gross Test One:		46.93091	Gross Test Two:	48.37601	46.82748	
mass collected:		0.0001		-0.0001	-0.0005	
Control Weights:		Test 1	Test 2	Blank		
Mass Change:	Filter:	0.00001	0.00001	0.00001		
Mass Change:	Beaker:	-0.00038	-0.00038	-0.00038		
DGM Cal factor(Yd):		1.0047	1.0138			
Avg Delta H(DH):	Pa	729	673			
Barometric pressure(Pba):	Pa	100200	100200			
Reference pressure(Pr):	Pa	101325				
Avg DGM temp(Tm):	K	304.5	307.0			
Reference temp (Tr):	K	273				
Duct O2(Od):	%					
Ref O2(Or):	%					
Moisture(Bws):	%	1.30	0.74			
Gas vol sampled(Vm):	m <sup>3</sup>	1.96	1.00			
Gas vol corrected(Vc):	m <sup>3</sup>	0.95	0.90			
Moles Dry Gas(Mdg):	M	42.50	40.07			
Particulates collected, (Mass):	mg	0.91	0.51			
Concentration at STP dry(Cm):	mg/m <sup>3</sup>	0.95	0.76	0.56		
Concentration at STP wet(Cw):	mg/m <sup>3</sup>	0.94	0.75	0.56		
Concentration at rel O2(C-O2):	mg/m <sup>3</sup>	0.95		0.56		
Minus Blank:	mg	1.10	0.69			
	mg/m <sup>3</sup>	1.15	0.96	0.77		
	mg/m <sup>3</sup>	1.14	0.95	0.77		
	mg/m <sup>3</sup>	1.15		0.77		
Overall Test Blank	mg	-0.19	-0.19			
	mg/m <sup>3</sup>	-0.20	-0.20	-1.0%	-1.0%	
	mg/m <sup>3</sup>	-0.20	-0.20	-1.0%	-1.0%	
	mg/m <sup>3</sup>	-0.20	-0.21	-1.0%	-1.0%	
Acetone Blank	mg	-0.08	-0.08			
	mg/m <sup>3</sup>	-0.08	-0.08	-0.08		
	mg/m <sup>3</sup>	-0.08	-0.08	-0.08		
	mg/m <sup>3</sup>	-0.08	-0.08	-0.08		
Emission Limit:	mg/m <sup>3</sup>	20				
Test Detection limit:						
Particulates collected, (Mass):	mg	0.29	0.29			
Concentration at STP dry(Cm):	mg/m <sup>3</sup>	0.30	0.32			
Concentration at STP wet(Cw):	mg/m <sup>3</sup>	0.30	0.32			
Concentration at rel O2(C-O2):	mg/m <sup>3</sup>	0.30	0.32			
Impinger weights:	g	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5
Before Test One:		580.2				
After Test One:		580.3				
H2O collected:		10.1	Moles H <sub>2</sub> O:	0.56		
Before Test Two:		590.3	Imp 1	Imp 2	Imp 3	Imp 4
After Test Two:		595.7	Imp 1	Imp 2	Imp 3	Imp 4
H2O collected:		5.4	Moles H <sub>2</sub> O:	0.30		
Test DGM readings:	l					
Before Test One:		4629.880	Before Test Two:	5706.130	Metric Millennium Inst	
After Test One:		5690.890	After Test Two:	6706.100	Meter	
Sampled vol :		1061.010		999.970		
% Isokinetic	Test One:		Test Two:			
Nozzle Dia:	"	0.2575	0.2575			
Sampl time / point	mins	10	10			
Sample Duration:	mins	40	40			
Theoretical vol @ STP:	m <sup>3</sup>	0.951	0.902			
% Isokinetic:		101	In Range	100	In Range	
Number of traverses:		2	2			
Theoretical Number of Traverses:		2	2			
Theoretical Points / Traverse		2	2			
Actual Points / Traverse		2	2			
Standard Uncertainty	+/-	0.3	mg/m <sup>3</sup>	0.3		
Expanded Uncertainty:	+/-	0.54	mg/m <sup>3</sup>	0.57		
% of ELV		2.7		2.8		

Mass Emission with or without blank correction

With = Y Without = N: n

Mass Emission		
Test One	Test Two	
8.7	4.9	mg/s
31	18	g/hr
251	141	g/8 hr day
1.3	0.71	kg/5 day week
60	34	kg/48 week year

## **APPENDIX IV**

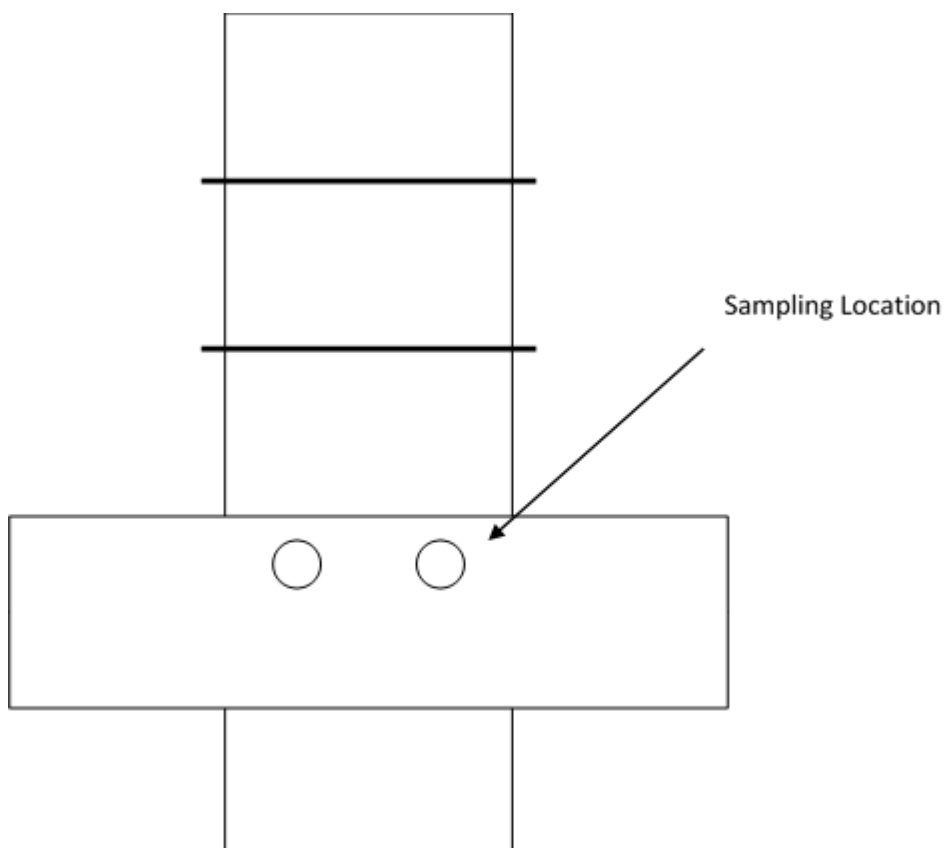
**Stack Ref.: BRO 5 (A5) Magnesium Treatment**

Emission Source            BRO 5 (A5)    Magnesium Treatment

Substances monitored:    Particulates

Arrestment:                Dry Bag Filter

<b>Emission Point Description:</b>			13284 / 16911 Compliant
Duct dimensions:	0.675 x 0.675 m diameter		-
Location of sampling plane:	In vertical outlet stack		✓
Type of sampling port:	2 x 4 " BSP		✓
Number of sample lines:	Two		✓
Arrangement of sample lines:	Parallel		✓
Orientation of sample lines:	Horizontal		✓
Gas flow parameters	Flow: angle < 15°, > 5Pa, Ratio < 3:1, no -ve flow		✓









PARTICULATES		Template Version 4 / Feb15 / TH			Date: 24-Aug-16	
Site:	Brockmoor	Plant:	Brierley Hill			
Units						
Stack diameter(Ds):	m	0.00	0.00			
Stack dimensions(Ds):	m	0.68	0.68			
Stack area(As):	m <sup>2</sup>	0.456				
Standard 9096 or 13284:		13284				
Filter ID:		1492	1493	1494		
Filter Size 37, 47, 110 or 4:		47	47	47		
Sample Ref:		BRO 5-1	BRO 5-2	BRO 5-B		
Filter weights:				Blank		
Tare Test One:		0.14886	Tare Test Two: 0.14721	0.14606		
Gross Test One:		0.14879	Gross Test Two: 0.14707	0.14593		
mass collected:		-0.00007	-0.00014	-0.00013		
Wash Out Weights:				Blank		
Tare Test One:		48.05921	Tare Test Two: 46.49378	46.81195		
Gross Test One:		48.05881	Gross Test Two: 46.49338	46.81168		
mass collected:		-0.0004	-0.0004	-0.0003		
Control Weights:		Test 1	Test 2	Blank		
Mass Change:	Filter:	0.00001	0.00001	0.00001		
Mass Change:	Beaker:	-0.00038	-0.00038	-0.00038		
DGM Cal factor(Yd):		1.0020	1.0020			
Avg Delta H(DH):	Pa	680	688			
Barometric pressure(Pba):	Pa	100600	100600			
Reference pressure(Pf):	Pa	101325				
Avg DGM temp(Tm):	K	273	301.4	306.7		
Reference temp (Tf):	K					
Duct O2(Od):	%					
Ref O2(Or):	%					
Moisture(Bws):	%	1.24	0.74			
Gas vol sampled(Vm):	m <sup>3</sup>	0.84	0.85			
Gas vol corrected(Vc):	m <sup>3</sup>	0.76	0.76			
Moles Dry Gas(Mdg):	M	33.96	33.75			
Particulates collected, (Mass):	mg	-0.11	-0.17			
Concentration at STP dry(Cm):	mg/m <sup>3</sup>	-0.14	-0.23			
Concentration at STP wet(Cw):	mg/m <sup>3</sup>	-0.14	-0.23			
Concentration at ref O2(C-O2):	mg/m <sup>3</sup>	-0.14	-0.23			
Minus Blank:	mg	-0.08	-0.14			
	mg/m <sup>3</sup>	-0.10	-0.19			
	mg/m <sup>3</sup>	-0.10	-0.19			
	mg/m <sup>3</sup>	-0.10	-0.19			
Overall Test Blank:	mg	-0.03	-0.03			
	mg/m <sup>3</sup>	-0.04	-0.04	-0.2%	-0.2%	
	mg/m <sup>3</sup>	-0.04	-0.04	-0.2%	-0.2%	
	mg/m <sup>3</sup>	-0.04	-0.04	-0.2%	-0.2%	
Acetone Blank:	mg	0.11	0.11			
	mg/m <sup>3</sup>	0.15	0.15			
	mg/m <sup>3</sup>	0.14	0.15			
	mg/m <sup>3</sup>	0.15	0.15			
Emission Limit:	mg/m <sup>3</sup>	20				
Test Detection limit:						
Particulates collected, (Mass):	mg	0.29	0.29			
Concentration at STP dry(Cm):	mg/m <sup>3</sup>	0.37	0.38			
Concentration at STP wet(Cw):	mg/m <sup>3</sup>	0.37	0.37			
Concentration at ref O2(C-O2):	mg/m <sup>3</sup>	0.37	0.38			
Impinger weights:	g	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5
Before Test One:		580.2				
After Test One:		587.9				
H2O collected:		7.7		0.43		
			Imp 2	Imp 3	Imp 4	Imp 5
Before Test Two:		587.9				
After Test Two:		592.4				
H2O collected:		4.5		0.25		
Test DGM readings:	m <sup>3</sup>					
Before Test One:		327.8460	Before Test Two: 328.6941	Metric Andersen		
After Test One:		328.6845	After Test Two: 329.5421	Meter		
Sampled vol :		0.8385	0.8480			
% Isokinetic:	Test One:		Test Two:			
Nozzle Dia:	"	0.3760	0.3760			
Sample time / point:	mins	8	8			
Sample Duration:	mins	32	32			
Theoretical vol @ STP:	m <sup>3</sup>	0.770	0.761			
% Isokinetic:		100	In Range	100	In Range	
Number of traverses:		2	2			
Theoretical Number of Traverses:		2	2			
Theoretical Points / Traverse:		2	2			
Actual Points / Traverse:		2	2			
Standard Uncertainty:	+/-	0.3	mg/m <sup>3</sup>	0.3		
Expanded Uncertainty:	+/-	0.67	mg/m <sup>3</sup>	0.68		
% of ELV:		3.3		3.4		

Mass Emission with or without blank correction

With = Y Without = N:

n	0.4	0.4
---	-----	-----

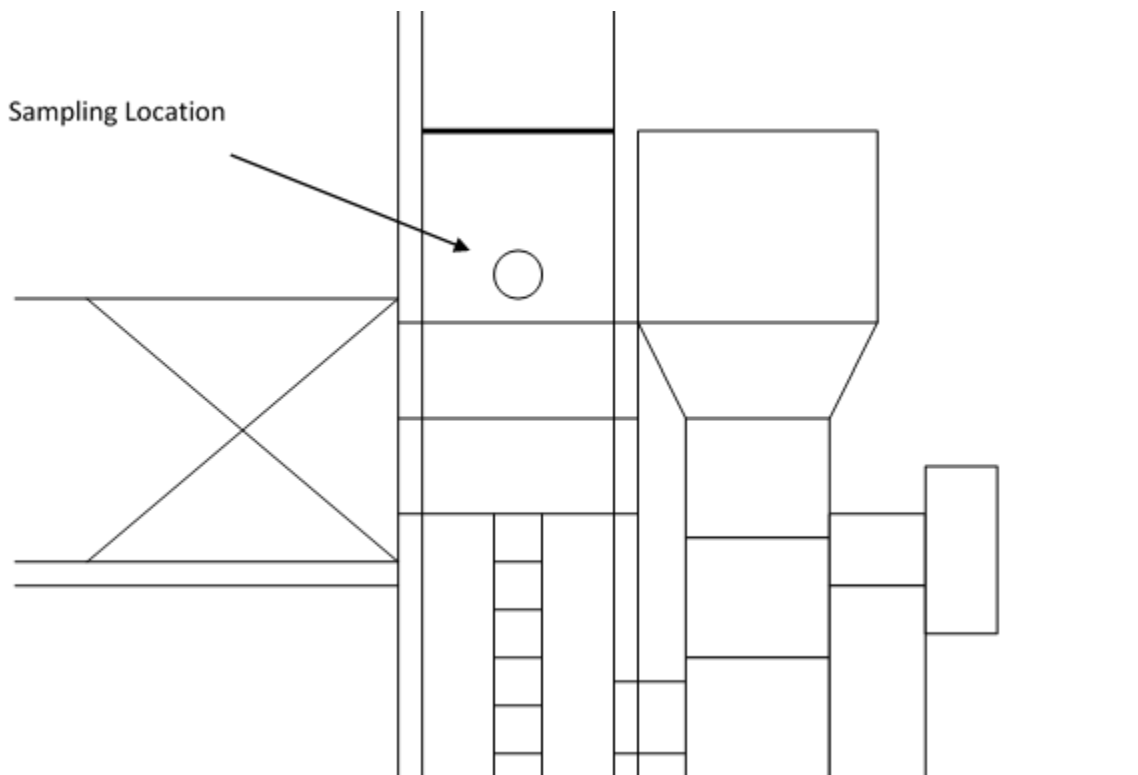
Mass Emission		
Test One	Test Two	
< 0.94	< 0.93	mg/s
< 3.4	< 3.4	g/hr
< 27	< 27	g/8 hr day
< 0.14	< 0.13	kg/5 day week
< 6.5	< 6.4	kg/48 week year

## **APPENDIX V**

**Stack Ref.: BRO 7 (A7) Knockout & Sandplant**

Emission Source            BRO 7 (A7)    Knockout & Sandplant  
 Substances monitored:    Particulates  
 Arrestment:                Dry Bag Filter

<b>Emission Point Description:</b>			13284 / 16911 Compliant
Duct dimensions:	1.29 m diameter		-
Location of sampling plane:	In vertical outlet stack		✓
Type of sampling port:	1 x 4 " BSP		✗
Number of sample lines:	One		✗
Arrangement of sample lines:	N/a		✗
Orientation of sample lines:	Horizontal		✓
Gas flow parameters	Flow: angle < 15°, > 5Pa, Ratio < 3:1, no -ve flow		✓







PARTICULATES		Template Version 4 / Feb15 / TH					
Site:	Brockmoor	Plant:	Brierley Hill	Date:	25-Aug-16		
Units							
Stack diameter(Ds):	m	1.29	0.65				
Stack dimensions(Ds):	m	0.00	0.00				
Stack area(As):	m <sup>2</sup>	1.307					
Standard 9096 or 13284:		13284					
Filter ID:		1452	1508	1509			
Filter Size 37, 47, 110 or 4:		47	47	47			
Sample Ref:		BRO 7-1	BRO 7-2	BRO 7-B			
Filter weights:							
Tare Test One:	0.14665	Tare Test Two:	0.14711	Blank			
Gross Test One:	0.14709	Gross Test Two:	0.14738	0.14701			
mass collected:	0.00044		0.00027	-0.14691			
				-0.00010			
Wash Out Weights:							
Tare Test One:	50.86258	Tare Test Two:	59.71435	Blank			
Gross Test One:	50.86258	Gross Test Two:	59.71412	62.31218			
mass collected:	0.0000		-0.0002	62.31169			
				-0.0005			
Control Weights:							
Mass Change:	Filter:	0.00002	0.00001	Blank			
				0.00001			
Mass Change:	Beaker:	-0.00038	-0.00038	-0.00038			
DGM Cal factor(Yd):		0.9692	0.9692	Mass Emission with or without blank correction			
Avg Delta H(DH):	Pa	410	414	With = Y Without = N: n			
Barometric pressure(Pba):	Pa	100200	100200	1.1 0.5			
Reference pressure(Pf):	Pa	101325					
Avg DGM temp(Tm):	K	273	284.5				
Reference temp (Tr):	K		290.6				
Duct O2(Od):	%						
Ref O2(Or):	%						
Moisture(Bws):	%	1.38	1.19				
Gas vol sampled(Vm):	m <sup>3</sup>	0.81	0.83				
Gas vol corrected(Vc):	m <sup>3</sup>	0.75	0.75				
Moles Dry Gas(Mdg):	M	33.33	33.34				
Particulates collected, (Mass):	mg	0.80	0.40				
Concentration at STP dry(Cm):	mg/m <sup>3</sup>	1.07	0.81				
Concentration at STP wet(Cw):	mg/m <sup>3</sup>	1.06	0.80				
Concentration at ref O2(C-O2):	mg/m <sup>3</sup>	1.07	0.84				
Minus Blank:	mg	1.04	0.64				
	mg/m <sup>3</sup>	1.39	1.12				
	mg/m <sup>3</sup>	1.37	1.11				
	mg/m <sup>3</sup>	1.39	0.86				
Overall Test Blank:	mg	-0.24	-0.24	% of limit Value			
	mg/m <sup>3</sup>	-0.31	-0.31	-1.6% -1.6%			
	mg/m <sup>3</sup>	-0.31	-0.31	-1.6% -1.6%			
	mg/m <sup>3</sup>	-0.31	-0.31	-1.6% -1.6%			
Acetone Blank:	mg	-0.12	-0.12				
	mg/m <sup>3</sup>	-0.15	-0.15				
	mg/m <sup>3</sup>	-0.15	-0.15				
	mg/m <sup>3</sup>	-0.15	-0.15				
Emission Limit:	mg/m <sup>3</sup>	20					
Test Detection limit:							
Particulates collected, (Mass):	mg	0.29	0.29				
Concentration at STP dry(Cm):	mg/m <sup>3</sup>	0.38	0.38				
Concentration at STP wet(Cw):	mg/m <sup>3</sup>	0.38	0.38				
Concentration at ref O2(C-O2):	mg/m <sup>3</sup>	0.38	0.38				
Impinger weights:	g	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6
Before Test One:		578.6					
After Test One:		588.0					
H2O collected:		8.4	Moles H2O:	0.47			
Before Test Two:		Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6
After Test Two:		588.0					
H2O collected:		595.2					
		7.2	Moles H2O:	0.40			
Test DGM readings:	m <sup>3</sup>						
Before Test One:		603.106	Before Test Two:	603.918	Imperial Apex 572		
After Test One:		603.915	After Test Two:	604.744	Meter		
Sampled vol :		0.808		0.826			
% Isokinetic:	Test One:		Test Two:				
Nozzle Dia:	"	0.2220	0.2220				
Sampl time / point:	mins	5	5				
Sample Duration:	mins	40	40				
Theoretical vol @ STP:	m <sup>3</sup>	0.738	0.744				
% Isokinetic:		103	In Range	102	In Range		
Number of traverses:		1	1				
Theoretical Number of Traverses:		2	2				
Theoretical Points / Traverse:		4	4				
Actual Points / Traverse:		8	8				
Standard Uncertainty:	+/	0.3	mg/m <sup>3</sup>	0.3			
Expanded Uncertainty:	+/	0.68	mg/m <sup>3</sup>	0.68			
% of ELV:		3.4		3.4			

## **APPENDIX VI**

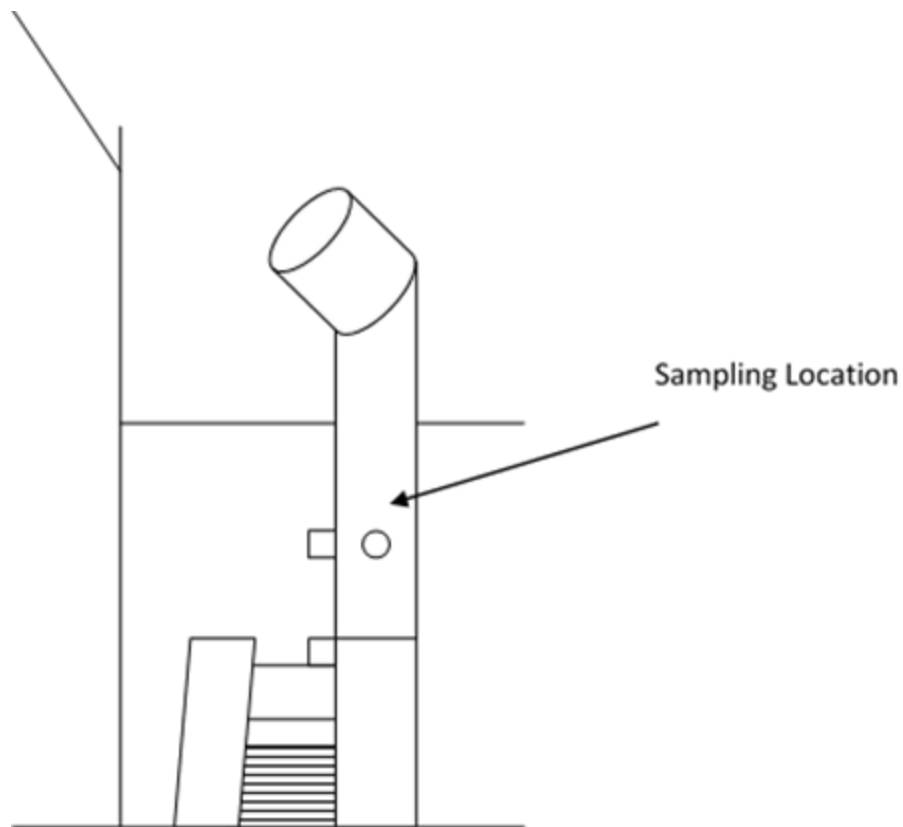
**Stack Ref.: BRO 28 Megaldi Cast/Cool  
(A28) LH Vent**

Emission Source            BRO 28 (A28)    Megaldi Cast/Cool LH Vent

Substances monitored:    Particulates.

Arrestment:                Dry Bag Filter

<b>Emission Point Description:</b>			13284 / 16911 Compliant
Duct dimensions:	0.63 m diameter		-
Location of sampling plane:	In vertical outlet stack		✓
Type of sampling port:	2 x 4 " BSP		✓
Number of sample lines:	Two		✓
Arrangement of sample lines:	90°		✓
Orientation of sample lines:	Horizontal		✓
Gas flow parameters	Flow: angle < 15°, > 5Pa, Ratio < 3:1, no -ve flow		✓







PARTICULATES		Template Version 4 / Feb15 / TH											
VELOCITY CALCULATION													
Site:	Brockmoor	Plant:	Brierley Hill	Date:	24/08/2016								
Stack diameter(Ds):	m	0.63		0.00									
Stack dimensions(L,W):	m												
Stack area(As):	m²	0.312											
Reference temp(T):	K	273											
Reference Pressure (Pr):	Pa	101300											
Barometric Pressure (Pb):	mb	1005.5		100550	Pa								
Static Pressure (Ps):	*H₂O	0.098		24	Pa								
	mmH₂O			0	Pa								
Pitot coefficient(Cp):		0.827		Note: Use 1 if raw data corrected									
TEST ONE:			STP										
	Delta Hs (mm)	Pitot mm H₂O	Pa	Stack Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m³/s	V(m/s)	Vol Flow m³/s	Vol Flow m³/min		
	99.3	43	288.4	32		17	17	5.2	14.9	4.6	278		
	62.4	27	181.1	33		18							
	64.5	28	187.8	33		18		Vol Flow		Vol Flow			
	36	15.6	104.6	32		19		cfm		cfm			
	36.5	15.8	106.0	32		19							
	36.5	15.8	106.0	30		20		11052		9830			
	36.5	15.8	106.0	30		20							
	Mean		171	32									
	Std		75	1.1									
			Pa	Temp, °C	DGM								
TEST TWO:			STP										
Barometric Pressure (Pb):	mb	1005.5		100550	Pa								
Static Pressure (Ps):	*H₂O	0.098		24	Pa								
	mmH₂O			0	Pa								
Pitot coefficient(Cp):		0.827											
	Delta Hs (mm)	Pitot mm H₂O	Pa	Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m³/s	V(m/s)	Vol Flow m³/s	Vol Flow m³/min		
	97	42	282	32		20	17	5.2	15	4.6	277		
	95	41	275	32		21							
	61	27	178	33		21							
	62	27	181	32		21		Vol Flow		Vol Flow			
	37	16	109	33		22		cfm		cfm			
	38	17	111	33		22							
	36	16	105	33		22		11028		9776			
	38	16	110	34		22							
	Mean		169	33									
	Std		70	0.66									
			Pa	Temp, °C	DGM								
EFFLUX VELOCITY CALCULATIONS													
Performed in accordance with HMIP Technical Guidance Note D1													
Stack area (As)		0.31			Heat Release	Momentum	Minimum Velocity						
Efflux velocity		16.7		m/s	0.1	10	10						
Discharge gas temperature		305.8		*K	0.2	20	11						
Vol discharge rate of gases		5.22		m³/s¹	0.3	30	11						
Ambient temperature(K)		283		*K	0.4	40	12						
					0.5	50	12						
Heat release:	Q=	0.13		MW	0.6	60	13						
					0.7	70	13						
					0.8	80	14						
Momentum:	M=	81			0.9	90	14						
					1	100	15						



PARTICULATES		Template Version 4 / Feb15 / TH			Date: 24-Aug-16		
Site:	Brockmoor	Plant:	Brierley Hill				
Units							
Stack diameter(Ds):	m	0.63	0.32				
Stack dimensions(Ds):	m	0.00	0.00				
Stack area(As):	m <sup>2</sup>	0.312					
Standard 9096 or 13284:		13284					
Filter ID:		1475	1476	1477			
Filter Size 37, 47, 110 or 4:		47	47	47			
Sample Ref:		BRO 28-1	BRO 28-2	BRO 28-B			
Filter weights:				Blank			
Tare Test One:		0.14730	Tare Test Two:	0.15141	0.14742		
Gross Test One:		0.14756	Gross Test Two:	0.15177	0.14732		
mass collected:		0.00026		0.00036	-0.00010		
Wash Out Weights:				Blank			
Tare Test One:		59.29068	Tare Test Two:	58.60186	48.33121		
Gross Test One:		59.29048	Gross Test Two:	58.60174	48.33065		
mass collected:		-0.0002		-0.0001	-0.0006		
Control Weights:		Test 1	Test 2	Blank			
Mass Change:	Filter:	0.00002	0.00002	0.00002			
Mass Change:	Beaker:	-0.00029	-0.00029	-0.00029			
DGM Cal factor(Yd):		0.9673	0.9673				
Avg Delta H(DH):	Pa	577	570				
Barometric pressure(Pba):	Pa	100550	100550				
Reference pressure(Pr):	Pa	101325					
Avg DGM temp(Tm):	K	273	291.4	294.4			
Reference temp (Tr):	K	273					
Duct O2(O <sub>2</sub> ):	%						
Ref O2(O <sub>2</sub> ):	%						
Moisture(Bws):	%	1.27	0.95				
Gas vol sampled(Vm):	m <sup>3</sup>	0.77	0.77				
Gas vol corrected(Vc):	m <sup>3</sup>	0.70	0.69				
Moles Dry Gas(Mdg):	M	31.09	30.62				
Particulates collected, (Mass):	mg	0.32	0.51				
Concentration at STP dry(Cm):	mg/m <sup>3</sup>	0.46	0.61	0.75			
Concentration at STP wet(Cw):	mg/m <sup>3</sup>	0.46	0.60	0.74			
Concentration at ref O2(C-O2):	mg/m <sup>3</sup>	0.46	0.75				
Minus Blank:	mg	0.71	0.90				
	mg/m <sup>3</sup>	1.01	1.16	1.31			
	mg/m <sup>3</sup>	1.00	1.15	1.30			
	mg/m <sup>3</sup>	1.01	1.31				
Overall Test Blank:	mg	-0.38	-0.38				
	mg/m <sup>3</sup>	-0.55	-0.56	-0.56	-2.8%	-2.8%	
	mg/m <sup>3</sup>	-0.54	-0.55	-0.55	-2.7%	-2.8%	
	mg/m <sup>3</sup>	-0.55	-0.56	-0.56	-2.8%	-2.8%	
Acetone Blank:	mg	-0.27	-0.27				
	mg/m <sup>3</sup>	-0.38	-0.38	-0.38			
	mg/m <sup>3</sup>	-0.38	-0.38	-0.38			
	mg/m <sup>3</sup>	-0.38	-0.38	-0.38			
Emission Limit:	mg/m <sup>3</sup>	20					
Test Detection limit:							
Particulates collected, (Mass):	mg	0.29	0.29				
Concentration at STP dry(Cm):	mg/m <sup>3</sup>	0.41	0.42				
Concentration at STP wet(Cw):	mg/m <sup>3</sup>	0.40	0.41				
Concentration at ref O2(C-O2):	mg/m <sup>3</sup>	0.41	0.42				
Impinger weights:	g	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6
Before Test One:		580.5					
After Test One:		587.7					
H2O collected:		7.2	Moles H <sub>2</sub> O:	0.40			
		Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6
Before Test Two:		587.7					
After Test Two:		593.0					
H2O collected:		5.3	Moles H <sub>2</sub> O:	0.29			
Test DGM readings:	m <sup>3</sup>						
Before Test One:		599.494	Before Test Two:	600.267	Imperial Apex 572		
After Test One:		600.264	After Test Two:	601.033	Meter		
Sampled vol :		0.770		0.766			
% Isokinetic:		Test One:	Test Two:				
Nozzle Dia:	"	0.2220	0.2220				
Sample time / point	mins	8	8				
Sample Duration:	mins	32	32				
Theoretical vol @ STP:	m <sup>3</sup>	0.714	0.710				
% Isokinetic:		99	In Range	98	In Range		
Number of traverses:		2	2				
Theoretical Number of Traverses:		2	2				
Theoretical Points / Traverse		2	2				
Actual Points / Traverse		2	2				
Standard Uncertainty	+/-	0.37	mg/m <sup>3</sup>	0.37			
Expanded Uncertainty:	+/-	0.73	mg/m <sup>3</sup>	0.74			
% of ELV		3.7		3.7			

Mass Emission with or without blank correction

With = Y Without = N: n

Mass Emission		
Test One	Test Two	
2.1	3.4	mg/s
7.6	12	g/hr
61	99	g/8 hr day
0.31	0.49	kg/5 day week
15	24	kg/48 week year

## **APPENDIX VII**

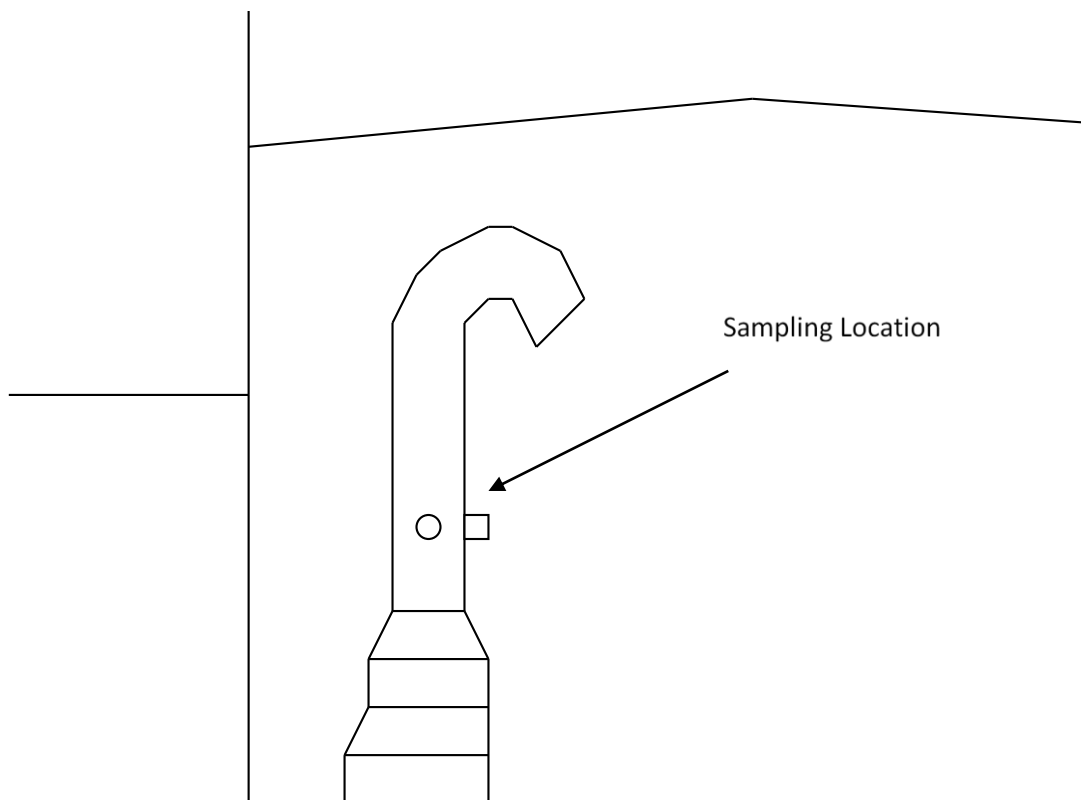
**Stack Ref.: BRO 29 Megaldi Cast/Cool  
(A29) RH Vent**

Emission Source            BRO 29 (A29)    Megaldi Cast/Cool RH Vent

Substances monitored:    Particulates

Arrestment:                Dry Bag Filter

<b>Emission Point Description:</b>			13284 / 16911 Compliant
Duct dimensions:	0.63 m diameter		-
Location of sampling plane:	In vertical outlet stack		✓
Type of sampling port:	2 x 4 " BSP		✓
Number of sample lines:	Two		✓
Arrangement of sample lines:	90°		✓
Orientation of sample lines:	Horizontal		✓
Gas flow parameters	Flow: angle < 15°, > 5Pa, Ratio < 3:1, no -ve flow		✓





PARTICULATES		Template Version 4 / Feb15 / TH									
<b>VELOCITY CALCULATION</b>											
Site:	Brockmoor Brierley Hill	Plant:	BRO29 Megalith RH		Date:	24/08/2016					
Stack diameter(Ds):	m	0.63			0.00						
Stack dimensions(L,W):	m										
Stack area(As):	m <sup>2</sup>	0.312									
Reference temp(Tr):	K	273									
Reference Pressure (Pr):	Pa	101300									
Barometric Pressure (Pb):	mb	1005	100500	Pa							
Static Pressure (Ps):	*H <sub>2</sub> O	0.409	102	Pa							
	mmH <sub>2</sub> O		0	Pa							
Pitot coefficient(Cp):		0.828	Note: Use 1 if raw data corrected								
<b>TEST ONE:</b>											
	Delta Hs (mm)	Pitot mm H <sub>2</sub> O	Pa	Stack Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m <sup>3</sup> /s	STP V(m/s)	Vol Flow m <sup>3</sup> /s	Vol Flow m <sup>3</sup> /min
	76	32	215	30		22	22	7.0	20	6.2	371
	76	32	215	31		22					
	133	56	377	33		23					
	133	56	377	35		23		Vol Flow		Vol Flow	
	76	32	215	36		24		cfm		cfm	
	76	32	215	36		24					
	155	85	437	36		25		14837		13097	
	119	50	336	36		25					
		Mean	298	34		24					
		Std	87	2.3							
			Pa	Temp, °C		DGM					
<b>TEST TWO:</b>											
Barometric Pressure (Pb):	mb	1006	100600	Pa							
Static Pressure (Ps):	*H <sub>2</sub> O	0.828	206	Pa							
	mmH <sub>2</sub> O		0	Pa							
Pitot coefficient(Cp):		0.828									
<b>TEST TWO:</b>											
	Delta Hs (mm)	Pitot mm H <sub>2</sub> O	Pa	Temp, °C	DGM in	DGM out	V(m/s)	Vol Flow m <sup>3</sup> /s	STP V(m/s)	Vol Flow m <sup>3</sup> /s	Vol Flow m <sup>3</sup> /min
	47.9	34	228.6	36		26	24	7.5	21	6.6	394
	45.1	32	215.2	37		26					
	87.4	62	416.9	38		26					
	87.4	62	416.9	39		26		Vol Flow		Vol Flow	
	47.9	34	228.6	38		27		cfm		cfm	
	46.5	33	221.9	38		27					
	107.2	76	511.0	38		27		15917		13921	
	107.2	76	511.0	37		28					
		Mean	344	38		27					
		Std	125	0.96							
			Pa	Temp, °C		DGM					
<b>EFFLUX VELOCITY CALCULATIONS</b>											
Performed in accordance with HMP Technical Guidance Note D1											
Stack area (As)		0.31		Heat Release		Momentum		Minimum Velocity			
Efflux velocity		24.1	m/s								
Discharge gas temperature		310.6	*K	0.1	10	10					
Vol discharge rate of gases		7.51	m <sup>3</sup> /s	0.2	30	11					
Ambient temperature(K)		283	*K	0.3	30	11	Use max of either Q or M				
				0.4	40	12					
				0.5	50	12					
Heat release.				0.6	60	13					
	Q=	0.23	MW	0.7	70	13					
				0.8	80	14					
Momentum.	M=	165		0.9	90	14					
				1	100	15					



PARTICULATES		Template Version 4 / Feb15 / TH					
Site:	Brockmoor Brierley Hill	Plant:	BRO29 Megaldi RH		Date:	24-Aug-16	
Stack diameter(Ds):	Units	0.63	0.32				
Stack dimensions(Ds):	m	0.00	0.00				
Stack area(As):	m <sup>2</sup>	0.312					
	Standard 9096 or 13284:	13284					
Filter ID:		1513	1514	1515			
	Filter Size 37, 47, 110 or 4:	47	47	47			
Sample Ref:		BRO 29-1	BRO 29-2	BRO 29-B			
Filter weights:							
Tare Test One:		0.14665	Tare Test Two:	0.15098	Blank		
Gross Test One:		0.14829	Gross Test Two:	0.15390	0.14707		
mass collected:		0.00164		0.00291	0.14698		
					-0.00009		
Wash Out Weights:					Blank		
Tare Test One:		46.47778	Tare Test Two:	45.16414	58.93638		
Gross Test One:		46.47754	Gross Test Two:	45.16402	58.93602		
mass collected:		-0.0002		-0.0001	-0.0004		
Control Weights:					Blank		
Mass Change:	Filter:	0.00001	0.00001	0.00001			
Mass Change:	Beaker:	-0.00029	-0.00029	-0.00029			
DGM Cal factor(Yd):		0.9609	0.9631		Mass Emission with or without blank correction		
Avg Delta HDH:	Pa	1036	707		With = Y Without = N: n		
Barometric pressure(Pba):	Pa	100500	100600		1.8 3.9		
Reference pressure(Pr):	Pa	101325					
Avg DGM temp(Tm):	K	296.5	299.6				
Reference temp (Tr):	K	273					
Duct O2(Od):	%						
Ref O2(Or):	%						
Moisture(Bws):	%	0.80	0.51				
Gas vol sampled(Vm):	m <sup>3</sup>	1.03	0.88				
Gas vol corrected(Vc):	m <sup>3</sup>	0.91	0.78				
Moles Dry Gas(Mdg):	M	40.82	34.63				
Particulates collected, (Mass):	mg	1.69	3.07				
Concentration at STP dry(Cm):	mg/m <sup>3</sup>	1.84	2.90	3.95			
Concentration at STP wet(Cw):	mg/m <sup>3</sup>	1.83	2.88	3.93			
Concentration at ref O2(C-O2):	mg/m <sup>3</sup>	1.84		3.95			
Minus Blank:	mg	1.86	3.24				
	mg/m <sup>3</sup>	2.03	3.11	4.18			
	mg/m <sup>3</sup>	2.02	3.09	4.16			
	mg/m <sup>3</sup>	2.03		4.18			
Overall Test Blank	mg	-0.17	-0.17		% of limit Value		
	mg/m <sup>3</sup>	-0.19	-0.21	-0.22	-1.0%	-1.1%	
	mg/m <sup>3</sup>	-0.19	-0.21	-0.22	-0.9%	-1.1%	
	mg/m <sup>3</sup>	-0.19	-0.22	-0.22	-1.0%	-1.1%	
Acetone Blank	mg	-0.07	-0.07				
	mg/m <sup>3</sup>	-0.08	-0.08	-0.09			
	mg/m <sup>3</sup>	-0.08	-0.08	-0.09			
	mg/m <sup>3</sup>	-0.08	-0.09	-0.09			
Emission Limit:	mg/m <sup>3</sup>	20					
Test Detection limit:							
Particulates collected, (Mass):	mg	0.29	0.29				
Concentration at STP dry(Cm):	mg/m <sup>3</sup>	0.31	0.37				
Concentration at STP wet(Cw):	mg/m <sup>3</sup>	0.31	0.37				
Concentration at ref O2(C-O2):	mg/m <sup>3</sup>	0.31	0.37				
Impinger weights:	g	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6
Before Test One:		580.0					
After Test One:		585.9					
H2O collected:		5.9	Moles H <sub>2</sub> O:	0.33			
Before Test Two:		Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6
After Test Two:		585.9					
H2O collected:		589.1					
		3.2	Moles H <sub>2</sub> O:	0.18			
Test DGM readings:	m <sup>3</sup>						
Before Test One:		601.035	Before Test Two:	602.071	Imperial Apex 572		
After Test One:		602.067	After Test Two:	602.955	Meter		
Sampled vol:		1.031		0.884			
% Isokinetic		Test One:	Test Two:				
Nozzle Dia:	"	0.2220	0.1950				
Sample time / point	mins	8	8				
Sample Duration:	mins	32	32				
Theoretical vol @ STP:	m <sup>3</sup>	0.951	0.780				
% Isokinetic:		97	In Range	100	In Range		
Number of traverses:		2	2				
Theoretical Number of Traverses:		2	2				
Theoretical Points / Traverse		2	2				
Actual Points / Traverse		2	2				
Standard Uncertainty	+/-	0.3	mg/m <sup>3</sup>	0.3			
Expanded Uncertainty:	+/-	0.56	mg/m <sup>3</sup>	0.68			
% of ELV		2.8		3.4			