

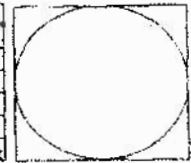


FIELD DATA

PLANT H. Kromer AMBIENT TEMPERATURE 60  
 DATE 9-17-13 BAROMETRIC PRESSURE 29.40  
 LOCATION Chicago IL ASSUMED MOISTURE % 3.5  
 OPERATOR J.M. PROBE LENGTH, in. 72  
 STACK NO. North Stack NOZZLE DIAMETER, in. 0.187  
 RUN NO. 24-1 - Month STACK DIAMETER, in. 59.5  
 SAMPLE BOX NO. APEX MINUTES PER POINT 7.5  
 METER BOX NO. 80509 NUMBER OF POINTS 24  
 START TIME 8:15 NUMBER OF PORTS 2

PROBE HEATER SETTING 250  
 HEATER BOX SETTING 250  
 METER No. 1.30  
 C, FACTOR 0.54  
 Y, FACTOR 1.072  
 PITOT NO. 654

WEIGHT OF PARTICULATE, mg	
Filter No.	<u>52685</u>
Temp	<u>224.0</u>
Moisture	
TOTAL	



CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (0) min.	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (F)	VELOCITY HEAD		PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (in. H <sub>2</sub> O)		GAS SAMPLE VOLUME (cu ft)	GAS SAMPLE TEMP AT DRY GAS METER		FILTER EXT GAS TEMP. (F)	PROBE TEMP (F)	AUXILIARY TEMP. (F)	LAST IMPINGING OUTLET TEMP. (F)	PUMP VACUUM (in. Hg)
					(AP)	(AP)	ACTUAL	DESIRED		INLET (T <sub>in</sub> ) (F)	OUTLET (T <sub>out</sub> ) (F)					
8:15	12	0	-0.65	100	.94		0.99	.94	345.25	64		230	250		47	1
8:22.5	11	7.5		99	.82		0.97	.97	344.97	65		233	250		47	1
8:30	10	15		100	.78		0.94	.94	353.90	66		241	250		49	1
8:37.5	9	22.5		106	.87		1.0	1.03	352.87	67		250	250		50	1
8:45	8	30		107	.80		0.95	.95	361.46	68		247	251		51	1
8:52.5	7	37.5		121	.79		0.94	.94	365.94	70		249	251		51	1
9:00	6	45		115	.75		0.89	.89	369.90	72		251	250		52	1
9:07.5	5	52.5		110	.75		0.89	.89	373.77	73		250	251		52	1
9:15	4	60		121	.74		0.88	.88	377.64	74		252	251		52	1
9:22.5	3	67.5		117	.72		0.85	.85	381.49	74		249	251		53	1
9:30	2	75		112	.72		0.85	.85	385.29	75		254	251		53	1
9:37.5	1	82.5		112	.71		0.89	.89	389.09	75		248	251		53	1
9:45/10:00	12	90		129	1.2		1.4	1.42	392.90	77		247	251		53	1
10:09.5	11	97.5		121	1.2		1.4	1.45	397.99	77		250	250		55	1
10:17	10	105		117	1.2		1.5	1.49	402.19	77		245	251		56	1
10:24.5	9	112.5		115	1.1		1.4	1.37	406.38	77		248	251		55	1
10:32	8	120		119	1.1		1.4	1.36	411.20	75		248	251		56	1
10:39.5	7	127.5		114	1.1		1.4	1.37	415.91	75		248	250		57	1
10:47	6	135		114	1.0		1.3	1.35	421.37	75		249	251		57	1
10:54.5	5	142.5		114	.93		1.2	1.16	425.96	75		250	251		58	1
11:02	4	150		116	.89		1.1	1.11	430.36	76		250	251		58	1
11:09.5	3	157.5		117	.85		1.1	1.06	434.65	76		254	251		60	1
11:17	2	165		117	.80		1.0	1.0	438.92	77		251	251		61	1
11:24.5	1	172.5		121	.78		.96	.96	443.06	77		252	251		61	1
		180							447.095							
AVERAGE	24	180	-0.65	114.0	0.9427		1.09		101.370	73.2		247.8	250.7		56.8	max 1

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)					SILICA GEL WEIGHT
	#1	#2	#3	#4	#5	
INITIAL						
FINAL	100	100	0	56	-	200
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						

ORSAT DATA	TIME	LEAK CHECK	
		CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1			
TRIAL 2			
TRIAL 3			
Average			

LEAK CHECK	
SYSTEM PRE:	0.000 CFM@15" Hg
POST:	0.000 CFM@15" Hg
PITOT PRE:	1/- OK @ > 3" H <sub>2</sub> O
POST:	1/- OK @ > 3" H <sub>2</sub> O

9 minute leak test  
 392.885 / 393.265

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IMPINGER RECOVERY DATA SHEET

Company: H Kramer Date Set-up: 9-16-13  
 Location: Chicago, IL Test Date: 9-17-13  
 Source: North Bayhouse Date Recovered: 9-17-13  
 Run No.: 29-1-North USEPA Method: 29  
 Corresponding Filter Wgt: ~~818.9~~ (507) 829.0  
 Filter Container No: ~~52828~~ (1047) 8225 52688

Measurement Method: Weight or Volume

<u>Impinger No.</u>	<u>Impinger Contents</u>	<u>Initial wt/vol g/mL</u>	<u>Final wt/vol g/mL</u>	<u>Difference wt/vol g/mL</u>	<u>Sample Container No.</u>
1	<u>~100ml S/10</u>	<u>705.4</u>	<u>704.3</u>	<u>-1.1</u>	
2	<u>~100ml S/10</u>	<u>712.6</u>	<u>723.6</u>	<u>11.0</u>	
3	<u>MT</u>	<u>601.6</u>	<u>602.7</u>	<u>1.1</u>	
4	<u>~200g S/5</u>	<u>746.3</u>	<u>765.3</u>	<u>19.0</u>	
5					
6					<u>30.0</u>



FIELD DATA

PLANT H Kramer AMBIENT TEMPERATURE 77  
 DATE 9-17-13 BAROMETRIC PRESSURE 29.60  
 LOCATION Ch. 0302, 1L ASSUMED MOISTURE, % 1.0  
 OPERATOR TM PROBE LENGTH, in. 72  
 STACK NO. North Stack NOZZLE DIAMETER, in. 0.187  
 RUN NO. 24-2 STACK DIAMETER, in. 53.5  
 SAMPLE BOX NO. APEX MINUTES PER POINT 7.5  
 METER BOX NO. 805024 NUMBER OF POINTS 24  
 START TIME 1335 NUMBER OF PORTS 2

PROBE HEATER SETTING 250  
 HEATER BOX SETTING 250  
 METER Hz 1.90  
 C<sub>1</sub> FACTOR 0.94  
 Y<sub>1</sub> FACTOR 1.002  
 PITOT NO. 654

WEIGHT OF PARTICULATE, mg	
Filter No.	52087
Sample	
Final wt	
Time wt	
Wt gain	
TOTAL	mg



CLOCK TIME (H:M)	TRAVERSE POINT NUMBER	SAMPLING TIME (M) min	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (°F)	VELOCITY READ (AP)		PRESSURE DIFFERENTIAL ACROSS METRIC ORIFICE (in. H <sub>2</sub> O)		GAS SAMPLE VOLUME (CYCLE)	GAS SAMPLE TEMP AT DRY GAS METER (°F)		FILTER EXIT GAS TEMP. (°F)	PROBE TEMP (°F)	AUXILIARY TEMP. (°F)	LAST IMPINGER OUTLET TEMP. (°F)	PUMP VACUUM (in. Hg)
					AP <sub>1</sub>	AP <sub>2</sub>	ACTUAL	DESIRED		INLET (T <sub>in</sub> )	OUTLET (T <sub>out</sub> )					
1235	12	0	-0.65	146	.92		1.1	1.10	451.730	77		255	252		66	1
1242.5	11	7.5		133	.95		1.2	1.15	456.00	77		255	252		66	1
1250	10	15		127	.98		1.2	1.20	460.20	77		255	252		67	1
1257.5	9	22.5		123	.97		1.2	1.20	464.41	78		252	252		67	1
1305	8	30		151	.92		1.2	1.19	468.74	78		255	251		65	1
1312.5	7	37.5		124	.90		1.2	1.16	473.20	79		254	252		66	1
1320	6	45		124	.93		1.1	1.07	477.59	78		255	251		65	1
1327.5	5	52.5		130	.91		1.0	1.05	481.82	78		253	252		65	1
1335	4	60		140	.89		1.1	1.05	486.00	78		252	252		65	1
1342.5	3	67.5		144	.81		1.0	1.01	490.30	78		254	252		66	1
1350	2	75		130	.81		1.0	1.03	494.46	78		254	252		66	1
1357.5	1	82.5		133	.84		1.1	1.08	498.63	78		254	252		66	1
1405/MID	12	90		140	1.1		1.4	1.38	502.80	78		254	251		64	1
1420.5	11	97.5		146	1.2		1.5	1.49	507.70	79		252	251		67	1
1428	10	105		144	1.1		1.4	1.36	512.65	80		253	252		67	1
1435.5	9	112.5		142	1.1		1.4	1.38	517.55	82		255	253		67	1
1443	8	120		154	.97		1.2	1.24	522.46	83		253	252		66	1
1450.5	7	127.5		150	.74		.92	.92	526.94	83		257	252		63	1
1458	6	135		147	.80		1.0	1.0	530.93	82		254	254		62	1
1505.5	5	142.5		146	.78		.98	.98	535.19	80		254	252		61	1
1513	4	150		144	.75		.93	.93	539.33	79		256	253		61	1
1520.5	3	157.5		143	.72		.90	.90	543.33	78		255	251		60	1
1528	2	165		130	.75		.95	.95	547.26	78		257	252		61	1
1535.5	1	172.5		124	.73		.94	.94	551.50	78		254	252		60	1
		180							555.240							
AVERAGE	24	180	-0.65	135.8	0.9400		1.12		103.510	78.9		254.5	252.0		≤ 68	max

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)					SILICA GEL WEIGHT
	#1	#2	#3	#4	#5	
INITIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						

DESAT DATA	V <sub>m</sub> = 103.290		
	TIME	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1			
TRIAL 2			
TRIAL 3			
Average			

LEAK CHECK	
SYSTEM PRE: 0.500	CFM@15" Hg
POST: 0.500	CFM@15" Hg
PITOT PRE: 4/- OK @ 3" H <sub>2</sub> O	
POST: 4/- OK @ 3" H <sub>2</sub> O	

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**IMPINGER RECOVERY DATA SHEET**

Company:	<u>H Kramer</u>	Date Set-up:	<u>9-16-13</u>
Location:	<u>Chicago IL</u>	Test Date:	<u>9-17-13</u>
Source:	<u>North Bay house</u>	Date Recovered:	<u>9-17-13</u>
Run No.:	<u>27-2 - North</u>	USEPA Method:	<u>29</u>
		Corresponding Filter Wgt:	<u>819.5</u>
		Filter Container No:	<u>52687</u>

Measurement Method: Weight or Volume

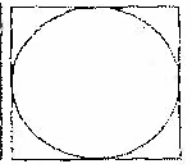
Impinger No.	Impinger Contents	Initial wt/vol g/mL	Final wt/vol g/mL	Difference wt/vol g/mL	Sample Container No.
1	<u>~100ml 5/10</u>	<u>644.2</u>	<u>661.0</u>	<u>16.8</u>	
2	<u>~100ml 5/10</u>	<u>685.8</u>	<u>686.7</u>	<u>0.9</u>	
3	<u>MT</u>	<u>631.2</u>	<u>630.9</u>	<u>-0.3</u>	
4	<u>~200g SG</u>	<u>731.9</u>	<u>745.5</u>	<u>13.6</u>	
5					
6					<u>31.0</u>



FIELD DATA

PLANT H. Kromer AMBIENT TEMPERATURE 69 PROBE HEATER SETTING 250  
 DATE 4-28-13 BAROMETRIC PRESSURE 29.45 HEATER BOX SETTING 250  
 LOCATION CR2092-14 ASSUMED MOISTURE, % 1.0 METER H<sub>2</sub>O 1.30  
 OPERATOR JM PROBE LENGTH, in. 72 C. FACTOR 0.84  
 STACK NO. MULTI STACK NOZZLE DIAMETER, in. 0.187 V. FACTOR 1.002  
 RUN NO. 1420-3 STACK DIAMETER, in. 59.5 PITOT NO. 654  
 SAMPLE BOX NO. AP2 MINUTES PER POINT 1.5  
 METER BOX NO. 808024 NUMBER OF POINTS 24  
 START TIME 740 NUMBER OF PORTS 2

WEIGHT OF PARTICULATE, mg	
Probe No.	<u>53648</u>
Sample	
Probe No.	
Sample	
Probe No.	
Sample	
Probe No.	
Sample	
TOTAL	mg



CLOCK TIME (H:M)	TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (°F)	VELOCITY HEAD		PRESSURE DIFFERENTIAL ACROSS METER OR PIPES (in. H <sub>2</sub> O)		GAS SAMPLE VOLUME (L/min)	GAS SAMPLE TEMP AT DRY GAS METER		FILTER EXIT GAS TEMP (°F)	PROBE TEMP (°F)	AUXILIARY TEMP (°F)	LAST IMPINGER OUTLET TEMP (°F)	PUMP VACUUM (in. Hg)
					(AP)	(VAP)	ACTUAL	DESIRED		INLET (°F)	OUTLET (°F)					
740	12	0	-55	126	1.2		1.5	1.52	556.165	69		237	251		57	1
747.5	11	7.5		144	1.2		1.5	1.45	561.18	69		242	251		56	1
755	10	15		161	1.1		1.3	1.20	566.11	69		249	251		57	1
802.5	9	22.5		163	.92		1.1	1.09	570.67	69		252	251		57	1
810	8	30		155	.88		1.1	1.06	574.97	70		251	251		58	1
817.5	7	37.5		133	.80		1.0	1.0	579.34	70		247	251		58	1
825	6	45		124	.89		1.1	1.13	582.05	70		251	250		58	1
832.5	5	52.5		118	.87		1.1	1.11	587.95	71		251	251		58	1
840	4	60		116	.86		1.1	1.11	592.26	71		250	251		59	1
847.5	3	67.5		114	.87		1.1	1.12	596.45	71		252	251		60	1
855	2	75		114	.80		1.0	1.03	600.70	71		251	251		61	1
862.5	1	82.5		113	.79		1.0	1.02	604.84	71		251	251		62	1
910/118	12	90		120	1.1		1.4	1.40	609.00/100	71		241	251		61	1
926.5	11	97.5		117	1.1		1.4	1.41	613.90	72		247	251		60	1
933	10	105		114	1.1		1.4	1.42	618.72	73		243	251		60	1
940.5	9	112.5		128	1.0		1.3	1.36	623.66	73		251	251		60	1
948	8	120		137	.93		1.2	1.16	628.35	74		250	251		61	1
955.5	7	127.5		141	.82		1.0	1.02	632.79	75		251	251		62	1
1003	6	135		143	.79		.98	.98	636.43	76		251	251		62	1
1010.5	5	142.5		144	.85		1.1	1.05	641.05	77		251	251		63	1
1018	4	150		144	.88		1.1	1.09	645.59	77		253	251		63	1
1025.5	3	157.5		145	.86		1.0	1.02	649.55	78		250	251		66	1
1033	2	165		145	.80		1.0	1.0	653.70	80		252	251		64	1
1041.5	1	172.5		146	.83		1.0	1.02	657.91	81		249	251		63	1
1048		180							662.100							
AVERAGE	124	180	-0.55	133.7	0.9601		1.16		105.935	72.8		249.0	251.0		68	MAX

NO. LINE OR WEIGHT OF LIQUID COLLECTED (cc)	IMPINGER PART					SILICA GEL WEIGHT
	1	2	3	4	5	
FINAL						
INITIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (cc) (0.1 or 0.2)						

OBS. DATA	TIME	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1			
TRIAL 2			
TRIAL 3			
Average			

LEAK CHECK	
SYSTEM PRE: 0.000	CFM @ 15" H <sub>2</sub> O
POST: 0.000	CFM @ 15" H <sub>2</sub> O
PITOT PRE: V-OK	@ 3" H <sub>2</sub> O
POST: 41-01	@ 3" H <sub>2</sub> O

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IMPINGER RECOVERY DATA SHEET

Company:	<u>H. Kromer</u>	Date Set-up:	<u>9-17-13</u>
Location:	<u>Chicago, IL</u>	Test Date:	<u>9-18-13</u>
Source:	<u>North BH</u>	Date Recovered:	<u>9-18-13</u>
Run No.:	<u>29.3-North</u>	USEPA Method:	<u>29</u>
		Corresponding Filter Wgt:	<u>822.7</u>
		Filter Container No:	<u>53618</u>

Measurement Method: Weight or Volume

<u>Impinger No.</u>	<u>Impinger Contents</u>	<u>Initial wt/vol g/mL</u>	<u>Final wt/vol g/mL</u>	<u>Difference wt/vol g/mL</u>	<u>Sample Container No.</u>
1	<u>~100ml 2/10</u>	<u>694.8</u>	<u>705.0</u>	<u>10.2</u>	
2	<u>~100ml 2/10</u>	<u>724.9</u>	<u>732.6</u>	<u>7.7</u>	
3	<u>MT</u>	<u>603.7</u>	<u><del>604.5</del> 603.2</u>	<u>-0.5</u>	
4	<u>~200g SK</u>	<u>782.2</u>	<u>802.0</u>	<u>19.8</u>	
5					
6					<u>37.2</u>





STACK GAS MOLECULAR WEIGHT FIELD DATA

COMPANY: H. Kramer  
 LOCATION: Chicago IL  
 SOURCE: North Baghouse  
 TEST DATE: 9/17/13 - 9/18/13

Field Orsat Measurements

Run: 1  
 Run Clock Time: 815-1132  
 Analysis Clock Time: 1415

PARAMETER	#1	#2	#3	Average
Carbon dioxide	0.2	0.2	0.2	0.2
Oxygen	20.6	20.6	20.6	20.6
Nitrogen (by difference)				79.2

Run: 2  
 Run Clock Time: 1235-1543  
 Analysis Clock Time: 1025

PARAMETER	#1	#2	#3	Average
Carbon dioxide	0.3	0.3	0.2	0.3
Oxygen	20.6	20.6	20.6	20.6
Nitrogen (by difference)				79.1

Run: 3  
 Run Clock Time: 740-1048  
 Analysis Clock Time: 1435

PARAMETER	#1	#2	#3	Average
Carbon dioxide	0.4	0.4	0.4	0.4
Oxygen	20.4	20.4	20.5	20.4
Nitrogen (by difference)				79.2





IMPINGER RECOVERY DATA SHEET

Company:	<u>H. Kravon</u>	Date Set-up:	<u>9.20.13</u>
Location:	<u>Chicago IL</u>	Test Date:	<u>9.20.13</u>
Source:	<u>S. BH</u>	Date Recovered:	<u>9.20.13</u>
Run No.:	<u>Field Blank</u>	USEPA Method:	<u>M29</u>
		Corresponding Filter Wgt:	<u>876.0</u>
		Filter Container No:	<u>53081</u>

Measurement Method: Weight or Volume

<u>Impinger No.</u>	<u>Impinger Contents</u>	<u>Initial wt/vol g/mL</u>	<u>Final wt/vol g/mL</u>	<u>Difference wt/vol g/mL</u>	<u>Sample Container No.</u>
1	<u>~100ml 5/10</u>	<u>684.9</u>	<u>684.9</u>	<u>0</u>	
2	<u>-100ml 5/10</u>	<u>729.3</u>	<u>729.3</u>	<u>0</u>	
3	<u>MT</u>	<u>604.6</u>	<u>604.6</u>	<u>0</u>	
4	<u>200g SL</u>	<u>779.8</u>	<u>779.8</u>	<u>0</u>	
5					
6					<u>(2)</u>

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**IMPINGER RECOVERY DATA SHEET**

Company: H. Kramer Date Set-up: 9.19.13  
 Location: Chicago IL Test Date: 9.20.13  
 Source: \_\_\_\_\_ Date Recovered: 9.20.13  
 Run No.: PM - Field B/sk USEPA Method: 29  
 Corresponding Filter Wgt: \_\_\_\_\_  
 Filter Container No: \_\_\_\_\_

Measurement Method: Weight or Volume

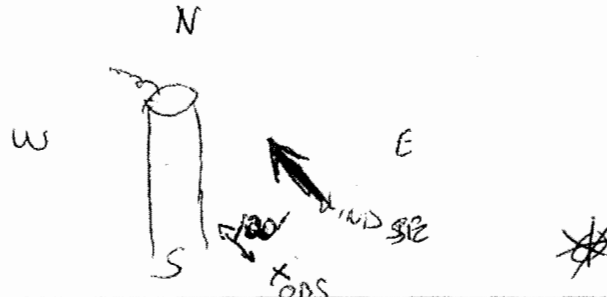
Impinger No.	Impinger Contents	Initial wt/vol g/mL	Final wt/vol g/mL	Difference wt/vol g/mL	Sample Container No.
1	MT	339.0	<sup>339.2</sup> <del>339.0</del>		
2	MT	587.4	587.4		
3	~100ul DI	599.1	599.2		
4	~200ul SG	717.7	719.0		
5					
6					



FUGITIVE OR SMOKE EMISSION INSPECTION  
OUTDOOR LOCATION

COMPANY H. KRAMER OBSERVER LARRY GOLDFINE  
 LOCATION CHICAGO, IL AFFILIATION ARI ENVIRONMENTAL, INC  
 COMPANY REPRESENTATIVE \_\_\_\_\_ DATE 9/17/13  
 SKY CONDITIONS clear WIND DIRECTION SE  
 PRECIPITATION ~ WIND SPEED 5  
 INDUSTRY metallurgy PROCESS UNIT NORTH BACHOUSE RE#1

Sketch process unit; indicate observer position relative to source and sun; indicate potential emission points and/or actual emission points.



OBSERVATIONS	Clock time	Observation period duration min:sec	Accumulated emission time min:sec
Begin Observation	<u>0815-0835</u>	<u>20:00</u>	<u>0:00</u>
	<u>0840-0900</u>	<u>20:00</u>	<u>0:00</u>
	<u>0905-0925</u>	<u>20:00</u>	<u>0:00</u>
End Observation		<u>60 minutes</u>	<u>0:00 minutes</u>

NO VE observed



**APPENDIX B**

H. Kramer & Company: Chicago, IL  
North and South Baghouse Stacks  
Test Dates: 9/17 - 9/20/13

## **Rotary Furnace 2: South Baghouse Stack Calculation Summaries and Field Data**

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## SUMMARY OF PARTICULATE MATTER TEST RESULTS

Company : H. Kramer  
 Location : Chicago, IL  
 Source : South Baghouse

Test Run	1	2	3	
Test Date	9/19/2013	9/19/2013	9/20/2013	
Test Time	08:07 - 11:14	12:05 - 15:15	7:30 - 10:40	<b>Average</b>

**STACK GAS**

Temperature, av. °F	145.7	137.8	150.3	<b>144.6</b>
Velocity, av. ft/sec	58.489	59.928	56.724	<b>58.380</b>
Volume flow, acfm	67,762	69,429	65,717	<b>67,636</b>
Volume flow, scfm	57,981	60,190	56,208	<b>58,126</b>
Volume flow, dscfm	56,540	57,284	54,721	<b>56,182</b>
Volume flow, scfh	3,478,839	3,611,413	3,372,467	<b>3,487,573</b>
Volume flow, dscfh	3,392,407	3,437,048	3,283,285	<b>3,370,913</b>
Moisture, av. % vol	2.48	4.83	2.64	<b>3.32</b>
CO <sub>2</sub> , av. % vol, db	0.3	0.4	0.2	<b>0.3</b>
O <sub>2</sub> , av. % vol, db	20.5	20.4	20.7	<b>20.5</b>

**Sample Train Data**

Time, min	180.0	180.0	180.0	
Volume, dscf	104.382	107.350	99.989	
Volume, dscm	2.956	3.040	2.832	
Isokinetic Ratio, %	102.7	104.3	101.7	

**Filterable PM collected, mg**

Filterable PM collected, mg	1.33	0.92	1.16	<b>1.14</b>
Concentration				
gr/dscf	0.00020	0.00013	0.00018	<b>0.00017</b>
lb/dscf x 10 <sup>-6</sup>	0.0281	0.0189	0.0256	<b>0.0242</b>
Emission rate				
lb/hr	0.0953	0.0649	0.0840	<b>0.0814</b>

**Condensable PM collected, mg**

Condensable PM collected, mg	2.00	5.10	4.20	<b>3.77</b>
Concentration				
gr/dscf	0.00030	0.00073	0.00065	<b>0.00056</b>
lb/dscf x 10 <sup>-6</sup>	0.0422	0.1048	0.0926	<b>0.0799</b>
Emission rate				
lb/hr	0.1433	0.3599	0.3040	<b>0.2691</b>

**Total PM collected, mg**

Total PM collected, mg	3.33	6.02	5.36	<b>4.90</b>
Concentration				
gr/dscf	0.00049	0.00087	0.00083	<b>0.00073</b>
lb/dscf x 10 <sup>-6</sup>	0.0703	0.1237	0.1182	<b>0.1041</b>
Emission rate				
lb/hr	0.2386	0.4249	0.3880	<b>0.3505</b>

ARI ENVIRONMENTAL, INC.  
USEPA METHODS 5/202 - TOTAL PM CALCULATION SUMMARY

COMPANY: H. Kramer  
LOCATION: Chicago, IL  
SOURCE: South Baghouse  
TEST DATE: 9/19/13  
RUN NUMBER: 1

**INPUT**

$V_m$ :	111.805 ft <sup>3</sup>	$Q_s$ :	56,540 dscfm
$\gamma$ FACTOR:	0.988	$T_s$ :	145.7 °F
$P_{bar}$ :	29.4 in.Hg	Runtime:	180 minutes
$\Delta H$ :	1.16 in.H <sub>2</sub> O	$V_s$ :	58.489 ft/sec
$T_m$ :	90.65 °F	$P_s$ :	29.37 in.Hg
$V_{lc}$ :	56.5 mL	Noz. diam:	0.188 inches
$M_n$ total:	3.3 mg		
CO <sub>2</sub> :	0.30 % by volume		
O <sub>2</sub> :	20.50 % by volume		

ENGLISH UNITS  
(29.92 in.Hg & 68 °F)

<b>VOLUME OF SAMPLE @ STANDARD CONDITIONS, DRY BASIS</b>			
$V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 104.382 \text{ dscf}$			
$\gamma = 0.988$			
<b>VOLUME OF WATER IN SAMPLE @ STANDARD CONDITIONS</b>			
$V_{wstd} = 0.04707 \times V_{lc} = 2.659 \text{ scf}$			
<b>FRACTIONAL MOISTURE CONTENT OF STACK GAS</b>			
$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} \times 100 = 2.48 \%$			
<b>PARTICULATE CONCENTRATION IN STACK GAS ON A DRY BASIS</b>			
$C_s = (0.01543) \left( \frac{M_n}{V_{mstd}} \right)$		Total	= 0.00049 gr/dscf
$C'_s = (2.205 \times 10^{-6}) \left( \frac{M_n}{V_{mstd}} \right)$		$C'_s$ Total	= 0.0703 x 10 <sup>-6</sup> lbs/dscf
<b>EMISSION RATE</b>			
$pmr = \left( \frac{C_s}{7000} \right) (Q_{std})(60)$		Total	= 0.2386 lbs/hr 1.045 ton/yr
<b>ISOKINETIC SAMPLING RATE</b>			
$\%ISO = \frac{(100)(T_s) \left[ (0.002669 \times V_{lc}) + \left( \frac{V_m}{T_m} \right) (\gamma) \left( P_{bar} + \left( \frac{\Delta H}{13.6} \right) \right) \right]}{(60)(0)(V_s)(P_s)(A_n)} = 102.74 \%$			
$A_n = 0.000193 \text{ ft}^2$		Runtime =	180 minutes

ARI ENVIRONMENTAL, INC.  
USEPA METHOD 5 - FILTERABLE PARTICULATE CALCULATION SUMMARY

COMPANY: H. Kramer  
LOCATION: Chicago, IL  
SOURCE: South Baghouse  
TEST DATE: 9/19/13  
RUN NUMBER: 1

**INPUT**

V <sub>m</sub> :	111.805	ft <sup>3</sup>	Q <sub>s</sub> :	56,540	dscfm
γ FACTOR:	0.988		T <sub>s</sub> :	145.7	°F
P <sub>bar</sub> :	29.4	in.Hg	Runtime:	180	minutes
ΔH:	1.16	in.H <sub>2</sub> O	V <sub>s</sub> :	58.489	ft/sec
T <sub>m</sub> :	90.6	°F	P <sub>s</sub> :	29.37	in.Hg
V <sub>lc</sub> :	56.5	mL	Noz. diam:	0.188	inches
M <sub>n</sub> front:	1.33	mg			
CO <sub>2</sub> :	0.30	% by volume			
O <sub>2</sub> :	20.50	% by volume			

ENGLISH UNITS  
(29.92 in.Hg & 68 °F)

<b>VOLUME OF SAMPLE @ STANDARD CONDITIONS, DRY BASIS</b>		
$V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right]$	=	104.382 dscf
$\gamma = 0.988$		
<b>VOLUME OF WATER IN SAMPLE @ STANDARD CONDITIONS</b>		
$V_{wstd} = 0.04707 \times V_{lc}$	=	2.659 scf
<b>FRACTIONAL MOISTURE CONTENT OF STACK GAS</b>		
$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} \times 100$	=	2.48 %
<b>PARTICULATE CONCENTRATION IN STACK GAS ON A DRY BASIS</b>		
$C_s = (0.01543) \left( \frac{M_n}{V_{mstd}} \right)$	Total	= 0.00020 gr/dscf
$C'_s = (2.205 \times 10^{-6}) \left( \frac{M_n}{V_{mstd}} \right)$	C' <sub>s</sub> Total	= 0.0281 x 10 <sup>-6</sup> lbs/dscf
<b>EMISSION RATE</b>		
$pmr = \left( \frac{C_s}{7000} \right) (Q_{std})(60)$	=	0.0953 lbs/hr 0.4173 ton/yr
<b>ISOKINETIC SAMPLING RATE</b>		
$\%ISO = \frac{(100)(T_s) \left[ (0.002669 \times V_{lc}) + \left( \frac{V_m}{T_m} \right) (\gamma) \left( P_{bar} + \left( \frac{\Delta H}{13.6} \right) \right) \right]}{(60)(\theta)(V_s)(P_s)(A_n)}$	=	102.74 % I
$A_n = 0.0001928 \text{ ft}^2$	Runtime =	180 minutes

ARI ENVIRONMENTAL, INC.  
USEPA METHOD 202 - CONDENSIBLE PARTICULATE CALCULATION SUMMARY

COMPANY: H. Kramer  
LOCATION: Chicago, IL  
SOURCE: South Baghouse  
TEST DATE: 9/19/13  
RUN NUMBER: 1

<b>INPUT</b>		<b>Q<sub>s</sub>:</b>	56,540	<b>dscfm</b>
V <sub>m</sub> :	111.805 ft <sup>3</sup>	T <sub>s</sub> :	145.7	°F
γ FACTOR:	0.988	Runtime:	180	minutes
P <sub>bar</sub> :	29.4 in.Hg	V <sub>s</sub> :	58.489	ft/sec
ΔH:	1.16 in.H <sub>2</sub> O	P <sub>s</sub> :	29.37	in.Hg
T <sub>m</sub> :	90.6 °F	Noz. diam:	0.188	inches
V <sub>ic</sub> :	56.5 mL	m <sub>ib</sub> :	2.15	mg
N:	0.0000	m <sub>ob</sub> :	0.90	mg
V <sub>t</sub> :	0.00 mL			
m <sub>r</sub> :	2.55 mg			
m <sub>o</sub> :	1.45 mg			

ENGLISH UNITS  
(29.92 in.Hg & 68 °F)

<b>VOLUME OF SAMPLE @ STANDARD CONDITIONS, DRY BASIS</b>				
	$V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right]$		=	104.382 dscf
<b>MASS OF AMMONIA CORRECTION</b>				
Equation #1	m <sub>c</sub> = 17.03 × V <sub>t</sub> × N		=	0.00 mg
<b>MASS OF THE FIELD BLANK</b>				
Equation #2	m <sub>fb</sub> = m <sub>ib</sub> + m <sub>ob</sub>		=	3.05 mg
				2.00 mg @ max allowable
<b>MASS OF INORGANIC CONDENSIBLE PM</b>				
Equation #3	m <sub>i</sub> = m <sub>r</sub> - m <sub>c</sub>		=	2.55 mg
<b>TOTAL MASS OF CONDENSIBLE PM</b>				
Equation #4	m <sub>cpm</sub> = m <sub>i</sub> + m <sub>o</sub> - m <sub>fb</sub>		=	2.00 mg
				@ max. blank
<b>TOTAL CONCENTRATION OF CONDENSIBLE PM - METRIC UNITS</b>				
Equation #5	C <sub>cpm</sub> = $\frac{m_{cpm}}{V_{m(std)}}$		=	0.0192 mg/dscf
<b>TOTAL CONCENTRATION OF CONDENSIBLE PM - ENGLISH UNITS</b>				
	C <sub>s</sub> = (0.01543)(C <sub>cpm</sub> )	Total	=	0.00030 gr/dscf
	C <sub>s</sub> ' = (2.205 × 10 <sup>-6</sup> )(C <sub>cpm</sub> )	C <sub>s</sub> ' Total	=	0.0422 x 10 <sup>-6</sup> lbs/dscf
<b>EMISSION RATE</b>				
	pmr = $\left( \frac{C_s}{7000} \right) (Q_{std})(60)$		Total	=
				0.1433 lbs/hr
				0.6276 ton/yr
<b>ISOKINETIC SAMPLING RATE</b>				
%ISO =	$\frac{(100)(T_s) \left[ (0.002669 \times V_{ic}) + \left( \frac{V_m}{T_m} \right) (\gamma) \left( P_{bar} + \left( \frac{\Delta H}{13.6} \right) \right) \right]}{(60)(\theta)(V_s)(P_s)(A_n)}$		=	102.74 % I
	A <sub>n</sub> = 0.00019 ft <sup>2</sup>	Runtime =	180	minutes



ARI ENVIRONMENTAL, INC.  
FLOW RATE CALCULATION SUMMARY

COMPANY: H. Kramer  
LOCATION: Chicago, IL  
RUN NUMBER: 1

SOURCE: South Baghouse  
TEST DATE: 9/19/2013

BAROMETRIC: 29.4 in. Hg      STACK DIAM: 59.50 inches  
STATIC PRES: -0.42 in.H<sub>2</sub>O      CO<sub>2</sub>: 0.30 % by volume  
STACK TEMP: 145.7 °F      O<sub>2</sub>: 20.50 % by volume  
SQ.RT ΔP: 0.9591 in.H<sub>2</sub>O

<b>DRY MOLECULAR WEIGHT OF STACK GAS</b>			
$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO)$	=	28.87	lb/lb-mole
<b>MOLECULAR WEIGHT OF STACK GAS, wet basis</b>			
$M_s = M_d(1 - B_{ws}) + 18B_{ws}$	=	28.60	lb/lb-mole
<b>PITOT TUBE COEFFICIENT</b>			
$C_p$ (from calibration curve or geometric specifications)	=	0.84	
<b>AVERAGE VELOCITY HEAD OF STACK GAS, in. H<sub>2</sub>O</b>			
$\sqrt{\Delta P} = \frac{1}{n} \sum_{i=1}^n \sqrt{\Delta p_i}$	=	0.9591	in. H <sub>2</sub> O
<b>AVERAGE ABSOLUTE STACK GAS TEMPERATURE</b>			
$T_s = 145.7 \text{ °F} + 460$	=	605.7	°R
<b>ABSOLUTE STACK GAS PRESSURE</b>			
$P_s = P_{bar} + \frac{P_{static}}{13.6}$	=	29.37	in.Hg
<b>STACK GAS VELOCITY</b>			
$V_s = (85.49)(C_p)(\text{avg } \sqrt{\Delta P}) \sqrt{\frac{T_s}{(P_s)(M_s)}}$	=	58.489	ft/sec
<b>STACK GAS VOLUMETRIC FLOW RATE, actual</b>			
$Q_s = 60 \times V_s \times A_s$	=	67,762	acfm
Stack Area =		19.309	ft <sup>2</sup>
<b>STACK GAS VOLUMETRIC FLOW RATE, standard conditions, wet basis</b>			
$Q_{stdw} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)$	=	57,981	scfm, wb
		3,478,839	scfh, wb
<b>STACK GAS VOLUMETRIC FLOW RATE, standard conditions, dry basis</b>			
$Q_{std} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)(1 - B_{ws})$	=	56,540	dscfm
		3,392,407	dscfh

ARI ENVIRONMENTAL, INC.  
MOISTURE CALCULATION SUMMARY

COMPANY: H. Kramer  
LOCATION: Chicago, IL  
SOURCE: South Baghouse  
TEST DATE: 9/19/2013  
RUN NUMBER: 1

$\gamma$ FACTOR:	0.988	STACK DIAM:	59.50 inches
BAROMETRIC:	29.40 in. Hg	METER VOLUME:	111.805 ft <sup>3</sup>
STATIC PRES:	-0.42 in.H <sub>2</sub> O	METER TEMP:	90.6 °F
STACK TEMP:	145.7 °F	LIQUID COLL:	56.5 milliliters
SQ.RT $\Delta$ P:	0.9591 in.H <sub>2</sub> O	CO <sub>2</sub> :	0.30 % by volume
$\Delta$ H:	1.16 in.H <sub>2</sub> O	O <sub>2</sub> :	20.50 % by volume

ENGLISH UNITS  
(29.92 in.Hg & 68 °F)

<b>VOLUME OF SAMPLE @ STANDARD CONDITIONS, DRY BASIS</b>	
$V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] =$	104.382 dscf
$\gamma = 0.988$	
<b>VOLUME OF WATER IN SAMPLE @ STANDARD CONDITIONS</b>	
$V_{wstd} = 0.04707 \times V_{lc} =$	2.659 scf
$V_{lc} = 56.5 \text{ mL}$	
<b>FRACTIONAL MOISTURE CONTENT OF STACK GAS AS MEASURED</b>	
$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} =$	0.0248
<b>FRACTIONAL MOISTURE CONTENT OF STACK GAS @ SATURATION</b>	
$B_{ws@saturation} = \frac{S.V.P.}{P_{bar} + \frac{P_{static}}{13.6}} =$	0.2332
$S.V.P. = 6.85 \text{ in. Hg}$	
<b>FRACTIONAL MOISTURE CONTENT USED IN CALCULATIONS</b>	
$B_{ws} =$	0.0248

ARI ENVIRONMENTAL, INC.  
USEPA METHODS 5/202 - TOTAL PM CALCULATION SUMMARY

COMPANY: H. Kramer  
LOCATION: Chicago, IL  
SOURCE: South Baghouse  
TEST DATE: 9/19/13  
RUN NUMBER: 2

**INPUT**

V <sub>m</sub> :	114.285 ft <sup>3</sup>	Q <sub>s</sub> :	57,284	dscfm
γ FACTOR:	0.988	T <sub>s</sub> :	137.8	°F
P <sub>bar</sub> :	29.4 in.Hg	Runtime:	180	minutes
ΔH:	1.22 in.H <sub>2</sub> O	V <sub>s</sub> :	59.928	ft/sec
T <sub>m</sub> :	87.4 °F	P <sub>s</sub> :	29.37	in.Hg
V <sub>ic</sub> :	115.7 mL	Noz. diam:	0.188	inches
M <sub>n</sub> total:	6.0 mg			
CO <sub>2</sub> :	0.40 % by volume			
O <sub>2</sub> :	20.40 % by volume			

ENGLISH UNITS  
(29.92 in.Hg & 68 °F)

<b>VOLUME OF SAMPLE @ STANDARD CONDITIONS, DRY BASIS</b>			
$V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right]$		=	107.350 dscf
γ = 0.988			
<b>VOLUME OF WATER IN SAMPLE @ STANDARD CONDITIONS</b>			
$V_{wstd} = 0.04707 \times V_{ic}$		=	5.446 scf
<b>FRACTIONAL MOISTURE CONTENT OF STACK GAS</b>			
$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} \times 100$		=	4.83 %
<b>PARTICULATE CONCENTRATION IN STACK GAS ON A DRY BASIS</b>			
$C_s = (0.01543) \left( \frac{M_n}{V_{mstd}} \right)$		Total =	0.00087 gr/dscf
$C'_s = (2.205 \times 10^{-6}) \left( \frac{M_n}{V_{mstd}} \right)$		C' <sub>s</sub> Total =	0.1237 x 10 <sup>-6</sup> lbs/dscf
<b>EMISSION RATE</b>			
$pmr = \left( \frac{C_s}{7000} \right) (Q_{std})(60)$		Total =	0.4249 lbs/hr 1.861 ton/yr
<b>ISOKINETIC SAMPLING RATE</b>			
$\%ISO = \frac{(100)(T_s) \left[ (0.002669 \times V_{ic}) + \left( \frac{V_m}{T_m} \right) (\gamma) \left( P_{bar} + \left( \frac{\Delta H}{13.6} \right) \right) \right]}{(60)(\theta)(V_s)(P_s)(A_n)}$		=	104.29 %
A <sub>n</sub> = 0.000193 ft <sup>2</sup>		Runtime =	180 minutes

ARI ENVIRONMENTAL, INC.  
USEPA METHOD 5 - FILTERABLE PARTICULATE CALCULATION SUMMARY

COMPANY: H. Kramer  
LOCATION: Chicago, IL  
SOURCE: South Baghouse  
TEST DATE: 9/19/13  
RUN NUMBER: 2

**INPUT**

V <sub>m</sub> :	114.285	ft <sup>3</sup>	Q <sub>s</sub> :	57.284	dscfm
γ FACTOR:	0.988		T <sub>s</sub> :	137.8	°F
P <sub>bar</sub> :	29.4	in.Hg	Runtime:	180	minutes
ΔH:	1.22	in.H <sub>2</sub> O	V <sub>s</sub> :	59.928	ft/sec
T <sub>m</sub> :	87.4	°F	P <sub>s</sub> :	29.37	in.Hg
V <sub>lc</sub> :	115.7	mL	Noz. diam:	0.188	inches
M <sub>n</sub> front:	0.92	mg			
CO <sub>2</sub> :	0.40	% by volume			
O <sub>2</sub> :	20.40	% by volume			

ENGLISH UNITS  
(29.92 in.Hg & 68 °F)

<b>VOLUME OF SAMPLE @ STANDARD CONDITIONS, DRY BASIS</b>	
$V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right]$	= 107.350 dscf
$\gamma = 0.988$	
<b>VOLUME OF WATER IN SAMPLE @ STANDARD CONDITIONS</b>	
$V_{wstd} = 0.04707 \times V_{lc}$	= 5.446 scf
<b>FRACTIONAL MOISTURE CONTENT OF STACK GAS</b>	
$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} \times 100$	= 4.83 %
<b>PARTICULATE CONCENTRATION IN STACK GAS ON A DRY BASIS</b>	
$C_s = (0.01543) \left( \frac{M_n}{V_{mstd}} \right)$	Total = 0.00013 gr/dscf
$C'_s = (2.205 \times 10^{-6}) \left( \frac{M_n}{V_{mstd}} \right)$	C <sub>s</sub> Total = 0.0189 x 10 <sup>-6</sup> lbs/dscf
<b>EMISSION RATE</b>	
$pmr = \left( \frac{C_s}{7000} \right) (Q_{std})(60)$	= 0.0649 lbs/hr 0.2844 ton/yr
<b>ISOKINETIC SAMPLING RATE</b>	
$\%ISO = \frac{(100)(T_s) \left[ (0.002669 \times V_{lc}) + \left( \frac{V_m}{T_m} \right) (\gamma) \left( P_{bar} + \left( \frac{\Delta H}{13.6} \right) \right) \right]}{(60)(\theta)(V_s)(P_s)(A_n)}$	= 104.29 %
$A_n = 0.0001928 \text{ ft}^2$	Runtime = 180 minutes

ARI ENVIRONMENTAL, INC.  
USEPA METHOD 202 - CONDENSIBLE PARTICULATE CALCULATION SUMMARY

COMPANY: H. Kramer  
LOCATION: Chicago, IL  
SOURCE: South Baghouse  
TEST DATE: 9/19/13  
RUN NUMBER: 2

<b>INPUT</b>		$Q_s$ :	57,284	dscfm
$V_m$ :	114.285	$T_s$ :	137.8	°F
$\gamma$ FACTOR:	0.988	Runtime:	180	minutes
$P_{bar}$ :	29.4	$V_s$ :	59.928	ft/sec
$\Delta H$ :	1.22	$P_s$ :	29.37	in.Hg
$T_m$ :	87.4	Noz. diam:	0.188	inches
$V_{ic}$ :	115.7	$m_{ib}$ :	2.15	mg
$N$ :	0.0000	$m_{ob}$ :	0.90	mg
$V_t$ :	0.00			
$m_r$ :	5.50			
$m_o$ :	1.60			

ENGLISH UNITS  
(29.92 in.Hg & 68 °F)

<b>VOLUME OF SAMPLE @ STANDARD CONDITIONS, DRY BASIS</b>				
	$V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right]$		=	107.350 dscf
<b>MASS OF AMMONIA CORRECTION</b>				
Equation #1	$m_c = 17.03 \times V_T \times N$		=	0.00 mg
<b>MASS OF THE FIELD BLANK</b>				
Equation #2	$m_{fb} = m_{ib} + m_{ob}$		=	3.05 mg 2.00 mg @ max allowable
<b>MASS OF INORGANIC CONDENSIBLE PM</b>				
Equation #3	$m_i = m_r - m_c$		=	5.50 mg
<b>TOTAL MASS OF CONDENSIBLE PM</b>				
Equation #4	$m_{cpm} = m_i + m_o - m_{fb}$		=	5.10 mg @ max. blank
<b>TOTAL CONCENTRATION OF CONDENSIBLE PM - METRIC UNITS</b>				
Equation #5	$C_{cpm} = \frac{m_{cpm}}{V_{m(std)}}$		=	0.0475 mg/dscf
<b>TOTAL CONCENTRATION OF CONDENSIBLE PM - ENGLISH UNITS</b>				
	$C_s = (0.01543)(C_{cpm})$	Total	=	0.00073 gr/dscf
	$C'_s = (2.205 \times 10^{-6})(C_{cpm})$	$C'_s$ Total	=	0.1048 x 10 <sup>-6</sup> lbs/dscf
<b>EMISSION RATE</b>				
	$pmr = \left( \frac{C_s}{7000} \right) (Q_{std})(60)$		Total	= 0.3599 lbs/hr 1.5765 ton/yr
<b>ISOKINETIC SAMPLING RATE</b>				
%ISO =	$\frac{(100)(T_s) \left[ (0.002669 \times V_{ic}) + \left( \frac{V_m}{T_m} \right) (\gamma) \left( P_{bar} + \left( \frac{\Delta H}{13.6} \right) \right) \right]}{(60)(\theta)(V_s)(P_s)(A_n)}$		=	104.29 % I
	$A_n = 0.00019 \text{ ft}^2$	Runtime =	180	minutes

ARI ENVIRONMENTAL, INC.  
FLOW RATE CALCULATION SUMMARY

COMPANY: H. Kramer  
LOCATION: Chicago, IL  
RUN NUMBER: 2

SOURCE: South Baghouse  
TEST DATE: 9/19/2013

BAROMETRIC:	29.4 in. Hg	STACK DIAM:	59.50 inches
STATIC PRES:	-0.44 in.H <sub>2</sub> O	CO <sub>2</sub> :	0.40 % by volume
STACK TEMP:	137.8 °F	O <sub>2</sub> :	20.40 % by volume
SQ. RT ΔP:	0.9849 in.H <sub>2</sub> O		

<b>DRY MOLECULAR WEIGHT OF STACK GAS</b>			
$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO)$	=	28.88	lb/lb-mole
<b>MOLECULAR WEIGHT OF STACK GAS, wet basis</b>			
$M_g = M_d(1 - B_{ws}) + 18B_{ws}$	=	28.35	lb/lb-mole
<b>PITOT TUBE COEFFICIENT</b>			
$C_p$ (from calibration curve or geometric specifications)	=	0.84	
<b>AVERAGE VELOCITY HEAD OF STACK GAS, in. H<sub>2</sub>O</b>			
$\sqrt{\Delta P} = \frac{1}{n} \sum_{i=1}^n \sqrt{\Delta P_i}$	=	0.9849	in. H <sub>2</sub> O
<b>AVERAGE ABSOLUTE STACK GAS TEMPERATURE</b>			
$T_s = 137.8 \text{ °F} + 460$	=	597.8	°R
<b>ABSOLUTE STACK GAS PRESSURE</b>			
$P_s = P_{bar} + \frac{P_{static}}{13.6}$	=	29.37	in.Hg
<b>STACK GAS VELOCITY</b>			
$V_s = (85.49)(C_p)(\text{avg } \sqrt{\Delta P}) \sqrt{\frac{T_s}{(P_s)(M_g)}}$	=	59.928	ft/sec
<b>STACK GAS VOLUMETRIC FLOW RATE, actual</b>			
$Q_s = 60 \times V_s \times A_s$	=	69,429	acfm
Stack Area =		19.309 ft <sup>2</sup>	
<b>STACK GAS VOLUMETRIC FLOW RATE, standard conditions, wet basis</b>			
$Q_{stdw} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)$	=	60,190 3,611,413	scfm, wb scfh, wb
<b>STACK GAS VOLUMETRIC FLOW RATE, standard conditions, dry basis</b>			
$Q_{std} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)(1 - B_{ws})$	=	57,284 3,437,048	dscfm dscfh

ARI ENVIRONMENTAL, INC.  
MOISTURE CALCULATION SUMMARY

COMPANY: H. Kramer  
LOCATION: Chicago, IL  
SOURCE: South Baghouse  
TEST DATE: 9/19/2013  
RUN NUMBER: 2

$\gamma$ FACTOR:	0.988	STACK DIAM:	59.50 inches
BAROMETRIC:	29.40 in. Hg	METER VOLUME:	114.285 ft <sup>3</sup>
STATIC PRES:	-0.44 in.H <sub>2</sub> O	METER TEMP:	87.4 °F
STACK TEMP:	137.8 °F	LIQUID COLL:	115.7 milliliters
SQ.RT $\Delta$ P:	0.9849 in.H <sub>2</sub> O	CO <sub>2</sub> :	0.40 % by volume
$\Delta$ H:	1.22 in.H <sub>2</sub> O	O <sub>2</sub> :	20.40 % by volume

ENGLISH UNITS  
(29.92 in.Hg & 68 °F)

<b>VOLUME OF SAMPLE</b> @ STANDARD CONDITIONS, DRY BASIS  $V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 107.350 \text{ dscf}$ $\gamma = 0.988$	
<b>VOLUME OF WATER IN SAMPLE</b> @ STANDARD CONDITIONS  $V_{wstd} = 0.04707 \times V_{lc} = 5.446 \text{ scf}$ $V_{lc} = 115.7 \text{ mL}$	
<b>FRACTIONAL MOISTURE CONTENT OF STACK GAS AS MEASURED</b>  $B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = 0.0483$	
<b>FRACTIONAL MOISTURE CONTENT OF STACK GAS @ SATURATION</b>  $B_{ws@saturation} = \frac{S.V.P.}{P_{bar} + \frac{P_{static}}{13.6}} = 0.1902$ $S.V.P. = 5.585 \text{ in. Hg}$	
<b>FRACTIONAL MOISTURE CONTENT USED IN CALCULATIONS</b>  $B_{ws} = 0.0483$	

ARI ENVIRONMENTAL, INC.  
USEPA METHODS 5/202 - TOTAL PM CALCULATION SUMMARY

COMPANY: H. Kramer  
LOCATION: Chicago, IL  
SOURCE: South Baghouse  
TEST DATE: 9/20/13  
RUN NUMBER: 3

**INPUT**

$V_m$ :	106.48	ft <sup>3</sup>	$Q_s$ :	54,721	dscfm
$\gamma$ FACTOR:	0.988		$T_s$ :	150.25	°F
$P_{bar}$ :	29.61	in.Hg	Runtime:	180	minutes
$\Delta H$ :	1.08	in.H <sub>2</sub> O	$V_s$ :	56.724	ft/sec
$T_m$ :	91.3	°F	$P_s$ :	29.58	in.Hg
$V_{ic}$ :	57.7	mL	Noz. diam:	0.188	inches
$M_n$ total:	5.4	mg			
CO <sub>2</sub> :	0.20	% by volume			
O <sub>2</sub> :	20.70	% by volume			

ENGLISH UNITS  
(29.92 in.Hg & 68 °F)

<b>VOLUME OF SAMPLE @ STANDARD CONDITIONS, DRY BASIS</b>			
$V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right]$		=	99.989 dscf
$\gamma = 0.988$			
<b>VOLUME OF WATER IN SAMPLE @ STANDARD CONDITIONS</b>			
$V_{wstd} = 0.04707 \times V_{ic}$		=	2.716 scf
<b>FRACTIONAL MOISTURE CONTENT OF STACK GAS</b>			
$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} \times 100$		=	2.64 %
<b>PARTICULATE CONCENTRATION IN STACK GAS ON A DRY BASIS</b>			
$C_s = (0.01543) \left( \frac{M_n}{V_{mstd}} \right)$		Total =	0.00083 gr/dscf
$C'_s = (2.205 \times 10^{-5}) \left( \frac{M_n}{V_{mstd}} \right)$		$C'_s$ Total =	0.1182 x 10 <sup>-6</sup> lbs/dscf
<b>EMISSION RATE</b>			
$pmr = \left( \frac{C_s}{7000} \right) (Q_{std})(60)$		Total =	0.3880 lbs/hr 1.699 ton/yr
<b>ISOKINETIC SAMPLING RATE</b>			
$\%ISO = \frac{(100)(T_s) \left[ (0.002669 \times V_{ic}) + \left( \frac{V_m}{T_m} \right) (\gamma) \left( P_{bar} + \left( \frac{\Delta H}{13.6} \right) \right) \right]}{(60)(\theta)(V_s)(P_s)(A_n)}$		=	101.68 % I
$A_n = 0.000193 \text{ ft}^2$		Runtime =	180 minutes



ARI ENVIRONMENTAL, INC.  
USEPA METHOD 5 - FILTERABLE PARTICULATE CALCULATION SUMMARY

COMPANY: H. Kramer  
LOCATION: Chicago, IL  
SOURCE: South Baghouse  
TEST DATE: 9/20/13  
RUN NUMBER: 3

**INPUT**

$V_m$ :	106.48	ft <sup>3</sup>	$Q_s$ :	54,721	dscfm
$\gamma$ FACTOR:	0.988		$T_s$ :	150.25	°F
$P_{bar}$ :	29.61	in.Hg	Runtime:	180	minutes
$\Delta H$ :	1.08	in.H <sub>2</sub> O	$V_s$ :	56.724	ft/sec
$T_m$ :	91.25	°F	$P_s$ :	29.58	in.Hg
$V_{ic}$ :	57.7	mL	Noz. diam:	0.188	inches
$M_n$ front:	1.16	mg			
CO <sub>2</sub> :	0.20	% by volume			
O <sub>2</sub> :	20.70	% by volume			

ENGLISH UNITS  
(29.92 in.Hg & 68 °F)

<b>VOLUME OF SAMPLE @ STANDARD CONDITIONS, DRY BASIS</b>		
$V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right]$	=	99.989 dscf
$\gamma = 0.988$		
<b>VOLUME OF WATER IN SAMPLE @ STANDARD CONDITIONS</b>		
$V_{wstd} = 0.04707 \times V_{ic}$	=	2.716 scf
<b>FRACTIONAL MOISTURE CONTENT OF STACK GAS</b>		
$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} \times 100$	=	2.64 %
<b>PARTICULATE CONCENTRATION IN STACK GAS ON A DRY BASIS</b>		
$C_s = (0.01543) \left( \frac{M_n}{V_{mstd}} \right)$	Total	= 0.00018 gr/dscf
$C'_s = (2.205 \times 10^{-6}) \left( \frac{M_n}{V_{mstd}} \right)$	$C'_s$ Total	= 0.0256 x 10 <sup>-6</sup> lbs/dscf
<b>EMISSION RATE</b>		
$pmr = \left( \frac{C_s}{7000} \right) (Q_{std})(60)$	=	0.0840 lbs/hr 0.3678 ton/yr
<b>ISOKINETIC SAMPLING RATE</b>		
$\%ISO = \frac{(100)(T_s) \left[ (0.002669 \times V_{ic}) + \left( \frac{V_m}{T_m} \right) \left( \gamma \left( P_{bar} + \left( \frac{\Delta H}{13.6} \right) \right) \right) \right]}{(60)(\theta)(V_s)(P_s)(A_n)}$	=	101.68 % I
$A_n = 0.0001928 \text{ ft}^2$	Runtime =	180 minutes

ARI ENVIRONMENTAL, INC.  
USEPA METHOD 202 - CONDENSIBLE PARTICULATE CALCULATION SUMMARY

COMPANY: H. Kramer  
LOCATION: Chicago, IL  
SOURCE: South Baghouse  
TEST DATE: 9/20/13  
RUN NUMBER: 3

<b>INPUT</b>		<b>Q<sub>s</sub>:</b>	54,721	<b>dscfm</b>
V <sub>m</sub> :	106.48	<b>T<sub>s</sub>:</b>	150.3	<b>°F</b>
γ FACTOR:	0.988	<b>Runtime:</b>	180	<b>minutes</b>
P <sub>bar</sub> :	29.61	<b>V<sub>s</sub>:</b>	56.724	<b>ft/sec</b>
ΔH:	1.08	<b>P<sub>s</sub>:</b>	29.58	<b>in.Hg</b>
T <sub>m</sub> :	91.25	<b>Noz. diam:</b>	0.188	<b>inches</b>
V <sub>ic</sub> :	57.7	<b>m<sub>lb</sub>:</b>	2.15	<b>mg</b>
N:	0.0000	<b>m<sub>ob</sub>:</b>	0.90	<b>mg</b>
V <sub>t</sub> :	0.00			
m <sub>r</sub> :	5.20			
m <sub>o</sub> :	1.00			

ENGLISH UNITS  
(29.92 in.Hg & 68 °F)

<b>VOLUME OF SAMPLE @ STANDARD CONDITIONS, DRY BASIS</b>					
	$V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right]$		=	99.989 dscf	
<b>MASS OF AMMONIA CORRECTION</b>					
Equation #1	m <sub>c</sub> = 17.03 × V <sub>T</sub> × N		=	0.00 mg	
<b>MASS OF THE FIELD BLANK</b>					
Equation #2	m <sub>fb</sub> = m <sub>lb</sub> + m <sub>ob</sub>		=	3.05 mg 2.00 mg @ max allowable	
<b>MASS OF INORGANIC CONDENSIBLE PM</b>					
Equation #3	m <sub>i</sub> = m <sub>r</sub> - m <sub>c</sub>		=	5.20 mg	
<b>TOTAL MASS OF CONDENSIBLE PM</b>					
Equation #4	m <sub>cpm</sub> = m <sub>i</sub> + m <sub>o</sub> - m <sub>fb</sub>		=	4.20 mg @ max. blank	
<b>TOTAL CONCENTRATION OF CONDENSIBLE PM - METRIC UNITS</b>					
Equation #5	C <sub>cpm</sub> = $\frac{m_{cpm}}{V_{m(std)}}$		=	0.0420 mg/dscf	
<b>TOTAL CONCENTRATION OF CONDENSIBLE PM - ENGLISH UNITS</b>					
	C <sub>s</sub> = (0.01543)(C <sub>cpm</sub> )	Total	=	0.00065 gr/dscf	
	C <sub>s</sub> = (2.205 × 10 <sup>-6</sup> )(C <sub>cpm</sub> )	C <sub>s</sub> Total	=	0.0926 × 10 <sup>-6</sup> lbs/dscf	
<b>EMISSION RATE</b>					
	pmr = $\left( \frac{C_s}{7000} \right) (Q_{std})(60)$		Total	=	0.3040 lbs/hr 1.3315 ton/yr
<b>ISOKINETIC SAMPLING RATE</b>					
%ISO =	$\frac{(100)(T_s) \left[ (0.002669 \times V_{ic}) + \left( \frac{V_m}{T_m} \right) (\gamma) \left( P_{bar} + \left( \frac{\Delta H}{13.6} \right) \right) \right]}{(60)(0)(V_s)(P_s)(A_n)}$		=	101.68 % I	
	A <sub>n</sub> = 0.00019 ft <sup>2</sup>	Runtime =	180	minutes	

ARI ENVIRONMENTAL, INC.  
FLOW RATE CALCULATION SUMMARY

COMPANY: H. Kramer  
LOCATION: Chicago, IL  
RUN NUMBER: 3

SOURCE: South Baghouse  
TEST DATE: 9/20/2013

BAROMETRIC:	29.61 in. Hg	STACK DIAM:	59.50 inches
STATIC PRES:	-0.45 in.H <sub>2</sub> O	CO <sub>2</sub> :	0.20 % by volume
STACK TEMP:	150.3 °F	O <sub>2</sub> :	20.70 % by volume
SQ.RT ΔP:	0.9295 in.H <sub>2</sub> O		

<b>DRY MOLECULAR WEIGHT OF STACK GAS</b>			
$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO)$	=	28.86	lb/lb-mole
<b>MOLECULAR WEIGHT OF STACK GAS, wet basis</b>			
$M_s = M_d(1 - B_{ws}) + 18B_{ws}$	=	28.57	lb/lb-mole
<b>PITOT TUBE COEFFICIENT</b>			
$C_p$ (from calibration curve or geometric specifications)	=	0.84	
<b>AVERAGE VELOCITY HEAD OF STACK GAS, in. H<sub>2</sub>O</b>			
$\sqrt{\Delta P} = \frac{1}{n} \sum_{i=1}^n \sqrt{\Delta p_i}$	=	0.9295	in. H <sub>2</sub> O
<b>AVERAGE ABSOLUTE STACK GAS TEMPERATURE</b>			
$T_s = 150.3 \text{ °F} + 460$	=	610.3	°R
<b>ABSOLUTE STACK GAS PRESSURE</b>			
$P_s = P_{bar} + \frac{P_{static}}{13.6}$	=	29.58	in.Hg
<b>STACK GAS VELOCITY</b>			
$V_s = (85.49)(C_p)(avg \sqrt{\Delta P}) \sqrt{\frac{T_s}{(P_s)(M_s)}}$	=	56.724	ft/sec
<b>STACK GAS VOLUMETRIC FLOW RATE, actual</b>			
$Q_s = 60 \times V_s \times A_s$	=	65,717	acfm
Stack Area =		19.309	ft <sup>2</sup>
<b>STACK GAS VOLUMETRIC FLOW RATE, standard conditions, wet basis</b>			
$Q_{stdw} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)$	=	56,208 3,372,467	scfm, wb scfh, wb
<b>STACK GAS VOLUMETRIC FLOW RATE, standard conditions, dry basis</b>			
$Q_{std} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)(1 - B_{ws})$	=	54,721 3,283,285	dscfm dscfh

ARI ENVIRONMENTAL, INC.  
MOISTURE CALCULATION SUMMARY

COMPANY: H. Kramer  
LOCATION: Chicago, IL  
SOURCE: South Baghouse  
TEST DATE: 9/20/2013  
RUN NUMBER: 3

$\gamma$ FACTOR:	0.988	STACK DIAM:	59.50 inches
BAROMETRIC:	29.61 in. Hg	METER VOLUME:	106.480 ft <sup>3</sup>
STATIC PRES:	-0.45 in.H <sub>2</sub> O	METER TEMP:	91.3 °F
STACK TEMP:	150.3 °F	LIQUID COLL:	57.7 milliliters
SQ.RT $\Delta$ P:	0.9295 in.H <sub>2</sub> O	CO <sub>2</sub> :	0.20 % by volume
$\Delta$ H:	1.08 in.H <sub>2</sub> O	O <sub>2</sub> :	20.70 % by volume

ENGLISH UNITS  
(29.92 in.Hg & °F)

<b>VOLUME OF SAMPLE</b> @ STANDARD CONDITIONS, DRY BASIS  $V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 99.989 \text{ dscf}$ $\gamma = 0.988$	
<b>VOLUME OF WATER IN SAMPLE</b> @ STANDARD CONDITIONS  $V_{wstd} = 0.04707 \times V_{lc} = 2.716 \text{ scf}$ $V_{lc} = 57.7 \text{ mL}$	
<b>FRACTIONAL MOISTURE CONTENT OF STACK GAS AS MEASURED</b>  $B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = 0.0264$	
<b>FRACTIONAL MOISTURE CONTENT OF STACK GAS @ SATURATION</b>  $B_{ws@saturation} = \frac{S.V.P.}{P_{bar} + \frac{P_{static}}{13.6}} = 0.2559$ $S.V.P. = 7.569 \text{ in. Hg}$	
<b>FRACTIONAL MOISTURE CONTENT USED IN CALCULATIONS</b>  $B_{ws} = 0.0264$	

**SUMMARY OF TEST RESULTS**

TABLE	:	Lead Emission Summary			
COMPANY	:	H. Kramer			
LOCATION	:	Chicago, IL			
SOURCE	:	South Baghouse			
TEST DATE	:	9/19/2013	9/19/2013	9/20/2013	
RUN NO	:	1	2	3	
TEST TIME	:	08:07 - 11:14	12:05 - 15:15	07:30 - 10:40	Average

**Stack Gas Parameters**

Temperature, °F	149.8	141.5	155.0	145.6
Velocity, av. ft/sec	58.8	59.9	55.3	59.4
Volumetric flow, acfm	68,126	69,403	64,040	68,765
Volumetric flow, scfm	57,906	59,805	54,346	58,855
Volumetric flow, dscfh	3,376,899	3,411,128	3,164,613	3,394,014
Moisture, av. % vol	2.8	4.9	2.9	3.9
Carbon Dioxide, av. % vol	0.3	0.4	0.2	0.4
Oxygen, av. % vol	20.5	20.4	20.7	20.5

**Sample**

Time, min	180.0	180.0	180.0	
Volume, dscf	102.427	104.955	96.051	101.144
Volume, dscm	2.901	2.972	2.720	2.864
Front Half Lead, ug	7.608	21.938	25.880	18.475
Back Half Lead, ug	<1.250	6.710	1.800	<3.253
Total Lead, ug	<8.858	28.648	27.680	<21.729
Isokinetic Ratio, %	102.4	103.9	102.5	102.9

**Lead Emissions**

Concentration				
gr/dscf	<0.0000013	0.0000042	0.0000044	<0.0000033
mg/dscm	<0.00305	0.00964	0.01018	<0.00762
x 10 <sup>-6</sup> lb/dscf	<0.0002	0.0006	0.0006	<0.0005
Emission Rate				
lb/hr	<0.00064	0.00205	0.00201	<0.00157

**Visible Emissions (Method 22)**

# of minutes:sec with visible emissions (During 1st hour of 1st run)*	0:00
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\*As requested by Mr. Kevin Mattison of IEPA, Division of Air Pollution Control

SUMMARY OF TEST RESULTS

TABLE USEPA Method 29 Metals Emissions Summary  
 COMPANY H. Kramer  
 LOCATION Chicago, IL  
 SOURCE South Baghouse

TEST DATE	9/19/2013				9/19/2013				9/20/2013				Average	
RUN NO	1				2				3					
TEST TIME	08:07 - 11:14				12:05 - 15:15				07:30 - 10:40					
Metals Sample					180.0				180.0					
Time, min	180.0				180.0				180.0					
Volume, dscf	102.427				104.955				96.051					
Isokinetic Ratio, %	102.4				103.9				102.5					
Metals Emissions	Mass	Concentration	Concentration	Emission Rate	Mass	Concentration	Concentration	Emission Rate	Mass	Concentration	Concentration	Emission Rate	Average Concentration	Average Emission Rate
Analyte	ug	mg/dscm	x10 <sup>-6</sup> lb/dscf	lb/hr	ug	mg/dscm	x10 <sup>-6</sup> lb/dscf	lb/hr	ug	mg/dscm	x10 <sup>-6</sup> lb/dscf	lb/hr	mg/dscm	lb/hr
Antimony	<2.500	<0.00086	<0.054	<0.000182	<2.500	<0.00084	<0.053	<0.000179	<2.650	<0.00097	<0.061	<0.000193	<0.00089	<0.000184
Arsenic	<2.500	<0.00086	<0.054	<0.000182	<2.500	<0.00084	<0.053	<0.000179	<2.500	<0.00092	<0.057	<0.000182	<0.00087	<0.000181
Barium	5.200	0.00179	0.112	0.000378	13.980	0.00470	0.294	0.000100	<8.560	<0.00315	<0.197	<0.000622	<0.00321	<0.000367
Beryllium	<0.120	<0.00004	<0.003	<0.000009	<0.120	<0.00004	<0.003	<0.000009	<0.120	<0.00004	<0.003	<0.000009	<0.00004	<0.000009
Cadmium	<1.260	<0.00043	<0.027	<0.000092	<3.790	<0.00128	<0.080	<0.000272	7.100	0.00261	0.163	0.000516	<0.00144	<0.000293
Chromium	<4.610	<0.00186	<0.104	<0.000350	2.400	0.00081	0.050	0.000172	12.130	0.00446	0.278	0.000881	<0.00231	<0.000468
Cobalt	<6.740	<0.00232	<0.145	<0.000490	<1.260	<0.00042	<0.026	<0.000090	18.730	0.00689	0.430	0.001361	<0.00321	<0.000647
Copper	4.120	0.0014	0.089	0.000300	6.880	0.00231	0.145	0.000493	5.600	0.00206	0.129	0.000407	0.00193	0.000400
Lead	<8.858	<0.00305	<0.191	<0.000644	28.648	0.00964	0.602	0.002053	27.680	0.01018	0.635	0.002011	<0.00782	<0.001569
Manganese	<2.290	<0.00077	<0.049	<0.000166	<4.010	<0.00135	<0.084	<0.000287	<3.070	<0.00113	<0.070	<0.000223	<0.00108	<0.000226
Nickel	<3.300	<0.00114	<0.071	<0.000240	2.850	0.00096	0.060	0.000204	3.380	0.00124	0.078	0.000246	<0.00111	<0.000230
Phosphorus	485.834	0.16741	10.455	0.035304	424.379	0.14277	8.916	0.030413	315.341	0.11592	7.239	0.022909	0.14204	0.029542
Selenium	<6.030	<0.00208	<0.130	<0.000438	<8.700	<0.00293	<0.183	<0.000623	<15.720	<0.00578	<0.361	<0.001142	<0.00359	<0.000735
Silver	<1.260	<0.00043	<0.027	<0.000092	<1.260	<0.00042	<0.026	<0.000090	<1.260	<0.00046	<0.029	<0.000092	<0.00044	<0.000091
Thallium	<2.500	<0.00086	<0.054	<0.000182	<2.500	<0.00084	<0.053	<0.000179	<2.500	<0.00092	<0.057	<0.000182	<0.00087	<0.000181
Zinc	50.130	0.01728	1.079	0.003644	34.880	0.01173	0.733	0.002500	103.720	0.03813	2.381	0.007535	0.02238	0.004560



USEPA Method 29  
Metals Emissions Calculation Summary

Client: H. Kramer  
Location: Chicago, IL  
Source: South Baghouse  
Date: 9/19/2013  
Run #: 1

Test Data Input		Metals Laboratory Analysis Weights (M <sub>i</sub> ) < Values = Below MDL	
Barometric pressure (P <sub>bar</sub> ):	29.40 inches Hg	Manganese (Mn):	<2.29 ug
Stack pressure (P <sub>s</sub> ):	29.37 inches Hg Abs.	Antimony (Sb):	<2.50 ug
Test length (t):	180.00 minutes	Arsenic (As):	<2.50 ug
Sample nozzle diameter (D <sub>n</sub> ):	0.187 inches	Barium (Ba):	5.20 ug
Sample nozzle area (S <sub>b</sub> ):	0.000191 ft <sup>2</sup>	Beryllium (Be):	<0.12 ug
Stack temperature (T <sub>s</sub> ):	149.750 °F	Cadmium (Cd):	<1.26 ug
Volume metered (V <sub>meter</sub> ):	102.427 dscf	Chromium (Cr):	<4.81 ug
Stack gas velocity (V <sub>s</sub> ):	56.803 ft/sec	Cobalt (Co):	<6.74 ug
Stack gas volumetric flow (Q <sub>std</sub> ):	3,376,899 dscfh	Copper (Cu):	4.12 ug
Fractional Moisture content (B <sub>mo</sub> ):	0.028 %	Lead (Pb):	<6.86 ug
		Nickel (Ni):	<3.30 ug
		Phosphorus (P):	485.63 ug
		Selenium (Se):	<6.03 ug
		Silver (Ag):	<1.26 ug
		Thallium (Tl):	<2.50 ug
		Zinc (Zn):	50.13 ug

Sample calculations @ standard conditions (29.92 inches Hg, 88.0 °F):

Percent isokinetic:

$$\% \text{isokinetic} = \frac{0.0945 \times V_{\text{meter}} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{\text{mo}})} = 102.421 \% \text{ isokinetic}$$

Metals concentration (mg/dscm):

$$C_s = \frac{M_i}{\left[ \frac{V_{\text{meter}}}{35.31 \text{ dscf / dscm}} \right]} = <0.00077 \text{ mg/dscm Manganese (Mn)}$$

=	<0.00086	mg/dscm Antimony (Sb)	=	<0.00114	mg/dscm Nickel (Ni)
=	<0.00086	mg/dscm Arsenic (As)	=	0.16741	mg/dscm Phosphorus (P)
=	0.00179	mg/dscm Barium (Ba)	=		
=	<0.00004	mg/dscm Beryllium (Be)	=		
=	<0.00043	mg/dscm Cadmium (Cd)	=	<0.00208	mg/dscm Selenium (Se)
=	<0.00166	mg/dscm Chromium (Cr)	=	<0.00043	mg/dscm Silver (Ag)
=	0.00142	mg/dscm Copper (Cu)	=	<0.00086	mg/dscm Thallium (Tl)
			=	0.01728	mg/dscm Zinc (Zn)
=	<0.00305	mg/dscm Lead (Pb)	=		
=	<0.00232	mg/dscm Cobalt (Co)	=		

Metals concentration (x10<sup>-9</sup> lb/dscf):

$$C_s^1 = \frac{2205 \times 10^{-9} \text{ lb} \times M_i}{V_{\text{meter}}} = <0.0493 \times 10^{-9} \text{ lb/dscf Manganese (Mn)}$$

=	<0.0538	x 10 <sup>-9</sup> lb/dscf Antimony (Sb)	=	<0.0710	x 10 <sup>-9</sup> lb/dscf Nickel (Ni)
=	<0.0538	x 10 <sup>-9</sup> lb/dscf Arsenic (As)	=	10.4545	x 10 <sup>-9</sup> lb/dscf Phosphorus (P)
=	0.1119	x 10 <sup>-9</sup> lb/dscf Barium (Ba)	=		
=	<0.0026	x 10 <sup>-9</sup> lb/dscf Beryllium (Be)	=		
=	<0.0271	x 10 <sup>-9</sup> lb/dscf Cadmium (Cd)	=	<0.1298	x 10 <sup>-9</sup> lb/dscf Selenium (Se)
=	<0.1035	x 10 <sup>-9</sup> lb/dscf Chromium (Cr)	=	<0.0271	x 10 <sup>-9</sup> lb/dscf Silver (Ag)
=	0.0887	x 10 <sup>-9</sup> lb/dscf Copper (Cu)	=	<0.0538	x 10 <sup>-9</sup> lb/dscf Thallium (Tl)
			=	1.0792	x 10 <sup>-9</sup> lb/dscf Zinc (Zn)
=	<0.1907	x 10 <sup>-9</sup> lb/dscf Lead (Pb)	=		
=	<0.1451	x 10 <sup>-9</sup> lb/dscf Cobalt (Co)	=		

Metals emission rate (lb/hr):

$$E_m = C_s^1 \times Q_{\text{std}} = <0.000166 \text{ lb/hr Manganese (Mn)}$$

=	<0.000182	lb/hr Antimony (Sb)	=	<0.000240	lb/hr Nickel (Ni)
=	<0.000182	lb/hr Arsenic (As)	=	0.035304	lb/hr Phosphorus (P)
=	0.000378	lb/hr Barium (Ba)	=		
=	<0.000009	lb/hr Beryllium (Be)	=		
=	<0.000092	lb/hr Cadmium (Cd)	=	<0.000438	lb/hr Selenium (Se)
=	<0.000350	lb/hr Chromium (Cr)	=	<0.000092	lb/hr Silver (Ag)
=	0.000300	lb/hr Copper (Cu)	=	<0.000182	lb/hr Thallium (Tl)
			=	0.003644	lb/hr Zinc (Zn)
=	<0.000644	lb/hr Lead (Pb)	=		
=	<0.000490	lb/hr Cobalt (Co)	=		



**Metals Laboratory Data Summary**

B-20

Client: H. Kramer  
 Location: Chicago, IL  
 Source: South Baghouse  
 Date: 9/19/2013  
 Run #: 1  
 Filter Diam 110.00 mm  
 Filter Diam 4.33 in.  
 "A value"= 20.62 ug/in.

ND-Value Below Minimum Detection Limit - listed by DAT as ND  
 J-Value below LOQ but above MDL  
 (Sample - Blank) less than MDL: use MDL  
 FH = Front half, BH = Back half

**Front Half Metal Calculation**

Metal	FH Sample (M <sub>fh</sub> ) (micrograms)	FH Blank (M <sub>fb</sub> ) (micrograms)	<u>I Value</u>	<u>II Values</u>			Blank Value Used (micrograms)	Blank Corrected Sample Mass (micrograms)	Final* Blank Corrected Sample Mass (micrograms)	Sample	MDL
			A Value (filter) (micrograms)	5 % of FH Sample (micrograms)	Lesser value (M <sub>fb</sub> ) vs 5% (micrograms)	Greater Value I vs II (micrograms)					
Antimony	<1.25	7.15	20.62	0.06	0.06	20.62	7.15	-5.90	<1.25	ND	1.25
Arsenic	<1.25	0.00	20.62	0.06	0.00	20.62	0.00	1.25	<1.25	ND	1.25
Barium	6.05	11.02	20.62	0.30	0.30	20.62	11.02	-4.97	2.50		2.50
Beryllium	<0.06	0.00	20.62	0.00	0.00	20.62	0.00	0.06	<0.06	ND	0.06
Cadmium	<0.63	0.00	20.62	0.03	0.00	20.62	0.00	0.63	<0.63	ND	0.63
Chromium	4.63	5.44	20.62	0.23	0.23	20.62	5.44	-0.81	<0.25		0.25
Cobalt	7.12	1.01	20.62	0.36	0.36	20.62	1.01	6.11	6.11	J	0.63
Copper	2.00	1.55	20.62	0.10	0.10	20.62	1.55	0.45	0.45		0.32
Lead	28.23	21.09	20.62	1.41	1.41	20.62	20.62	7.61	7.61		1.25
Manganese	0.89	1.26	20.62	0.04	0.04	20.62	1.26	-0.37	<0.63	J	0.63
Nickel	2.05	2.12	20.62	0.10	0.10	20.62	2.12	-0.07	<0.63	J	0.63
Phosphorus	195.92	171.49	20.62	9.80	9.80	20.62	20.62	175.30	175.30		2.50
Selenium	10.71	11.63	20.62	0.54	0.54	20.62	11.63	-0.92	<1.25		1.25
Silver	<0.63	0.00	20.62	0.03	0.00	20.62	0.00	0.63	<0.63	ND	0.63
Thallium	<1.25	0.00	20.62	0.06	0.00	20.62	0.00	1.25	<1.25	ND	1.25
Zinc	41.25	5.24	20.62	2.06	2.06	20.62	5.24	36.01	36.01		0.63

\*Use MDL if the blank corrected value is <MDL

**Back Half Metal Calculation**

Metal	BH Sample (M <sub>bh</sub> ) (micrograms)	BH Blank (M <sub>bhb</sub> ) (micrograms)	<u>I Value</u>	<u>II Values</u>			Blank Value Used (micrograms)	Blank Corrected Sample Mass (micrograms)*	Final* Blank Corrected Sample Mass (micrograms)	Sample	MDL
			5 % of BH Sample (micrograms)	Lesser value (M <sub>bh</sub> ) vs 5% (micrograms)	Greater Value I vs II (micrograms)						
Antimony	<1.25	17.76	1.00	0.06	0.06	1.00	1.00	0.25	<1.25	ND	1.25
Arsenic	<1.25	0.00	1.00	0.06	0.00	1.00	0.00	1.25	<1.25	ND	1.25
Barium	2.70	0.00	1.00	0.14	0.00	1.00	0.00	2.70	2.70	J	2.50
Beryllium	<0.06	0.43	1.00	0.00	0.00	1.00	0.43	-0.37	<0.06	ND	0.06
Cadmium	0.68	3.51	1.00	0.03	0.03	1.00	1.00	-0.32	<0.63	J	0.63
Chromium	4.56	0.00	1.00	0.23	0.00	1.00	0.00	4.56	4.56		0.25
Cobalt	<0.63	0.00	1.00	0.03	0.00	1.00	0.00	0.63	<0.63	ND	0.63
Copper	4.67	5.16	1.00	0.23	0.23	1.00	1.00	3.67	3.67		0.32
Lead	<1.25	8.25	1.00	0.06	0.06	1.00	1.00	0.25	<1.25	ND	1.25
Manganese	1.66	0.00	1.00	0.08	0.00	1.00	0.00	1.66	1.66	J	0.63
Nickel	2.67	0.00	1.00	0.13	0.00	1.00	0.00	2.67	2.67		0.63
Phosphorus	326.67	322.35	1.00	16.33	16.33	16.33	16.33	310.34	310.34		2.50
Selenium	4.78	0.00	1.00	0.24	0.00	1.00	0.00	4.78	4.78	J	1.25
Silver	<0.63	0.00	1.00	0.03	0.00	1.00	0.00	0.63	<0.63	ND	0.63
Thallium	<1.25	0.00	1.00	0.06	0.00	1.00	0.00	1.25	<1.25	ND	1.25
Zinc	14.12	0.00	1.00	0.71	0.00	1.00	0.00	14.12	14.12		0.63

\*Use MDL if the blank corrected value is <MDL





**Metals Laboratory Data Summary**  
Total Front Half Plus Back Half Metal Calculation

Client: H. Kramer  
 Location: Chicago, IL  
 Source: South Baghouse  
 Date: 9/19/2013  
 Run #: 1

ND-Value Below Minimum Detection Limit - listed by DAT as ND  
 J-Value below LOQ but above MDL  
 (Sample - Blank) less than MDL: use MDL  
 FH = Front half, BH = Back half

Metal	Final FH Blank Corrected Sample Mass (micrograms)	Final BH Blank Corrected Sample Mass (micrograms)	Total Metal (M)	MDL	FH	BH
Antimony	<1.25	<1.25	<2.50	1.25	ND	ND
Arsenic	<1.25	<1.25	<2.50	1.25	ND	ND
Barium	2.50	2.70	5.20	2.50		J
Beryllium	<0.06	<0.06	<0.12	0.06	ND	ND
Cadmium	<0.63	<0.63	<1.26	0.63	ND	J
Chromium	<0.25	4.56	<4.81	0.25		
Cobalt	6.11	<0.63	<6.74	0.63	J	ND
Copper	0.45	3.67	4.12	0.32		
Lead	7.61	<1.25	<8.86	1.25		ND
Manganese	<0.63	1.66	<2.29	0.63	J	J
Nickel	<0.63	2.67	<3.30	0.63	J	
Phosphorus	175.30	310.34	485.63	2.50		
Selenium	<1.25	4.78	<6.03	1.25	ND	J
Silver	<0.63	<0.63	<1.26	0.63	ND	ND
Thallium	<1.25	<1.25	<2.50	1.25	ND	ND
Zinc	36.01	14.12	50.13	0.63		



USEPA Method 2  
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: H. Kramer  
Location: Chicago, IL  
Source: South Baghouse  
Date: 9/19/2013  
Run #: 1

**Data Input**

Carbon Dioxide (CO <sub>2</sub> ):	0.3 %
Oxygen (O <sub>2</sub> ):	20.5 %
Nitrogen (N <sub>2</sub> ):	79.2 %
Fractional Moisture Content (B <sub>ws</sub> )	0.0281 dimensionless
Stack Temperature (T <sub>s</sub> ):	149.8 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	0.9805 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.40 inches Hg
Static Pressure (S <sub>t</sub> )	-0.42 inches H <sub>2</sub> O
Stack diameter:	59.50 inches
Stack area (A <sub>s</sub> ):	19.3091 ft <sup>2</sup>

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):****Dry molecular weight of stack gas:**

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 28.868 \text{ lb/lb-mole}$$

**Molecular weight of stack gas, wet basis:**

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 28.563 \text{ lb/lb-mole}$$

**Absolute stack gas pressure:**

$$P_s = P_{bar} + \left( \frac{S_t}{13.6} \right) = 29.369 \text{ inches H}_2\text{O}$$

**Stack gas velocity:**

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 58.803 \text{ feet/second}$$

**Stack gas volumetric flow rate:**

$$Q_a = A_s \times V_s \times 60 = 68,126 \text{ acfm}$$

**Stack gas volumetric flow rate, wet basis:**

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 57,906 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 3,474,355 \text{ scfh}$$

**Stack gas volumetric flow rate, dry basis:**

$$Q_{std} = Q_{sw} \times (1 - B_{ws}) = 56,282 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{ws}) \times 60 = 3,376,899 \text{ dscfh}$$



**USEPA Method 4  
Moisture Determination Sample Calculations**

**Client:** H. Kramer  
**Location:** Chicago, IL  
**Source:** South Baghouse  
**Date:** 9/19/2013  
**Run #:** 1

**Data Input:**

Volume metered ( $V_m$ ):	107.625 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.002 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.40 inches Hg
Meter sample rate ( $\Delta H$ ):	1.16 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	87.8 °F
Volume of moisture collected ( $V_{ic}$ ):	62.8 milliliters
Stack Temperature ( $T_s$ ):	149.8 °F
Static Pressure (St):	-0.4 inches H <sub>2</sub> O

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):****Volume of sample, dry basis:**

$$V_{m_{dd}} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92 \text{ Hg}} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 102.427 \text{ dscf}$$

**Volume of water vapor in sample:**

$$V_{w_{sd}} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{ic} = 2.956 \text{ scf}$$

**Fractional moisture content of stack gas:**

$$B_{vs} = \frac{V_{w_{sd}}}{(V_{m_{sd}} + V_{w_{sd}})} = 0.0281 B_{wo}$$

**Percent Moisture:**

$$\% \text{moisture} = B_{vs} \times 100 = 2.81 \%$$

**Fractional moisture content of stack gas at saturated conditions:**

$$T_{s(K)} = ((T_s - 32) \times 0.5556) + 273 = 338.4 \text{ Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{S_t}{13.6} \right) \times 25.401 = 746.79 \text{ mm Hg}$$

$$B_{wos} = \frac{\sqrt{10 \left( \frac{A \left( \frac{B}{T_{s(K)} - C} \right) \right)}}{P_{s(\text{mmHg})}} \quad \begin{array}{l} \text{where:} \\ A=8.361 \\ B=1893.5 \\ C=27.65 \end{array} = 0.2476 \%$$

**Percent moisture at saturated conditions:**

$$\% \text{moisture}_{\text{saturated}} = B_{wos} \times 100 = 24.76 \%$$

**Percent moisture used for emissions calculations:**

$$= 2.81 \%$$



USEPA Method 29  
Metals Emissions Calculation Summary

Client: H. Kramer  
Location: Chicago, IL  
Source: South Baghouse  
Date: 9/19/2013  
Run #: 2

Test Data Input

Barometric pressure (P <sub>bar</sub> ):	29.40 inches Hg
Stack pressure (P <sub>s</sub> ):	29.37 inches Hg Abs.
Test length (l):	180.00 minutes
Sample nozzle diameter (D <sub>s</sub> ):	0.187 inches
Sample nozzle area (S <sub>b</sub> ):	0.000191 ft <sup>2</sup>
Stack temperature (T <sub>s</sub> ):	141.46 °F
Volume metered (V <sub>met</sub> ):	104.96 dscf
Stack gas velocity (V <sub>s</sub> ):	59.91 ft/sec
Stack gas volumetric flow (Q <sub>s,Std</sub> ):	3,411,128 dscfh
Fractional Moisture content (B <sub>wa</sub> ):	0.049 %

Metals Laboratory Analysis Weights (Mt)

Antimony (Sb):	<2.50 ug	Manganese (Mn):	<4.01 ug
Arsenic (As):	<2.50 ug	Nickel (Ni):	2.85 ug
Barium (Ba):	13.980 ug	Phosphorus (P):	424.39 ug
Beryllium (Be):	<0.12 ug	Selenium (Se):	<6.70 ug
Cadmium (Cd):	<3.79 ug	Silver (Ag):	<1.26 ug
Chromium (Cr):	2.400 ug	Thallium (Tl):	<2.50 ug
Cobalt (Co):	<1.26 ug	Zinc (Zn):	34.88 ug
Copper (Cu):	6.680 ug		
Lead (Pb):	28.648 ug		

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\% \text{Isokinetic} = \frac{0.0945 \times V_{\text{met}} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wa})} = 103.896 \% \text{ Isokinetic}$$

Metals concentration (mg/dscm):

$$C_s = \frac{M_i}{\left( \frac{V_{\text{met}}}{35.3 \text{ l/dscf}} / \text{dscm} \right)}$$

=	<0.00084	mg/dscm Antimony (Sb)	=	<0.00135	mg/dscm Manganese (Mn)
=	<0.00084	mg/dscm Arsenic (As)	=	0.00096	mg/dscm Nickel (Ni)
=	0.00470	mg/dscm Barium (Ba)	=	0.14277	mg/dscm Phosphorus (P)
=	<0.00094	mg/dscm Beryllium (Be)	=		
=	<0.00128	mg/dscm Cadmium (Cd)	=	<0.00293	mg/dscm Selenium (Se)
=	0.00081	mg/dscm Chromium (Cr)	=	<0.00042	mg/dscm Silver (Ag)
=	0.00231	mg/dscm Copper (Cu)	=	<0.00084	mg/dscm Thallium (Tl)
=			=	0.01173	mg/dscm Zinc (Zn)
=	0.00964	mg/dscm Lead (Pb)	=		
=	<0.00042	mg/dscm Cobalt (Co)	=		

Metals concentration (x10<sup>-5</sup> lb/dscf):

$$C'_s = \frac{\left( \frac{2.205 \times 10^{-9} \text{ lb}}{\mu\text{g}} \times M_i \right)}{V_{\text{met}}}$$

=	<0.0525	x 10 <sup>-5</sup> lb/dscf Antimony (Sb)	=	<0.0842	x 10 <sup>-5</sup> lb/dscf Manganese (Mn)
=	<0.0525	x 10 <sup>-5</sup> lb/dscf Arsenic (As)	=	0.0599	x 10 <sup>-5</sup> lb/dscf Nickel (Ni)
=	0.2937	x 10 <sup>-5</sup> lb/dscf Barium (Ba)	=	8.9158	x 10 <sup>-5</sup> lb/dscf Phosphorus (P)
=	<0.0025	x 10 <sup>-5</sup> lb/dscf Beryllium (Be)	=		
=	<0.0796	x 10 <sup>-5</sup> lb/dscf Cadmium (Cd)	=	<0.1828	x 10 <sup>-5</sup> lb/dscf Selenium (Se)
=	0.0504	x 10 <sup>-5</sup> lb/dscf Chromium (Cr)	=	<0.0265	x 10 <sup>-5</sup> lb/dscf Silver (Ag)
=	0.1445	x 10 <sup>-5</sup> lb/dscf Copper (Cu)	=	<0.0525	x 10 <sup>-5</sup> lb/dscf Thallium (Tl)
=			=	0.7328	x 10 <sup>-5</sup> lb/dscf Zinc (Zn)
=	0.6019	x 10 <sup>-5</sup> lb/dscf Lead (Pb)	=		
=	<0.0265	x 10 <sup>-5</sup> lb/dscf Cobalt (Co)	=		

Metals emission rate (lb/hr):

$$E_m = C'_s \times Q_{sc}$$

=	<0.000179	lb/hr Antimony (Sb)	=	<0.000287	lb/hr Manganese (Mn)
=	<0.000179	lb/hr Arsenic (As)	=	0.000204	lb/hr Nickel (Ni)
=	0.000100	lb/hr Barium (Ba)	=	0.30413	lb/hr Phosphorus (P)
=	<0.000009	lb/hr Beryllium (Be)	=		
=	<0.000272	lb/hr Cadmium (Cd)	=	<0.000623	lb/hr Selenium (Se)
=	0.000172	lb/hr Chromium (Cr)	=	<0.000090	lb/hr Silver (Ag)
=	0.000493	lb/hr Copper (Cu)	=	<0.000179	lb/hr Thallium (Tl)
=			=	0.002500	lb/hr Zinc (Zn)
=	0.002053	lb/hr Lead (Pb)	=		
=	<0.000090	lb/hr Cobalt (Co)	=		



**Metals Laboratory Data Summary**

Client: H. Kramer  
 Location: Chicago, IL  
 Source: South Baghouse  
 Date: 9/19/2013  
 Run #: 2

ND-Value Below Minimum Detection Limit - listed by DAT as ND  
 J-Value below LOQ but above MDL  
 (Sample - Blank) less than MDL: use MDL  
 FH = Front half, BH = Back half

**Front Half Metal Calculation**

Metal	FH Sample (M <sub>fh</sub> ) (micrograms)	FH Blank (M <sub>fhb</sub> ) (micrograms)	<u>I Value</u>	<u>II Values</u>			Blank Value Used (micrograms)	Blank Corrected Sample Mass (micrograms)	Final* Blank Corrected Sample Mass (micrograms)	Sample	MDL
			<u>A Value</u> (4 inch filter) (micrograms)	5 % of FH Sample (micrograms)	Lesser value (M <sub>fhb</sub> ) vs 5% (micrograms)	Greater Value I vs II (micrograms)					
Antimony	8.29	7.15	20.62	0.41	0.41	20.62	7.15	1.14	<1.25		1.25
Arsenic	<1.25	0.00	20.62	0.06	0.00	20.62	0.00	1.25	<1.25	ND	1.25
Barium	5.69	11.02	20.62	0.28	0.28	20.62	11.02	-5.33	<2.50	J	2.50
Beryllium	<0.06	0.00	20.62	0.00	0.00	20.62	0.00	0.06	<0.06	ND	0.06
Cadmium	<0.63	0.00	20.62	0.03	0.00	20.62	0.00	0.63	<0.63	ND	0.63
Chromium	6.19	5.44	20.62	0.31	0.31	20.62	5.44	0.75	0.75		0.25
Cobalt	<0.63	1.01	20.62	0.03	0.03	20.62	1.01	-0.38	<0.63	ND	0.63
Copper	3.67	1.55	20.62	0.18	0.18	20.62	1.55	2.12	2.12		0.32
Lead	42.56	21.09	20.62	2.13	2.13	20.62	20.62	21.94	21.94		1.25
Manganese	1.07	1.26	20.62	0.05	0.05	20.62	1.26	-0.19	<0.63	J	0.63
Nickel	2.82	2.12	20.62	0.14	0.14	20.62	2.12	0.70	0.70		0.63
Phosphorus	165.35	171.49	20.62	8.27	8.27	20.62	20.62	144.73	144.73		2.50
Selenium	11.02	11.63	20.62	0.55	0.55	20.62	11.63	-0.61	<1.25		1.25
Silver	<0.63	0.00	20.62	0.03	0.00	20.62	0.00	0.63	<0.63	ND	0.63
Thallium	<1.25	0.00	20.62	0.06	0.00	20.62	0.00	1.25	<1.25	ND	1.25
Zinc	25.58	5.24	20.62	1.28	1.28	20.62	5.24	20.34	20.34		0.63

\*Use MDL if the blank corrected value is <MDL

**Back Half Metal Calculation**

Metal	BH Sample (M <sub>bh</sub> ) (micrograms)	BH Blank (M <sub>bhb</sub> ) (micrograms)	<u>I Value</u>	<u>II Values</u>			Blank Value Used (micrograms)	Blank Corrected Sample Mass (micrograms)	Final* Blank Corrected Sample Mass (micrograms)	Sample	MDL
			(micrograms)	5 % of BH Sample (micrograms)	Lesser value (M <sub>bhb</sub> ) vs 5% (micrograms)	Greater Value I vs II (micrograms)					
Antimony	<1.25	17.76	1.00	0.06	0.06	1.00	1.00	0.25	<1.25	ND	1.25
Arsenic	<1.25	0.00	1.00	0.06	0.00	1.00	0.00	1.25	<1.25	ND	1.25
Barium	11.48	0.00	1.00	0.57	0.00	1.00	0.00	11.48	11.48		2.50
Beryllium	0.16	0.43	1.00	0.01	0.01	1.00	0.43	-0.27	<0.06	J	0.06
Cadmium	4.16	3.51	1.00	0.21	0.21	1.00	1.00	3.16	3.16		0.63
Chromium	1.65	0.00	1.00	0.08	0.00	1.00	0.00	1.65	1.65		0.25
Cobalt	<0.63	0.00	1.00	0.03	0.00	1.00	0.00	0.63	<0.63	ND	0.63
Copper	5.76	5.16	1.00	0.29	0.29	1.00	1.00	4.76	4.76		0.32
Lead	7.71	8.25	1.00	0.39	0.39	1.00	1.00	6.71	6.71		1.25
Manganese	3.38	0.00	1.00	0.17	0.00	1.00	0.00	3.38	3.38		0.63
Nickel	2.15	0.00	1.00	0.11	0.00	1.00	0.00	2.15	2.15	J	0.63
Phosphorus	294.37	322.35	1.00	14.72	14.72	14.72	14.72	279.65	279.65		2.50
Selenium	7.45	0.00	1.00	0.37	0.00	1.00	0.00	7.45	7.45		1.25
Silver	<0.63	0.00	1.00	0.03	0.00	1.00	0.00	0.63	<0.63	ND	0.63
Thallium	<1.25	0.00	1.00	0.06	0.00	1.00	0.00	1.25	<1.25	ND	1.25
Zinc	14.54	0.00	1.00	0.73	0.00	1.00	0.00	14.54	14.54		0.63

\*Use MDL if the blank corrected value is <MDL



**Metals Laboratory Data Summary**  
**Total Front Half Plus Back Half Metal Calculation**

B-26

Client: H. Kramer  
 Location: Chicago, IL  
 Source: South Baghouse  
 Date: 9/19/2013  
 Run #: 2

ND-Value Below Minimum Detection Limit - listed by DAT as ND  
 J-Value below LOQ but above MDL  
 (Sample - Blank) less than MDL: use MDL  
 FH = Front half, BH = Back half

Metal	Final FH Blank Corrected Sample Mass (micrograms)	Final BH Blank Corrected Sample Mass (micrograms)	Total Metal (M <sub>t</sub> ) (micrograms)	MDL	FH	BH
Antimony	<1.25	<1.25	<2.50	1.25		ND
Arsenic	<1.25	<1.25	<2.50	1.25	ND	ND
Barium	2.50	11.48	13.98	2.50	J	
Beryllium	<0.06	<0.06	<0.12	0.06	ND	J
Cadmium	<0.63	3.16	<3.79	0.63	ND	
Chromium	0.75	1.65	2.40	0.25		
Cobalt	<0.63	<0.63	<1.26	0.63	ND	ND
Copper	2.12	4.76	6.88	0.32		
Lead	21.94	6.71	28.65	1.25		
Manganese	<0.63	3.38	<4.01	0.63	J	
Nickel	0.70	2.15	2.85	0.63		J
Phosphorus	144.73	279.65	424.38	2.50		
Selenium	<1.25	7.45	<8.70	1.25		
Silver	<0.63	<0.63	<1.26	0.63	ND	ND
Thallium	<1.25	<1.25	<2.50	1.25	ND	ND
Zinc	20.34	14.54	34.88	0.63		



USEPA Method 2  
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: H. Kramer  
Location: Chicago, IL  
Source: South Baghouse  
Date: 9/19/2013  
Run #: 2

**Data Input**

Carbon Dioxide (CO <sub>2</sub> ):	0.4 %
Oxygen (O <sub>2</sub> ):	20.4 %
Nitrogen (N <sub>2</sub> ):	79.2 %
Fractional Moisture Content (B <sub>ws</sub> )	0.0494 dimensionless
Stack Temperature (T <sub>s</sub> ):	141.5 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	0.9814 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.40 inches Hg
Static Pressure (S <sub>i</sub> )	-0.42 inches H <sub>2</sub> O
Stack diameter:	59.50 inches
Stack area (A <sub>s</sub> ):	19.3091 ft <sup>2</sup>

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):****Dry molecular weight of stack gas:**

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 28.880 \text{ lb/lb-mole}$$

**Molecular weight of stack gas, wet basis:**

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 28.343 \text{ lb/lb-mole}$$

**Absolute stack gas pressure:**

$$P_s = P_{bar} + \left( \frac{S_i}{13.6} \right) = 29.369 \text{ inches H}_2\text{O}$$

**Stack gas velocity:**

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 59.905 \text{ feet/second}$$

**Stack gas volumetric flow rate:**

$$Q_s = A_s \times V_s \times 60 = 69,403 \text{ acfm}$$

**Stack gas volumetric flow rate, wet basis:**

$$Q_{sw} = Q_s \times \left[ \left( \frac{528^\circ\text{R}}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 59,805 \text{ scfm}$$

$$Q_{sw} = Q_s \times \left[ \left( \frac{528^\circ\text{R}}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 3,588,281 \text{ scfh}$$

**Stack gas volumetric flow rate, dry basis:**

$$Q_{std} = Q_{sw} \times (1 - B_{ws}) = 56,852 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{ws}) \times 60 = 3,411,128 \text{ dscfh}$$



**USEPA Method 4  
Moisture Determination Sample Calculations**

Client: H. Kramer  
 Location: Chicago, IL  
 Source: South Baghouse  
 Date: 9/19/2013  
 Run #: 2

**Data Input:**

Volume metered (V <sub>m</sub> ):	109.825 ft <sup>3</sup>
Meter calibration coefficient (Y <sub>d</sub> ):	1.002 dimensionless
Barometric pressure (P <sub>bar</sub> ):	29.40 inches Hg
Meter sample rate (ΔH):	1.24 inches H <sub>2</sub> O
Meter inlet/outlet temperature (T <sub>m</sub> ):	85.7 °F
Volume of moisture collected (V <sub>ic</sub> ):	115.8 milliliters
Stack Temperature (T <sub>s</sub> ):	141.5 °F
Static Pressure (St):	-0.4 inches H <sub>2</sub> O

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):****Volume of sample, dry basis:**

$$Vm_{std} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92'' \text{ Hg}} \right) \times \left( \frac{P_{bar} + \Delta H}{T_m + 460} \right) = 104.955 \text{ dscf}$$

**Volume of water vapor in sample:**

$$V_{wstd} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{ic} = 5.451 \text{ scf}$$

**Fractional moisture content of stack gas:**

$$B_{ws} = \frac{V_{wstd}}{(V_{mstd} + V_{wstd})} = 0.0494 B_{wo}$$

**Percent Moisture:**

$$\% \text{moisture} = B_{ws} \times 100 = 4.94 \%$$

**Fractional moisture content of stack gas at saturated conditions:**

$$T_s(^{\circ}K) = ((T_s - 32) \times 0.5556) + 273 = 333.8 \text{ }^{\circ}\text{Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{S_t}{13.6} \right) \times 25.401 = 746.79 \text{ mm Hg}$$

$$B_{vos} = \frac{\sqrt{\left( 10^{\left( \frac{A \left( \frac{B}{T_s(^{\circ}K) - C} \right)} \right)} \right)}}{P_{s(\text{mmHg})}} \quad \begin{array}{l} \text{where:} \\ A = 8.361 \\ B = 1893.5 \\ C = 27.65 \end{array} = 0.2003 \%$$

**Percent moisture at saturated conditions:**

$$\% \text{moisture}_{\text{saturated}} = B_{vos} \times 100 = 20.03 \%$$

**Percent moisture used for emissions calculations:**

$$= 4.94 \%$$





USEPA Method 29  
Metals Emissions Calculation Summary

Client: H. Kramer  
Location: Chicago, IL  
Source: South Baghouse  
Date: 9/20/2013  
Run #: 3

Test Data Input		Metals Laboratory Analysis Weights (Mt)	
Barometric pressure (P <sub>bar</sub> ):	29.61 inches Hg	Antimony (Sb):	<2.650 ug
Stack pressure (P <sub>s</sub> ):	29.56 inches Hg Abs.	Arsenic (As):	<2.500 ug
Test length (t):	180.0 minutes	Barium (Ba):	<8.560 ug
Sample nozzle diameter (D <sub>s</sub> ):	0.1870 inches	Beryllium (Be):	<0.120 ug
Sample nozzle area (S <sub>b</sub> ):	0.009191 ft <sup>2</sup>	Cadmium (Cd):	7.100 ug
Stack temperature (T <sub>s</sub> ):	155.0 °F	Chromium (Cr):	12.130 ug
Volume metered (V <sub>metered</sub> ):	98.051 dscf	Cobalt (Co):	18.730 ug
Stack gas velocity (V <sub>s</sub> ):	55.276 ft/sec	Copper (Cu):	5.600 ug
Stack gas volumetric flow (Q <sub>stack</sub> ):	3,164,613 dscfh	Lead (Pb):	27.680 ug
Fractional Moisture content (B <sub>ws</sub> ):	0.029 %	Manganese (Mn):	<3.070 ug
		Nickel (Ni):	3.38 ug
		Phosphorus (P):	315.34 ug
		Selenium (Se):	<15.720 ug
		Silver (Ag):	<1.260 ug
		Thallium (Tl):	<2.500 ug
		Zinc (Zn):	103.72 ug

Sample calculations @ standard conditions (29.92 inches Hg, 88.0 °F):

Percent Isokinetic:

$$\% \text{Isokinetic} = \frac{0.0945 \times V_{\text{metered}} \times (T_s + 460)}{P_s \times V_s \times 0 \times A_s \times (1 - B_{ws})} = 102.489 \% \text{ Isokinetic}$$

Metals concentration (mg/dscm):

		$C_s = \left[ \frac{M_i}{35.3 \text{ dscf} / \text{dscm}} \right]$	
=	<0.00097	mg/dscm Antimony (Sb)	= <0.00113 mg/dscm Manganese (Mn)
=	<0.00092	mg/dscm Arsenic (As)	= 0.00124 mg/dscm Nickel (Ni)
=	<0.00315	mg/dscm Barium (Ba)	= 0.11582 mg/dscm Phosphorus (P)
=	<0.00004	mg/dscm Beryllium (Be)	= <0.00578 mg/dscm Selenium (Se)
=	0.00261	mg/dscm Cadmium (Cd)	= <0.00046 mg/dscm Silver (Ag)
=	0.00446	mg/dscm Chromium (Cr)	= <0.00092 mg/dscm Thallium (Tl)
=	0.00206	mg/dscm Copper (Cu)	= 0.03813 mg/dscm Zinc (Zn)
=	0.01018	mg/dscm Lead (Pb)	
=	0.00689	mg/dscm Cobalt (Co)	

Metals concentration (x10<sup>-9</sup> lb/dscf):

		$C'_s = \left[ \frac{2.205 \times 10^{-9} \text{ lb} \times M_i}{10 \times V_{\text{metered}}} \right]$	
=	<0.0608	x 10 <sup>-9</sup> lb/dscf Antimony (Sb)	= <0.0705 x 10 <sup>-9</sup> lb/dscf Manganese (Mn)
=	<0.0574	x 10 <sup>-9</sup> lb/dscf Arsenic (As)	= 0.0776 x 10 <sup>-9</sup> lb/dscf Nickel (Ni)
=	<0.1965	x 10 <sup>-9</sup> lb/dscf Barium (Ba)	= 7.2391 x 10 <sup>-9</sup> lb/dscf Phosphorus (P)
=	<0.0028	x 10 <sup>-9</sup> lb/dscf Beryllium (Be)	= <0.3609 x 10 <sup>-9</sup> lb/dscf Selenium (Se)
=	0.1630	x 10 <sup>-9</sup> lb/dscf Cadmium (Cd)	= <0.0289 x 10 <sup>-9</sup> lb/dscf Silver (Ag)
=	0.2785	x 10 <sup>-9</sup> lb/dscf Chromium (Cr)	= <0.0574 x 10 <sup>-9</sup> lb/dscf Thallium (Tl)
=	0.1286	x 10 <sup>-9</sup> lb/dscf Copper (Cu)	= 2.3811 x 10 <sup>-9</sup> lb/dscf Zinc (Zn)
=	0.6354	x 10 <sup>-9</sup> lb/dscf Lead (Pb)	
=	0.4300	x 10 <sup>-9</sup> lb/dscf Cobalt (Co)	

Metals emission rate (lb/hr):

		$E_m = C'_s \times Q_{sd}$	
=	<0.000193	lb/hr Antimony (Sb)	= <0.000223 lb/hr Manganese (Mn)
=	<0.000182	lb/hr Arsenic (As)	= 0.000246 lb/hr Nickel (Ni)
=	<0.000622	lb/hr Barium (Ba)	= 0.022909 lb/hr Phosphorus (P)
=	<0.000009	lb/hr Beryllium (Be)	= <0.001142 lb/hr Selenium (Se)
=	0.000516	lb/hr Cadmium (Cd)	= <0.000092 lb/hr Silver (Ag)
=	0.000981	lb/hr Chromium (Cr)	= <0.000182 lb/hr Thallium (Tl)
=	0.000407	lb/hr Copper (Cu)	= 0.007535 lb/hr Zinc (Zn)
=	0.002011	lb/hr Lead (Pb)	
=	0.001361	lb/hr Cobalt (Co)	



**Metals Laboratory Data Summary**

B-30

Client: H. Kramer  
 Location: Chicago, IL  
 Source: South Baghouse  
 Date: 9/20/2013  
 Run #: 3

ND-Value Below Minimum Detection Limit - listed by DAT as ND  
 J-Value below LOQ but above MDL  
 (Sample - Blank) less than MDL: use MDL  
 FH = Front half, BH = Back half

**Front Half Metal Calculation**

Metal	FH Sample (M <sub>fh</sub> ) (micrograms)	FH Blank (M <sub>fbh</sub> ) (micrograms)	<u>I Value</u>	<u>II Values</u>			Blank Value Used (micrograms)	Blank Corrected Sample Mass (micrograms)	Final* Blank Corrected Sample Mass (micrograms)	Sample	MDL
			<u>A Value</u> (4 inch filter) (micrograms)	5 % of FH Sample (micrograms)	Lesser value (M <sub>fbh</sub> ) vs 5% (micrograms)	Greater Value I vs II (micrograms)					
Antimony	<1.25	7.15	17.59	0.06	0.06	17.59	7.15	-5.90	<1.25	ND	1.25
Arsenic	<1.25	0.00	17.59	0.06	0.00	17.59	0.00	1.25	<1.25	ND	1.25
Barium	7.68	11.02	17.59	0.38	0.38	17.59	11.02	-3.34	<2.50	J	2.50
Beryllium	<0.06	0.00	17.59	0.00	0.00	17.59	0.00	0.06	<0.06	ND	0.06
Cadmium	6.47	0.00	17.59	0.32	0.00	17.59	0.00	6.47	6.47		0.63
Chromium	10.31	5.44	17.59	0.52	0.52	17.59	5.44	4.87	4.87		0.25
Cobalt	8.66	1.01	17.59	0.43	0.43	17.59	1.01	7.65	7.65		0.63
Copper	3.51	1.55	17.59	0.18	0.18	17.59	1.55	1.96	1.96		0.32
Lead	43.47	21.09	17.59	2.17	2.17	17.59	17.59	25.88	25.88		1.25
Manganese	1.61	1.26	17.59	0.08	0.08	17.59	1.26	0.35	<0.63	J	0.63
Nickel	2.84	2.12	17.59	0.14	0.14	17.59	2.12	0.72	0.72		0.63
Phosphorus	43.57	171.49	17.59	2.18	2.18	17.59	17.59	25.98	25.98		2.50
Selenium	5.91	11.63	17.59	0.30	0.30	17.59	11.63	-5.72	<1.25		1.25
Silver	<0.63	0.00	17.59	0.03	0.00	17.59	0.00	0.63	<0.63	ND	0.63
Thallium	<1.25	0.00	17.59	0.06	0.00	17.59	0.00	1.25	<1.25	ND	1.25
Zinc	62.06	5.24	17.59	3.10	3.10	17.59	5.24	56.82	56.82		0.63

\*Use MDL if blank corrected is <MDL

**Back Half Metal Calculation**

Metal	BH Sample (M <sub>bh</sub> ) (micrograms)	BH Blank (M <sub>bhb</sub> ) (micrograms)	<u>I Value</u>	<u>II Values</u>			Blank Value Used (micrograms)	Blank Corrected Sample Mass (micrograms)	Final* Blank Corrected Sample Mass (micrograms)	Sample	MDL
			<u>A Value</u> (micrograms)	5 % of BH Sample (micrograms)	Lesser value (M <sub>bhb</sub> ) vs 5% (micrograms)	Greater Value I vs II (micrograms)					
Antimony	2.40	17.76	1.00	0.12	0.12	1.00	1.00	1.40	1.40	J	1.25
Arsenic	<1.25	0.00	1.00	0.06	0.00	1.00	0.00	1.25	<1.25	ND	1.25
Barium	6.06	0.00	1.00	0.30	0.00	1.00	0.00	6.06	6.06	J	2.50
Beryllium	<0.06	0.43	1.00	0.00	0.00	1.00	0.43	-0.37	<0.06	ND	0.06
Cadmium	1.10	3.51	1.00	0.06	0.06	1.00	1.00	0.10	<0.63	J	0.63
Chromium	7.26	0.00	1.00	0.36	0.00	1.00	0.00	7.26	7.26		0.25
Cobalt	11.08	0.00	1.00	0.55	0.00	1.00	0.00	11.08	11.08		0.63
Copper	4.64	5.16	1.00	0.23	0.23	1.00	1.00	3.64	3.64		0.32
Lead	2.80	8.25	1.00	0.14	0.14	1.00	1.00	1.80	1.80		1.25
Manganese	2.44	0.00	1.00	0.12	0.00	1.00	0.00	2.44	2.44	J	0.63
Nickel	2.66	0.00	1.00	0.13	0.00	1.00	0.00	2.66	2.66	J	0.63
Phosphorus	304.59	322.35	1.00	15.23	15.23	15.23	15.23	289.36	289.36		2.50
Selenium	14.47	0.00	1.00	0.72	0.00	1.00	0.00	14.47	14.47		1.25
Silver	<0.63	0.00	1.00	0.03	0.00	1.00	0.00	0.63	<0.63	ND	0.63
Thallium	<1.25	0.00	1.00	0.06	0.00	1.00	0.00	1.25	<1.25	ND	1.25
Zinc	46.90	0.00	1.00	2.35	0.00	1.00	0.00	46.90	46.90		0.63

\*Use MDL if blank corrected is <MDL



**Metals Laboratory Data Summary**  
Total Front Half Plus Back Half Metal Calculation

Client: H. Kramer  
 Location: Chicago, IL  
 Source: South Baghouse  
 Date: 41,537  
 Run #: 3

ND-Value Below Minimum Detection Limit - listed by DAT as ND  
 J-Value below LOQ but above MDL  
 (Sample - Blank) less than MDL: use MDL  
 FH = Front half, BH = Back half

Metal	Final FH Blank Corrected Sample Mass (micrograms)	Final BH Blank Corrected Sample Mass (micrograms)	Total Metal (M) (micrograms)	MDL	Sample	BH
Antimony	<1.25	1.40	<2.65	1.25	ND	J
Arsenic	<1.25	<1.25	<2.50	1.25	ND	ND
Barium	<2.50	6.06	<8.56	2.50	J	J
Beryllium	<0.06	<0.06	<0.12	0.06	ND	ND
Cadmium	6.47	0.63	7.10	0.63		J
Chromium	4.87	7.26	12.13	0.25		
Cobalt	7.65	11.08	18.73	0.63		
Copper	1.96	3.64	5.60	0.32		
Lead	25.88	1.80	27.68	1.25		
Manganese	<0.63	2.44	<3.07	0.63	J	J
Nickel	0.72	2.66	3.38	0.63		J
Phosphorus	25.98	289.36	315.34	2.50		
Selenium	<1.25	14.47	<15.72	1.25		
Silver	<0.63	<0.63	<1.26	0.63	ND	ND
Thallium	<1.25	<1.25	<2.50	1.25	ND	ND
Zinc	56.82	46.90	103.72	0.63		



**USEPA Method 2  
Volumetric Flow Rate Sample Calculations (Circular Ducts)**

**Client:** H. Kramer  
**Location:** Chicago, IL  
**Source:** South Baghouse  
**Date:** 9/20/2013  
**Run #:** 3

**Data Input**

Carbon Dioxide (CO <sub>2</sub> ):	0.2 %
Oxygen (O <sub>2</sub> ):	20.7 %
Nitrogen (N <sub>2</sub> ):	79.1 %
Fractional Moisture Content (B <sub>wet</sub> ):	0.0295 dimensionless
Stack Temperature (T <sub>s</sub> ):	155.0 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	0.9018 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.61 inches Hg
Static Pressure (S <sub>t</sub> ):	-0.45 inches H <sub>2</sub> O
Stack diameter:	59.50 inches
Stack area (A <sub>s</sub> ):	19,3091 ft <sup>2</sup>

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):**

**Dry molecular weight of stack gas:**

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 28.860 \text{ lb/lb-mole}$$

**Molecular weight of stack gas, wet basis:**

$$M_s = (M_d \times (1 - B_{wet})) + (18 \times B_{wet}) = 28.540 \text{ lb/lb-mole}$$

**Absolute stack gas pressure:**

$$P_s = P_{bar} + \left( \frac{S_t}{13.6} \right) = 29.577 \text{ inches H}_2\text{O}$$

**Stack gas velocity:**

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 55.276 \text{ feet/second}$$

**Stack gas volumetric flow rate:**

$$Q_a = A_s \times V_s \times 60 = 64,040 \text{ acfm}$$

**Stack gas volumetric flow rate, wet basis:**

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 54,346 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 3,260,764 \text{ scfh}$$

**Stack gas volumetric flow rate, dry basis:**

$$Q_{std} = Q_{sw} \times (1 - B_{wet}) = 52,744 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{wet}) \times 60 = 3,164,613 \text{ dscfh}$$



**USEPA Method 4  
Moisture Determination Sample Calculations**

Client: H. Kramer  
 Location: Chicago, IL  
 Source: South Baghouse  
 Date: 9/20/2013  
 Run #: 3

**Data Input:**

Volume metered ( $V_m$ ):	100.400 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.002 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.61 inches Hg
Meter sample rate ( $\Delta H$ ):	1.02 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	88.7 °F
Volume of moisture collected ( $V_{m,c}$ ):	62.0 milliliters
Stack Temperature ( $T_s$ ):	155.0 °F
Static Pressure ( $St$ ):	-0.5 inches H <sub>2</sub> O

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):**

Volume of sample, dry basis:

$$V_{m, std} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92 \text{ Hg}} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 96.051 \text{ dscf}$$

Volume of water vapor in sample:

$$V_{w, std} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{m,c} = 2.918 \text{ scf}$$

Fractional moisture content of stack gas:

$$B_{ws} = \frac{V_{w, std}}{(V_{m, std} + V_{w, std})} = 0.0295 B_{wo}$$

Percent Moisture:

$$\% \text{moisture} = B_{ws} \times 100 = 2.95 \%$$

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(K)} = ((T_s - 32) \times 0.5556) + 273 = 341.4 \text{ Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{S_i}{13.6} \right) \times 25.401 = 752.12 \text{ mm Hg}$$

$$B_{wos} = \frac{\sqrt{\left( 10^{\left( A \left( \frac{B}{(T_{s(K)} - C) \right) \right) \right)}}}{P_{s(\text{mmHg})}}$$

where:

A= 9.361

B=1693.5

C=27.65

$$= 0.2805 \%$$

Percent moisture at saturated conditions:

$$\% \text{moisture}_{\text{saturated}} = B_{wos} \times 100 = 28.05 \%$$

Percent moisture used for emissions calculations:

$$= 2.95 \%$$



TRAVERSE POINT LOCATIONS FOR CIRCULAR AND RECTANGULAR STACKS AND DUCTS

B-34 Facility H. Kramer  
 Date 9-18-13  
 Sampling Location South Bughouse  
 Inside of Far Wall to  
 Outside of Port (Distance C) 61.75 in.  
 Inside of Near Wall to  
 Outside of Port (Distance D) 2.25 in.  
 Stack ID (Distance C- Distance D) 59.5 in.  
 Port Distance Downstream From Disturbance (B) 238 in.  
 Port Distance Upstream From Disturbance (A) 102 in.  
 Equivalent Diameters Downstream From Disturbance (B) 4.84 ( $\geq 2.0$ )  
 Equivalent Diameters Upstream From Disturbance (A) 1.71 ( $\geq 0.5$ )  
 Number of Ports Used 2 Traverse Points / Port 12

Note: Sketch Stack/Ports/Control Device on Back of Form

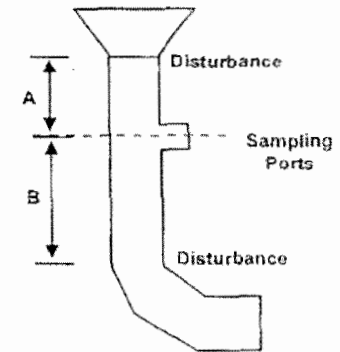
Equivalent Diameters Downstream From Disturbance (B) =  
 [ Distance B / Stack ID ]

Equivalent Diameters Upstream From Disturbance (A) =  
 [ Distance A / Stack ID ]

Equivalent Diameter For a Square or Rectangular Stack =  
 [ (2 x L x W) / (L + W) ]

Port ID 6 in. (for monorail bracket specs.)

Port Length Outside of Stack 22 in. (for monorail bracket specs.)



*L-Brackets welded  
 6' monorail w/ 5' E.L. Brackets*

Port Traverse Point Number	Fractional % of Stack I.D. (frac. %)	Stack I.D. (inches)	Product of Columns 2 and 3 (inches)	Port Depth (inches)	Traverse Point Location From Outside of Port (Sum of 4 and 5 in inches)
1	0.021	59.5	1.25	2.25	4.50
2	0.067		3.99		6.24
3	0.118		7.02		9.27
4	0.177		10.53		12.79
5	0.250		14.88		17.13
6	0.356		21.18		23.43
7	0.644		38.31		40.56
8	0.750		44.63		46.88
9	0.823		48.97		51.22
10	0.882		52.48		54.73
11	0.862		55.81		57.76
12	0.979		58.25		60.50

LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

Pts	4	6	8	10	12
1	6.7	4.4	3.2	2.6	2.1
2	25.0	14.6	10.5	8.2	6.7
3	75.0	29.6	19.4	14.6	11.8
4	93.3	70.4	32.3	22.6	17.7
5		85.4	67.7	34.2	25.0
6		95.5	80.5	65.8	35.6
7			89.5	77.4	64.4
8			96.8	85.4	75.0
9				91.8	82.3
10				97.4	88.2
11					93.3
12					97.9

LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS  
 CEMS\*

Pts	2	3	4	5	6	7	8	9
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8
4			87.5	70.0	58.3	50.0	43.8	38.9
5				90.0	75.0	64.3	56.3	50.0
6					91.7	78.6	68.8	61.1
7						92.9	81.3	72.2
8							93.8	83.3
9								94.4

\*3 point CEMS RATA traverse point locations (valid for rectangular and round stacks)

For Stacks / Ducts  $\leq 24$  inches ID - No traverse point shall be located less than 0.5 inches from stack wall

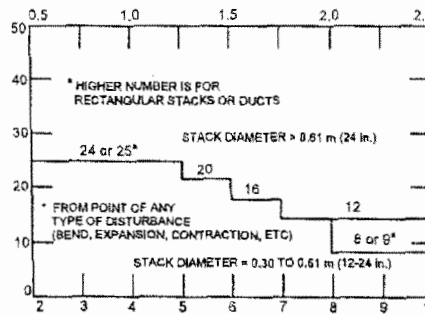
For Stacks / Ducts  $> 24$  inches ID - No traverse point shall be located less than 1.0 inches from stack wall

QA/QC Check:  
 Completeness \_\_\_\_\_ Legibility \_\_\_\_\_ Accuracy \_\_\_\_\_ Specifications \_\_\_\_\_

Method 1 Calculator Signature/Date [Signature] 9-18-13

Field Supervisor Signature/Date \_\_\_\_\_

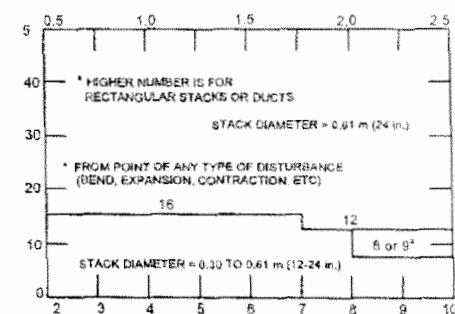
DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE\* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE\* (DISTANCE B)

MINIMUM NUMBER OF TRAVERSE POINTS  
 ISOKINETIC TESTING

DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE\* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE\* (DISTANCE B)

MINIMUM NUMBER OF TRAVERSE POINTS  
 FOR VELOCITY (NON-ISOKINETIC) TRAVERSES

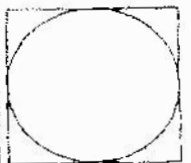


FIELD DATA

PLANT H. Kanger AMBIENT TEMPERATURE 75  
 DATE 9-19-13 BAROMETRIC PRESSURE 29.90  
 LOCATION Chicago IL ASSUMED MOISTURE, %  
 OPERATOR R.S. PROBE LENGTH, in. 72  
 STACK NO. South NOZZLE DIAMETER, in. 0.158  
 RUN NO. South-P19-1 STACK DIAMETER, in. 59.5  
 SAMPLE BOX NO. MINUTES PER POINT 7.5  
 METER BOX NO. 11209 NUMBER OF POINTS 24  
 START TIME 907 NUMBER OF PORTS 2

PROBE HEATER SETTING 250  
 HEATER BOX SETTING 250  
 METER H<sub>2</sub> 1.92  
 C FACTOR 0.907  
 Y FACTOR 0.983  
 PITOT NO. 655

WEIGHT OF PARTICULATE, mg	
Fiber No.	<u>53646</u>
Sample	
Final wt	
Time wt	<u>526.1</u>
Wt gain	
TOTAL	



CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (θ) min.	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (°F)	VELOCITY (ft/min)		PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (in. H <sub>2</sub> O)		GAS SAMPLE VOLUME (TYM) <sup>3</sup>	GAS SAMPLE TEMP AT DRY GAS METER		FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	CPM AMBIENT TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
					(DP <sub>1</sub> )	(DP <sub>2</sub> )	ACTUAL	DESIRED		INLET (T <sub>in</sub> ) °F	OUTLET (T <sub>out</sub> ) °F					
907	1	0	-0.42	136	0.86		1.1	1.09	80320	82	78	230	270	75	63	3
914.5	2	7.5		122	0.83		1.1	1.06	8805	87	79	242	267	72	60	3
922	3	15		130	0.89		1.1	1.12	98956	93	80	227	257	71	58	3
929.5	4	22.5		125	0.94		1.2	1.19	99420	94	80	228	258	70	58	3
937	5	30		119	0.97		1.2	1.23	94875	95	80	236	251	69	58	3
944.5	6	37.5		129	0.97		1.2	1.23	90341	98	79	234	260	70	58	3
952	7	45		136	0.95		1.2	1.21	90797	98	79	243	259	70	58	3
959.5	8	52.5		139	1.0		1.3	1.27	91277	99	79	251	261	71	59	4
907	9	60		141	1.2		1.5	1.53	91768	100	80	245	260	72	60	4
914.5	10	67.5		141	1.2		1.5	1.53	92320	99	80	246	260	72	60	4
922	11	75		140	1.2		1.5	1.53	92845	101	80	248	261	73	60	4
929.5	12	82.5		141	1.1		1.4	1.39	93362	103	80	247	260	74	61	4
937 1044	1	90		126	0.73		0.93	0.93	98160	96	80	250	258	74	62	4
944.5	2	97.5		134	0.77		0.98	0.98	94358	104	81	258	261	74	58	3
952	3	105		135	0.80		1.0	1.02	94795	105	82	239	252	73	59	3
959.5	4	112.5		130	0.81		1.0	1.03	95231	105	82	245	255	72	58	3
1006.5	5	120		134	0.77		0.98	0.98	95653	106	83	251	260	72	58	3
1014	6	127.5		157	0.72		0.92	0.92	96067	106	83	244	252	73	59	3
1021.5	7	135		172	0.80		1.0	1.02	96493	105	84	247	258	72	59	3
1029	8	142.5		180	0.84		1.0	1.03	96925	106	84	248	257	72	59	3
1036.5	9	150		179	0.96		1.2	1.18	97369	105	85	244	257	72	60	4
1044	10	157.5		180	1.0		1.2	1.23	97832	105	84	249	258	72	60	4
1051.5	11	165		181	0.95		1.2	1.17	98304	104	85	248	256	74	62	4
1059	12	172.5		180	0.95		1.2	1.17	98755	103	85	247	256	74	61	4
1106.5	END	180							92465							
AVERAGE	24	180	-0.42	145.7	0.959		1.16		112.043	90.65					≤68	≤4

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER					SILICA GEL WEIGHT
	VOLUME (ml) OR WEIGHT (g)					
	#1	#2	#3	#4	#5	#
FINAL INITIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						

ORBIT DATA	TIME		CO <sub>2</sub>	O <sub>2</sub>
	START	END		
TRIAL 1				
TRIAL 2				
TRIAL 3				
Average				

LEAK CHECK	
SYSTEM PRE:	<u>20.002</u> CFM @ 15" H <sub>2</sub> O
POST:	<u>20.000</u> CFM @ 15" H <sub>2</sub> O
PITOT PRE:	<u>7/8</u> @ > 3" H <sub>2</sub> O
POST:	<u>7/8</u> @ > 3" H <sub>2</sub> O

58390  
53015

B-36



**IMPINGER RECOVERY DATA SHEET**

Company:	<u>H Kramer</u>	Date Set-up:	<u>9-17-13</u>
Location:	<u>Chicago, IL</u>	Test Date:	<u>9-19-13</u>
Source:	<u>South BH</u>	Date Recovered:	<u>9-19-13</u>
Run No.:	<u>PM-1-South</u>	USEPA Method:	<u>8230 MS/202</u>
		Corresponding Filter Wgt:	<u>826.1</u>
		Filter Container No:	<u>53040</u>

Measurement Method: Weight or Volume

Impinger No.	Impinger Contents	Initial wt/vol g/mL	Final wt/vol g/mL	Difference wt/vol g/mL	Sample Container No.
1	<u>KO</u>	<u>350.0</u>	<u>355.0</u>	<u>5.0</u>	
2	<u>Empty</u>	<u>599.8</u>	<u>601.9</u>	<u>2.1</u>	
3	<u>100ml DI</u>	<u>678.7</u>	<u>713.5</u>	<u>34.8</u>	
4	<u>SG</u>	<u>739.8</u>	<u>754.4</u>	<u>14.6</u>	
5					
6					<u>56.5</u>

\* 100ml DI added prior to purge  
 Purge started @ 12:05





FIELD DATA

PLANT H. Kramer AMBIENT TEMPERATURE 75  
 DATE 9-19-13 BAROMETRIC PRESSURE 29.40  
 LOCATION Chicago, IL ASSUMED MOISTURE, % 15  
 OPERATOR RB PROBE LENGTH, in. 75  
 STACK NO. South NOZZLE DIAMETER, in. 0.188  
 RUN NO. South-PA-2 STACK DIAMETER, in. 59.5  
 SAMPLE BOX NO. MINUTES PER POINT 25  
 METER BOX NO. NUMBER OF POINTS 24  
 START TIME 1205 NUMBER OF PORTS 2

PROBE HEATER SETTING 250  
 HEATER BOX SETTING 250  
 METER H<sub>2</sub>O 1.82  
 C<sub>1</sub> FACTOR 0.87  
 Y<sub>1</sub> FACTOR 0.988  
 PITOT NO. 652

WEIGHT OF PARTICULATE, mg	
Filter No.	<u>33642</u>
Sample	
Post wt	
Tare wt	<u>819.1</u>
Wt. gain	
TOTAL	



CLOCK TIME (Est)	TRAVERSE POINT NUMBER	SAMPLING TIME (G) min.	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (°F)	VELOCITY READ		PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ARI W. H <sub>2</sub> O)		GAS SAMPLE VOLUME (V <sub>STP</sub> )	GAS SAMPLE TEMP. DRY GAS METER		FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
					(AP <sub>1</sub> )	(AP <sub>2</sub> )	ACTUAL	DESIRED		INLET (Dry) °F	OUTLET (T <sub>avg</sub> ) °F					
1205	1	0	-0.44	141	0.78		0.97	0.97	992.860	78	77	234	259	72	55	2
1212.5	2	25		137	0.91		1.0	1.01	997.20	95	78	234	261	69	52	2
1220	3	15		134	0.91		1.0	1.01	1001.41	96	79	249	258	69	52	2
1227.5	4	22.5		134	0.95		1.1	1.05	1005.72	96	79	251	255	69	54	2
1235	5	30		133	0.92		1.0	1.02	1010.10	95	80	241	254	70	54	2
1242.5	6	37.5		133	0.91		1.0	1.01	1014.41	96	80	245	255	71	55	2
1250	7	45		134	0.93		1.2	1.15	1018.70	96	80	246	258	73	57	3
1257.5	8	52.5		133	1.0		1.2	1.24	1023.45	96	80	243	258	73	58	3
1305	9	60		132	1.1		1.4	1.36	1028.36	96	80	245	256	74	58	3
1312.5	10	67.5		134	1.2		1.5	1.49	1033.27	96	80	245	255	77	60	3
1320	11	75		135	1.2		1.5	1.51	1038.39	95	80	244	255	76	56	3
1327.5	12	82.5		136	1.1		1.4	1.53	1044.80	96	80	245	256	77	56	3
1335/1345	1	90		124	0.81		1.0	1.01	1010.10	82	79	242	258	77	57	2
1352.5	2	97.5		128	0.93		1.0	1.04	1025.50	95	80	270	255	72	52	2
1400	3	105		130	0.91		1.1	1.14	1032.90	95	80	243	252	72	54	3
1407.5	4	112.5		132	0.93		1.2	1.17	1042.38	96	80	229	255	73	56	3
1415	5	120		135	0.96		1.2	1.21	1067.00	96	80	238	255	74	55	3
1422.5	6	127.5		135	0.96		1.2	1.21	1071.91	96	80	238	256	74	56	3
1430	7	135		142	0.99		1.2	1.24	1076.57	96	81	235	256	76	57	3
1437.5	8	142.5		148	1.1		1.4	1.37	1081.33	95	81	237	259	77	58	4
1445	9	150		153	1.1		1.4	1.37	1086.45	97	81	238	257	77	55	4
1452.5	10	157.5		156	1.1		1.4	1.37	1091.62	97	82	238	260	75	55	4
1600	11	165		157	1.2		1.5	1.49	1096.66	99	82	238	260	76	55	4
1507.5	12	172.5		152	1.1		1.4	1.37	1101.90	99	82	237	261	77	55	4
1515	END	180							1107.310							
AVERAGE	24	180	-0.44	137.80	0.9849		1.22		114.450 -0.165			87.40			58	≤ 4

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)					SILICA GEL WEIGHT
	#1	#2	#3	#4	#5	
INITIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						

ORIG. DATA	V <sub>m</sub> = 114.86		
	TEMP.	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1			
TRIAL 2			
TRIAL 3			
Average			

LEAK CHECK	
SYSTEM PRE:	<u>0.015</u> CFM @ 15" Hg
POST:	<u>0.012</u> CFM @ 15" Hg
PITOT PRE:	<u>1.7</u> @ 3" H <sub>2</sub> O
POST:	<u>1.8</u> @ 3" H <sub>2</sub> O

B-38



**IMPINGER RECOVERY DATA SHEET**

Company: H Kramer  
 Location: Chicago, IL  
 Source: South B#  
 Run No.: PM-2-South

Date Set-up: 9-17-13  
 Test Date: 9-19-13  
 Date Recovered: 9-19-13  
 USEPA Method: M51707  
 Corresponding Filter Wgt: 819.1  
 Filter Container No: 33542

Measurement Method: Weight or Volume

<u>Impinger No.</u>	<u>Impinger Contents</u>	<u>Initial wt/vol g/mL</u>	<u>Final wt/vol g/mL</u>	<u>Difference wt/vol g/mL</u>	<u>Sample Container No.</u>
1	<u>KO</u>	<u>370.6</u>	<u>437.9</u>	<u>67.3</u>	
2	<u>Empty</u>	<u>598.8</u>	<u>598.6</u>	<u>-0.2</u>	
3	<u>100ml DI</u>	<u>734.0</u>	<u>770.7</u>	<u>36.7</u>	
4	<u>SG</u>	<u>728.0</u>	<u>739.9</u>	<u>11.9</u>	
5					
6					<u>115.7</u>

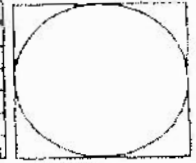
\* 100ml DI added prior to purge  
 purge started @ 15:25



FIELD DATA

PLANT H. Kigmar AMBIENT TEMPERATURE 6.8 PROBE HEATER SETTING 250  
 DATE 01-20-13 BAROMETRIC PRESSURE 29.61 HEATER BOX SETTING 250  
 LOCATION Chesapeake ASSUMED MOISTURE % 1.5 METER NO. 1.82  
 OPERATOR RB PROBE LENGTH, in. 32 C. FACTOR 0.84  
 STACK NO. South NOZZLE DIAMETER, in. 0.188 Y. FACTOR 0.938  
 RUN NO. South-PM-3 STACK DIAMETER, in. 59.5 PITOT NO. 655  
 SAMPLE BOX NO. MINUTES PER POINT 7.5  
 METER BOX NO. 41009 NUMBER OF POINTS 24  
 START TIME 0730 NUMBER OF PORTS 2

WEIGHT OF PARTICULATE, mg	
Filter No.	
Sample	
Final wt.	
Tare wt.	
Net gain	
TOTAL	



CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (t) min.	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (°F)	VELOCITY (ft/min)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (in. H <sub>2</sub> O)		GAS SAMPLE VOLUME (Vol %)	GAS SAMPLE TEMP AT DRY GAS METER (°F)		FILTER EXIT GAS TEMP (°F)	PROBE TEMP (°F)	AUXILIARY TEMP (°F)	LAST IMPINGER OUTLET TEMP (°F)	PUMP VACUUM (in. Hg)
						ACTUAL	DESIRED		INLET	OUTLET					
730	1	0	-0.45	115	0.80	1.0	1.03	112.075	83	81	228	251	71	49	2
737.5	2	7.5		133	0.77	0.99	0.99	116.51	83	81	228	259	68	47	2
745	3	15		138	0.85	1.1	1.09	120.95	93	81	250	263	69	50	2
752.5	4	22.5		143	0.91	1.1	1.13	125.31	96	81	235	257	70	51	2
800	5	30		152	0.91	1.1	1.13	129.80	99	82	228	257	72	53	2
807.5	6	37.5		153	0.95	1.2	1.18	134.28	99	82	226	262	73	54	2
815	7	45		150	0.86	1.1	1.07	139.02	99	83	229	260	74	55	2
822.5	8	52.5		154	0.97	1.2	1.21	143.51	100	83	229	261	75	55	3
830	9	60		156	1.0	1.3	1.25	148.46	100	83	239	259	76	57	3
837.5	10	67.5		157	1.1	1.4	1.37	153.36	100	84	240	259	76	58	3
845	11	75		185	1.1	1.4	1.36	158.36	102	84	236	257	77	60	3
852.5	12	82.5		151	1.1	1.4	1.36	163.40	102	84	237	259	78	59	3
900	1	90		137	0.64	0.29	0.29	168.345/168.510	95	84	228	269	78	58	2
917.5	2	97.5		138	0.69	0.85	0.85	172.40	100	84	267	264	78	53	2
925	3	105		147	0.77	0.99	0.99	176.33	99	84	264	263	78	52	2
932.5	4	112.5		148	0.71	0.57	0.57	180.48	101	84	248	263	79	53	2
940	5	120		171	0.65	0.77	0.77	184.53	101	84	242	262	80	53	2
947.5	6	127.5		172	0.64	0.76	0.76	188.00	101	84	230	263	81	54	2
955	7	135		172	0.79	0.94	0.94	192.08	102	85	230	262	80	54	2
1002.5	8	142.5		162	0.73	0.87	0.87	196.11	102	85	228	259	78	53	2
1010	9	150		156	0.91	1.1	1.06	200.15	102	85	230	260	77	52	2
1017.5	10	157.5		152	1.1	1.3	1.31	204.80	104	86	239	258	76	51	3
1025	11	165		144	1.0	1.2	1.19	209.71	103	86	232	259	76	52	2
1032.5	12	172.5		148	1.0	1.2	1.19	214.33	104	86	233	256	77	52	3
1040	END	180						218.720							
AVERAGE	24	180	-0.45	150.3	0.4295	1.03		106.645		9.13				568	3

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)					SILICA GEL WEIGHT
	#1	#2	#3	#4	#5	
INITIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						

ORSAT DATA	V <sub>m</sub> = 106.450		
	TIME	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1			
TRIAL 2			
TRIAL 3			
Average			

LEAK CHECK	
SYSTEM PRE: 40.00 L CFM @ 15" Hg	
POST: 40.00 L CFM @ 15" Hg	
PITOT PRE: +1.0 @ 3" H <sub>2</sub> O	
POST: +1.0 @ 3" H <sub>2</sub> O	

B-40



**IMPINGER RECOVERY DATA SHEET**

Company:	<u>H Kramer</u>	Date Set-up:	<u>9-19-13</u>
Location:	<u>Chicago, IL</u>	Test Date:	<u>9.20.13</u>
Source:	<u>South BH</u>	Date Recovered:	<u>9.20.13</u>
Run No.:	<u>SOUTH - PM-3</u>	USEPA Method:	<u>145/202</u>
		Corresponding Filter Wgt:	<u>819.0</u>
		Filter Container No:	<u>53043</u>

Measurement Method: Weight or Volume

Impinger No.	Impinger Contents	Initial wt/vol g/mL	Final wt/vol g/mL	Difference wt/vol g/mL	Sample Container No.
1	<u>Empty</u>	<u>361.3</u>	<u>370.5</u>	<u>9.2</u>	
2	<u>Empty</u>	<u>607.7</u>	<u>607.2</u>	<u>-0.5</u>	
3	<u>~100ml DI</u>	<u>753.1</u>	<u>786.7</u>	<u>33.6</u>	
4	<u>SG</u>	<u>722.5</u>	<u>737.9</u>	<u>15.4</u>	
5					
6					<u>57.7</u>

\* 100ml DI added prior to purge  
purge started @ 11:01



FIELD DATA

PLANT H. Kramer AMBIENT TEMPERATURE 69 PROBE HEATER SETTING 250  
 DATE 9-14-13 BAROMETRIC PRESSURE 29.40 HEATER BOX SETTING 250  
 LOCATION CA. Camp, IL ASSUMED MOISTURE, % 10 METR. H. 1.40  
 OPERATOR JM PROBE LENGTH, in. 73 C. FACTOR 0.94  
 STACK NO. South NOZZLE DIAMETER, in. 0.851 Y<sub>2</sub> FACTOR 1.002  
 RUN NO. 29-1 STACK DIAMETER, in. 59.5 PITOT NO. 654  
 SAMPLE BOX NO. APEx MINUTES PER POINT 75  
 METER BOX NO. 808024 NUMBER OF PORTS 24  
 START TIME 807 NUMBER OF PORTS 2

WEIGHT OF PARTICULATE, mg	
Filter No.	<u>53647</u>
Sample	
Final wt.	
Tare wt.	
Wt. gain	
TOTAL	



CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (8) min.	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (F)	VELOCITY (ft/min)		PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (in. H <sub>2</sub> O)		GAS SAMPLE VOLUME (ft <sup>3</sup> )	GAS SAMPLE TEMP AT DRY GAS METER		FILTER EXIT GAS TEMP (F)	PROBE TEMP (F)	AUXILIARY TEMP (F)	LAST IMPINGER OUTLET TEMP (F)	PUMP VACUUM (in. Hg)
					AP <sub>1</sub>	AP <sub>2</sub>	ACTUAL	DESIRED		INLET (T <sub>in</sub> ) F	OUTLET (T <sub>out</sub> ) F					
8:07	12	0	-0.42	142	1.1		1.4	1.39	662.505	89		241	251		67	1
8:14.5	11	7.5		141	1.2		1.5	1.53	668.33	85		251	251		67	1
8:22	10	15		135	1.2		1.5	1.54	673.33	86		248	251		68	1
8:29.5	9	22.5		129	1.1		1.4	1.42	678.41	86		243	251		68	1
8:37	8	30		121	1.1		1.4	1.44	683.26	86		235	251		66	1
8:44.5	7	37.5		131	1.1		1.4	1.42	688.15	86		252	251		66	1
8:52	6	45		138	.76		.97	.97	693.04	86		246	250		67	1
8:59.5	5	52.5		142	.77		.97	.97	697.33	86		243	251		68	1
9:07	4	60		143	.78		.99	.99	701.38	86		247	251		59	1
9:14.5	3	67.5		143	.74		1.0	1.00	705.62	86		250	251		58	1
9:22	2	75		143	.79		1.0	1.00	709.88	87		244	251		60	1
9:29.5	1	82.5		140	.81		1.0	1.02	714.13	87		251	251		60	1
9:37/944	12	90		144	.92		1.2	1.20	718.37	87		256	251		68	1
9:51.5	11	97.5		143	.98		1.2	1.24	722.96	88		241	251		60	1
9:59	10	105		140	1.2		1.3	1.33	727.49	88		253	251		62	1
10:06.5	9	112.5		133	1.2		1.6	1.55	732.67	89		249	251		62	1
10:14	8	120		142	1.1		1.4	1.40	738.15	89		254	251		62	2
10:21.5	7	127.5		160	.80		.99	.99	743.47	90		251	244		64	1
10:29	6	135		172	.81		.98	.98	747.70	90		253	250		64	1
10:36.5	5	142.5		182	.80		.96	.96	751.89	91		251	251		65	1
10:44	4	150		181	.76		.91	.91	756.05	91		251	250		65	1
10:51.5	3	157.5		183	.72		.86	.86	760.03	91		247	251		64	1
10:59	2	165		182	.80		.96	.96	763.92	91		248	251		65	1
11:06.5	1	172.5		182	.70		.84	.84	768.01	92		250	251		64	1
		180							771.860							
AVERAGE	24	180		149.8	0.8605		1.16		108.255	87.8		248.5	250.6		65	MAN 2

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)					SILICA GEL WEIGHT
	#1	#2	#3	#4	#5	
FINAL INITIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						

ORSAT DATA	V <sub>m</sub> = 107.625	
	TIME	O <sub>2</sub>
TRIAL 1		
TRIAL 2		
TRIAL 3		
Average		

LEAK CHECK	
SYSTEM PRE: 0.000	CFM @ 15" H <sub>2</sub> O
POST: 0.001	CFM @ 15" H <sub>2</sub> O
PITOT PRE: 4/-OK	@ 3" H <sub>2</sub> O
POST: 1/-OK	@ 3" H <sub>2</sub> O

90 min. leak check  
718.370 / 719.000

B-42



IMPINGER RECOVERY DATA SHEET

Company:	<u>A Kramer</u>	Date Set-up:	<u>9-18-13</u>
Location:	<u>Chicago IL</u>	Test Date:	<u>9-19-13</u>
Source:	<u>South Bit</u>	Date Recovered:	<u>9-19-13</u>
Run No.:	<u>South-29-1</u>	USEPA Method:	<u>m29</u>
		Corresponding Filter Wgt:	<u>822.3</u>
		Filter Container No:	<u>536-17</u>

Measurement Method: Weight or Volume

<u>Impinger No.</u>	<u>Impinger Contents</u>	<u>Initial wt/vol g/mL</u>	<u>Final wt/vol g/mL</u>	<u>Difference wt/vol g/mL</u>	<u>Sample Container No.</u>
1	<u>5% / 10% / 100ml</u>	<u>697.9</u>	<u>732.3</u>	<u>34.4</u>	
2	<u>5% / 10% / 100ml</u>	<u>720.9</u>	<u>736.2</u>	<u>15.3</u>	
3	<u>Empty</u>	<u>581.1</u>	<u>584.5</u>	<u>3.4</u>	
4	<u>SG</u>	<u>802.1</u>	<u>811.8</u>	<u>9.7</u>	
5					
6					<u>628</u>

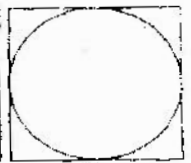


FIELD DATA

PLANT H. Kramer AMBIENT TEMPERATURE 75  
 DATE 9-13-13 BAROMETRIC PRESSURE 29.40  
 LOCATION CHICKS, IL ASSUMED MOISTURE % 7.0  
 OPERATOR TM PROBE LENGTH, in. 71  
 STACK NO South NOZZLE DIAMETER, in. 0.187  
 RUN NO 807-22-2 STACK DIAMETER, in. 94.5  
 SAMPLE BOX NO APC 1 MINUTES PER POINT 7.5  
 METER BOX NO 807224 NUMBER OF POINTS 24  
 START TIME 1305 NUMBER OF PORTS 3

PROBE HEATER SETTING 250  
 HEATER BOX SETTING 230  
 METER No. 1.90  
 C<sub>1</sub> FACTOR 0.94  
 Y<sub>1</sub> FACTOR 1.002  
 PITOT NO. 624

WEIGHT OF PARTICULATE, mg	
Filter No.	
Sample	
Post wt	
Tare wt	
Net gain	
TOTAL	0



CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (M) min.	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (°F)	VELOCITY HEAD (ft)		PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (in. H <sub>2</sub> O)		GAS SAMPLE VOLUME (CYM) <sup>3</sup>	GAS SAMPLE TEMP AT DRY GAS METER		FILTER EXIT GAS TEMP. (°F)	PROBE TEMP (°F)	AUXILIARY TEMP. (°F)	LAST IMPINGER OUTLET TEMP. (°F)	PUMP VACUUM (in. Hg)
					(M <sub>1</sub> )	(M <sub>2</sub> )	ACTUAL	DESIRED		INLET (°F)	OUTLET (°F)					
1205	12	0	-0.42	149	1.2		1.5	1.50	772.820	85		252	251		67	1
1212.5	11	7.5		142	1.3		1.5	1.50	777.62	85		251	251		67	1
1220	10	15		139	1.3		1.7	1.60	782.54	86		254	251		60	1
1227.5	9	22.5		138	1.3		1.7	1.66	787.90	86		252	251		60	1
1235	8	30		137	1.3		1.5	1.50	793.24	86		253	251		61	1
1242.5	7	37.5		136	.97		1.2	1.24	798.34	86		250	251		62	1
1250	6	45		135	.86		1.2	1.23	802.66	85		252	251		62	1
1257.5	5	52.5		135	.94		1.2	1.20	807.39	85		253	251		62	1
1305	4	60		134	.94		1.2	1.20	811.94	85		252	251		62	1
1312.5	3	67.5		135	.86		1.1	1.10	816.79	85		254	251		63	1
1320	2	75		136	.77		.98	.98	821.55	85		253	251		64	1
1327.5	1	82.5		137	.75		.96	.96	825.70	85		252	250		65	1
1335/1345	12	90		138	1.2		1.9	1.90	830.115	85		256	251		63	1
1352.5	11	97.5		137	1.2		1.5	1.53	835.17	85		252	251		64	1
1400	10	105		136	1.3		1.7	1.66	840.26	85		254	251		65	1
1407.5	9	112.5		136	1.1		1.4	1.41	845.45	86		252	251		66	1
1415	8	120		138	1.0		1.3	1.27	850.33	86		247	251		62	1
1422.5	7	127.5		137	.90		1.2	1.15	855.02	86		242	251		63	1
1430	6	135		144	.77		.97	.97	859.37	86		240	251		63	1
1437.5	5	142.5		150	.75		.94	.94	863.50	86		234	251		63	1
1445	4	150		155	.74		.92	.92	867.55	86		230	251		63	1
1452.5	3	157.5		158	.73		.90	.90	871.55	87		230	251		63	1
1500	2	165		159	.70		.86	.86	875.53	87		214	251		64	1
1507.5	1	172.5		154	.64		.80	.80	879.39	87		255	251		65	1
		180							883.100							
AVERAGE	24	180	-0.42	141.5	0.9814		1.24		10.280	85.7		248.0	251.0		≤ 68	max

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER					SILICA GEL WEIGHT
	#1	#2	#3	#4	#5	
ETRAL						
USTIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						

0.355

V<sub>m</sub> = 109825

TRIAL	TIME	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1			
TRIAL 2			
TRIAL 3			
Average			

LEAK CHECK	
SYSTEM PRE: 0-000 CFM@15" H <sub>2</sub> O	
POST: 0000 CFM@15" H <sub>2</sub> O	
PITOT PRE: +/- OK @ > 3" H <sub>2</sub> O	
POST: +/- OK @ > 3" H <sub>2</sub> O	

B-44



**IMPINGER RECOVERY DATA SHEET**

Company:	<u>H Kramer</u>	Date Set-up:	<u>9.15.13</u>
Location:	<u>Chicago</u>	Test Date:	<u>9.19.13</u>
Source:	<u>South Boulevard</u>	Date Recovered:	<u>9.19.13</u>
Run No.:	<u>South-29-2</u>	USEPA Method:	<u>29</u>
		Corresponding Filter Wgt:	<u>818.9</u>
		Filter Container No.:	<u>52828</u>

Measurement Method: Weight or Volume

<u>Impinger No.</u>	<u>Impinger Contents</u>	<u>Initial wt/vol g/mL</u>	<u>Final wt/vol g/mL</u>	<u>Difference wt/vol g/mL</u>	<u>Sample Container No.</u>
1	<u>5% 10% 100ml</u>	<u>652.5</u>	<u>738.9</u>	<u>86.4</u>	
2	<u>5% 10% 100ml</u>	<u>663.5</u>	<u>679.0</u>	<u>15.5</u>	
3	<u>Empty</u>	<u>633.1</u>	<u>636.7</u>	<u>3.6</u>	
4	<u>SG</u>	<u>745.5</u>	<u>755.8</u>	<u>10.3</u>	
5					
6					<u>115.8</u>





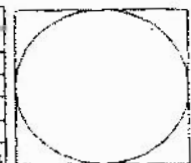
FIELD DATA

PLANT H. Kramer  
 DATE 9-20-13  
 LOCATION Ch. Cogh, IL  
 OPERATOR JM  
 STACK NO. South  
 RUN NO. 87-24-3  
 SAMPLE BOX NO. APC  
 METER BOX NO. 80824  
 START TIME 7:29

AMBIENT TEMPERATURE 68  
 BAROMETRIC PRESSURE 29.952961  
 ASSUMED MOISTURE % 1.0  
 PROBE LENGTH, in. 72  
 NOZZLE DIAMETER, in. 0.187  
 STACK DIAMETER, in. 59.5  
 MINUTES PER POINT 7.5  
 NUMBER OF PORTS 24  
 NUMBER OF PORTS 3

PROBE HEATER SETTING 250  
 HEATER BOX SETTING 250  
 METER H<sub>2</sub>O 1.00  
 C, FACTOR 0.94  
 Y, FACTOR 1.003  
 PITOT NO. 654

WEIGHT OF PARTICULATE, mg	
Filter No.	<u>53693</u>
Sample	
Tare wt	
Net wt	<u>876.6</u>
TOTAL	mg



CLOCK TIME (Hr)	TRAVERSE POINT NUMBER	SAMPLING TIME (H) min.	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (°F)	VELOCITY READ (AP)		PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (in. H <sub>2</sub> O)		GAS SAMPLE VOLUME (Yr)	GAS SAMPLE TEMP AT DRY GAS METER (°F)		FILTER EXIT GAS TEMP (°F)	PROBE TEMP (°F)	AUXILIARY TEMP (°F)	LAST IMPINGER OUTLET TEMP (°F)	PUMP VACUUM (in. Hg)
					(AP)	(AP)	ACTUAL	DESIRED		INLET (T <sub>in</sub> )	OUTLET (T <sub>out</sub> )					
730	12	0	-0.45	139	1.2		1.5	1.50	887.350	87		232	251		62	1
737.5	11	7.5		143	1.2		1.5	1.51	887.17	88		233	251		64	1
745	10	15		145	1.1		1.4	1.38	894.00	88		251	251		62	1
752.5	9	22.5		147	1.0		1.3	1.23	898.74	88		244	251		63	1
800	8	30		154	.82		1.0	1.02	903.53	88		274	251		64	1
807.5	7	37.5		156	.77		.95	.95	907.86	87		240	251		65	1
815	6	45		153	.70		.87	.87	912.00	87		241	251		65	1
822.5	5	52.5		156	.68		.84	.84	915.83	88		230	251		65	1
830	4	60		158	.67		.83	.83	919.78	88		237	251		65	1
837.5	3	67.5		158	.88		1.1	1.04	923.63	88		242	251		65	1
845	2	75		187	.67		.83	.83	927.02	89		230	251		65	1
852.5	1	82.5		153	.66		.82	.82	931.77	89		235	251		66	1
900/910	12	90		150	.90		1.1	1.13	935.80/935.25	89		230	251		64	1
917.5	11	97.5		150	.89		1.1	1.12	940.05	89		226	251		62	1
925	10	105		150	.90		1.1	1.13	944.40	89		232	251		60	1
932.5	9	112.5		151	.85		1.1	1.07	948.85	90		234	251		60	1
940	8	120		174	.76		.85	.85	953.03	90		234	251		61	1
947.5	7	127.5		177	.75		.90	.90	957.00	91		243	251		61	1
955	6	135		175	.75		.91	.91	960.99	91		232	251		62	1
1002.5	5	142.5		164	.78		.96	.96	965.00	92		230	251		65	1
1010	4	150		157	.77		.96	.96	969.08	92		235	251		63	1
1017.5	3	157.5		154	.74		.93	.93	973.23	93		243	251		63	1
1025	2	165		151	.68		.86	.86	977.29	92		221	251		63	1
1032.5	1	172.5		149	.63		.80	.80	981.17	92		231	251		64	1
1040		180							984.915							
AVERAGE	24	180	-0.45	155.0	0.9018		1.02	1.02	100.525 9163 100.400	88.7		237.1	251		68	max 1

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)					SILICA GEL WEIGHT
	#1	#2	#3	#4	#5	
TOTAL						
INITIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						

DESAT. DATA	TIME	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1			
TRIAL 2			
TRIAL 3			
Average			

LEAK CHECK	
SYSTEM PRE: <u>0.000</u>	CFM@15" Hg
POST: <u>0.000</u>	CFM@15" Hg
PITOT PRE: <u>+/- OK</u>	@ > 3" H <sub>2</sub> O
POST: <u>F/- R</u>	@ > 3" H <sub>2</sub> O

B-46



IMPINGER RECOVERY DATA SHEET

Company:	<u>H Kramer</u>	Date Set-up:	<u>9.19.13</u>
Location:	<u>Chicago IL</u>	Test Date:	<u>9.19.13</u>
Source:	<u>South BH</u>	Date Recovered:	<u>9.19.13</u>
Run No.:	<u>South-29-3</u>	USEPA Method:	<u>29</u>
		Corresponding Filter Wgt:	<u>0.76.6</u>
		Filter Container No:	<u>53699</u>

Measurement Method: Weight or Volume

<u>Impinger No.</u>	<u>Impinger Contents</u>	<u>Initial wt/vol g/mL</u>	<u>Final wt/vol g/mL</u>	<u>Difference wt/vol g/mL</u>	<u>Sample Container No.</u>
1	<u>51.1107. 100ml</u>	<u>687.0</u>	<u>725.9</u>	<u>38.9</u>	
2	<u>51.1107. 100ml</u>	<u>723.5</u>	<u>732.9</u>	<u>9.4</u>	
3	<u>Empty</u>	<u>602.9</u>	<u>603.7</u>	<u>0.8</u>	
4	<u>SG</u>	<u>766.4</u>	<u>779.3</u>	<u>12.9</u>	
5					
6					<u>62.0</u>



STACK GAS MOLECULAR WEIGHT FIELD DATA

COMPANY: H. Kramer  
 LOCATION: Chicago, IL  
 SOURCE: South Bayhouse  
 TEST DATE: 9/19/13 - 9/20/13

Field Orsat Measurements

Run: 1  
 Run Clock Time: 807-1114  
 Analysis Clock Time: 1446

PARAMETER	#1	#2	#3	Average
Carbon dioxide	0.3	0.3	0.3	0.3
Oxygen	20.5	20.5	20.5	20.5
Nitrogen (by difference)				79.2

Run: 2  
 Run Clock Time: 1205-1515  
 Analysis Clock Time: 1856

PARAMETER	#1	#2	#3	Average
Carbon dioxide	0.3	0.4	0.4	0.4
Oxygen	20.4	20.4	20.4	20.4
Nitrogen (by difference)				79.2

Run: 3  
 Run Clock Time: 730-1040  
 Analysis Clock Time: 1505

PARAMETER	#1	#2	#3	Average
Carbon dioxide	0.2	0.2	0.2	0.2
Oxygen	20.7	20.7	20.7	20.7
Nitrogen (by difference)				79.1



### VELOCITY TRAVERSE AND CYCLONIC FLOW VERIFICATION

PLANT H Kramer  
 DATE 9-18-13  
 LOCATION Chicago, IL  
 SOURCE South Baghouse  
 STACK ID 59.5  
 PROBE #/TC # ~~555~~ 655  
 BAROMETRIC PRESSURE, in. Hg 29.45  
 OPERATORS RB TM

SCHEMATIC OF TRAVERSE POINT LAYOUT

RUN NO. cyclonic  
 STATIC, in. H<sub>2</sub>O -  
 START: 1317 STOP: 1330  
 PRE-TEST: +/- de POST-TEST: +/- de

RUN NO. \_\_\_\_\_  
 STATIC, in. H<sub>2</sub>O \_\_\_\_\_  
 START: \_\_\_\_\_ STOP: \_\_\_\_\_  
 PRE-TEST: \_\_\_\_\_ POST-TEST: \_\_\_\_\_

TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H <sub>2</sub> O)	STACK TEMP. (°F)	YAW ANGLE (°)
1			7
2			4
3			4
4			6
5			4
6			2
7			3
8			3
9			5
10			7
11			7
12			5
1			2
2			2
3			1
4			3
5			3
6			4
7			0
8			1
9			0
10			2
11			4
12			5
AVERAGE			3.5°

TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H <sub>2</sub> O)	STACK TEMP. (°F)	YAW ANGLE (°)
AVERAGE			

OK ✓



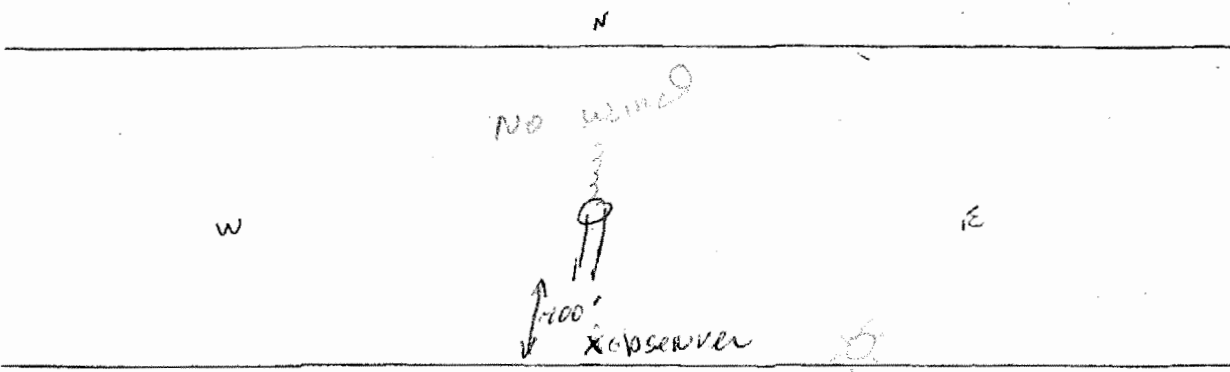
FUGITIVE OR SMOKE EMISSION INSPECTION  
OUTDOOR LOCATION

COMPANY H. KRAMER OBSERVER LARRY GODDINE  
 LOCATION CHICAGO, IL AFFILIATION ARI ENVIRONMENTAL, INC  
 COMPANY REPRESENTATIVE \_\_\_\_\_ DATE 9/19/13

SKY CONDITIONS OVERCAST WIND DIRECTION CALM  
 PRECIPITATION light rain WIND SPEED -

INDUSTRY Metallurgy PROCESS UNIT SOUTH BAGHOUSE RPH2

Sketch process unit; indicate observer position relative to source and sun; indicate potential emission points and/or actual emission points.



OBSERVATIONS	Clock time	Observation period duration min:sec	Accumulated emission time min:sec
Begin Observation	<u>0809-0829</u>	<u>20:00</u>	<u>0:00</u>
	<u>0837-0857</u>	<u>20:00</u>	<u>0:20</u>
	<u>0902-0922</u>	<u>20:00</u>	<u>0:00</u>
End Observation		<u>60 minutes</u>	<u>0:00 minutes</u>

NO VE observed



H. Kramer & Company: Chicago, IL  
North and South Baghouse Stacks  
Test Dates: 9/17 - 9/20/13

**APPENDIX C**

**Laboratory Data**

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