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AIR QUALITY DIVISION

**Third Quarter 2022**

**Annual RATA Report**

**Test Dates: September 20<sup>th</sup> & 21<sup>st</sup>, 2022**

**Tilden Mining Company LC  
1 Tilden Mine Road  
Ishpeming, MI 49849**

**Emission Units:**

**Tilden 1 North**

**Tilden 1 South**

**Air Emission Permit No: 148-12A**

**Contact: Ryan Korpela**

**VP/GM of Tilden Mining Company LC**

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*B4085-test-20220920*

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**Section 1**

**Tilden 1 North**

**RATA Results**

**Relative Accuracy Test Audit Report For:**

**Tilden Mining Company LC  
1 Tilden Mine Road  
Ishpeming, MI 49849**

**Tilden 1 North**

**Teledyne Monitor Labs  
T200H/O2 NO<sub>x</sub>/O<sub>2</sub> Monitor  
Serial Number: 149**

**Teledyne Monitor Labs  
T100H SO<sub>2</sub> Monitor  
Serial Number: 147**

**Teledyne Monitor Labs  
UF150 Flow Monitor  
Serial Number: 1501325**



On 09/20/2022 the Relative Accuracy Test Audit (RATA) was conducted on the Tilden 1 North stack at the Tilden Mining Company in Ishpeming, MI. All the analyzers in the system are installed on the Tilden 1 North stack.

The test was performed in accordance with the procedures in the Federal Register 40 CFR 60, Appendix B, Performance Specifications 2, 3 and 6.

**Relative Accuracy Test Audit:**

**Result:**

After calculating all differences, the Relative Accuracy was within the performance requirements for SO<sub>2</sub>, NO<sub>x</sub>, flow, and moisture.

A complete copy of Network Environmental's RATA report appears in Appendix B.

# Part 60 Rata Report

10/18/2022

Page 1

Facility Name: Tilden Mine  
Unit/Stack: T1N  
Parameter: SO2  
Units: LbPerHr

Test Date/Number: 09/20/2022, Test 1  
Reason for Test: Periodic Quality Assurance  
Primary Spec: 20 % of Reference Mean  
Alternate Spec: 10 % of LbPerHr

Relative Accuracy: 3.3 %  
Performance Spec: 20 % of Reference Mean (Primary Spec)  
Test Result: **Pass**

Std Deviation: 1.3  
Conf Coeff: 1.0  
T Value: 2.306

Run	Start Date/Time	Duration	Use Run	Load	CEM Value	Reference Value	Difference
1	09/20/22 11:27	25	-		37.8	32.0	-5.8
2	09/20/22 14:20	25	Yes		31.2	28.4	-2.8
3	09/20/22 15:06	25	Yes		31.7	31.4	-0.3
4	09/20/22 15:50	25	Yes		33.0	32.8	-0.2
5	09/20/22 16:33	25	Yes		33.1	32.2	-0.9
6	09/20/22 17:25	25	Yes		33.2	32.9	-0.3
7	09/20/22 18:08	25	Yes		32.1	32.5	0.4
8	09/20/22 18:57	25	Yes		32.1	33.0	0.9
9	09/20/22 19:45	25	Yes		33.5	34.8	1.3
10	09/20/22 20:35	25	Yes		32.0	33.3	1.3
Mean Values					32.4	32.4	-0.1

# Part 60 Rata Report

10/18/2022

Page 1

Facility Name: Tilden Mine  
 Unit/Stack: T1N  
 Parameter: NOx  
 Units: LbPerHr

Test Date/Number: 09/20/2022, Test 1  
 Reason for Test: Periodic Quality Assurance  
 Primary Spec: 20 % of Reference Mean  
 Alternate Spec: 10 % of LbPerHr

Relative Accuracy: 2.8 %  
 Performance Spec: 20 % of Reference Mean (Primary Spec)  
 Test Result: **Pass**

Std Deviation: 4.3  
 Conf Coeff: 3.3  
 T Value: 2.306

Run	Start Date/Time	Duration	Use Run	Load	CEM Value	Reference Value	Difference
1	09/20/22 11:27	25	-		234.2	199.0	-35.2
2	09/20/22 14:20	25	Yes		199.2	209.6	10.4
3	09/20/22 15:06	25	Yes		191.6	191.5	-0.1
4	09/20/22 15:50	25	Yes		196.6	193.9	-2.7
5	09/20/22 16:33	25	Yes		197.1	194.0	-3.1
6	09/20/22 17:25	25	Yes		196.3	195.6	-0.7
7	09/20/22 18:08	25	Yes		187.8	189.8	2.0
8	09/20/22 18:57	25	Yes		174.6	179.0	4.4
9	09/20/22 19:45	25	Yes		183.2	188.2	5.0
10	09/20/22 20:35	25	Yes		184.7	187.7	3.0
Mean Values					190.1	192.1	2.0

# Part 60 Rata Report

10/18/2022

Page 1

Facility Name: Tilden Mine  
 Unit/Stack: T1N  
 Parameter: StackFlow  
 Units: Kscfh

Test Date/Number: 09/20/2022, Test 1  
 Reason for Test: Periodic Quality Assurance  
 Primary Spec: 20 % of Reference Mean  
 Alternate Spec: 10 % of Kscfh

Relative Accuracy: 1.9 %  
 Performance Spec: 20 % of Reference Mean (Primary Spec)  
 Test Result: **Pass**

Std Deviation: 210.4  
 Conf Coeff: 161.7  
 T Value: 2.306

Run	Start Date/Time	Duration	Use Run	Load	CEM Value	Reference Value	Difference
1	09/20/22 11:27	25	-		18790.0	15719.0	-3071.0
2	09/20/22 14:20	25	Yes		15771.6	15831.0	59.4
3	09/20/22 15:06	25	Yes		15668.9	15691.0	22.1
4	09/20/22 15:50	25	Yes		15846.1	15728.0	-118.1
5	09/20/22 16:33	25	Yes		15686.5	15507.0	-179.5
6	09/20/22 17:25	25	Yes		15721.2	15805.0	83.8
7	09/20/22 18:08	25	Yes		15750.3	16053.0	302.7
8	09/20/22 18:57	25	Yes		15640.9	16052.0	411.1
9	09/20/22 19:45	25	Yes		15472.8	15848.0	375.2
10	09/20/22 20:35	25	Yes		15573.4	15798.0	224.6
Mean Values					15681.3	15812.6	131.3



**Section 2**

**Tilden 1 South**

**RATA Results**

**Relative Accuracy Test Audit Report For:**

**Tilden Mining Company LC  
1 Tilden Mine Road  
Ishpeming, MI 49849**

**Tilden 1 South**

**Teledyne Monitor Labs  
T200H/O<sub>2</sub> NO<sub>x</sub>/O<sub>2</sub> Monitor  
Serial Number: 148**

**Teledyne Monitor Labs  
T100H SO<sub>2</sub> Monitor  
Serial Number: 146**

**Teledyne Monitor Labs  
UF150 Flow Monitor  
Serial Number: 1501324**

On 09/21/2022 the Relative Accuracy Test Audit (RATA) was conducted on the Tilden 1 South stack at the Tilden Mining Company in Ishpeming, MI. All the analyzers in the system are installed on the Tilden 1 South stack.

The tests were performed in accordance with the procedures in the Federal Register 40 CFR 60, Appendix B, Performance Specifications 2, 3 and 6.

**Relative Accuracy Test Audit:**

**Result:**

After calculating all differences, the Relative Accuracy was within the performance requirements for SO<sub>2</sub>, NO<sub>x</sub>, flow, and moisture.

A complete copy of Network Environmental's RATA report appears in Appendix B.





# Part 60 Rata Report

10/18/2022  
Page 1

Facility Name: Tilden Mine  
Unit/Stack: T1S  
Parameter: NOx  
Units: LbPerHr

Test Date/Number: 09/21/2022, Test 1  
Reason for Test: Periodic Quality Assurance  
Primary Spec: 20 % of Reference Mean  
Alternate Spec: 10 % of LbPerHr

Relative Accuracy: 17.2 %  
Performance Spec: 20 % of Reference Mean (Primary Spec)  
Test Result: **Pass**

Std Deviation: 28.5  
Conf Coeff: 21.9  
T Value: 2.306

Run	Start Date/Time	Duration	Use Run	Load	CEM Value	Reference Value	Difference
1	09/21/22 12:37	25	Yes		567.7	648.4	80.7
2	09/21/22 13:42	25	Yes		563.5	641.2	77.7
3	09/21/22 14:29	25	Yes		602.0	654.2	52.2
4	09/21/22 15:23	25	Yes		555.9	631.6	75.7
5	09/21/22 16:09	25	Yes		588.6	689.6	101.0
6	09/21/22 16:56	25	Yes		522.6	602.7	80.1
7	09/21/22 17:42	25	Yes		504.5	637.2	132.7
8	09/21/22 18:28	25	Yes		521.5	611.4	89.9
9	09/21/22 19:18	25	Yes		719.2	860.3	141.1
Mean Values					571.7	664.1	92.3

# Part 60 Rata Report

10/18/2022  
Page 1

Facility Name: Tilden Mine  
Unit/Stack: T1S  
Parameter: StackFlow  
Units: Kscfh

Test Date/Number: 09/21/2022, Test 1  
Reason for Test: Periodic Quality Assurance  
Primary Spec: 20 % of Reference Mean  
Alternate Spec: 10 % of Kscfh

Relative Accuracy: 14.9 %  
Performance Spec: 20 % of Reference Mean (Primary Spec)  
Test Result: **Pass**

Std Deviation: 571.8  
Conf Coeff: 439.5  
T Value: 2.306

Run	Start Date/Time	Duration	Use Run	Load	CEM Value	Reference Value	Difference
1	09/21/22 12:37	25	Yes		27217.2	31342.0	4124.8
2	09/21/22 13:42	25	Yes		26862.4	30777.0	3914.6
3	09/21/22 14:29	25	Yes		27954.3	30817.0	2862.7
4	09/21/22 15:23	25	Yes		26930.3	30982.0	4051.7
5	09/21/22 16:09	25	Yes		26410.8	30810.0	4399.2
6	09/21/22 16:56	25	Yes		26382.3	30833.0	4450.7
7	09/21/22 17:42	25	Yes		26026.2	30675.0	4648.8
8	09/21/22 18:28	25	Yes		26705.0	31051.0	4346.0
9	09/21/22 19:18	25	Yes		26134.8	30964.0	4829.2

Mean Values                      26735.9                      30916.8                      4180.9

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## **Appendix A**

### **Process Data**

Tilden Mining Company L.C.  
EUKILN1: Production Data

Date Hour	Pellet Production	Natural Gas (MCFH)	Coal (Short Tons)
09/20/22 11:00	524	159	20
09/20/22 12:00	520	155	20
09/20/22 13:00	519	147	20
09/20/22 14:00	530	223	16
09/20/22 15:00	531	148	20
09/20/22 16:00	530	150	20
09/20/22 17:00	531	149	20
09/20/22 18:00	500	134	20
09/20/22 19:00	498	144	20
09/20/22 20:00	508	148	20

Date Hour	Pellet Production	Natural Gas (MCFH)	Coal (Short Tons)
09/21/22 12:00	572	146	20
09/21/22 13:00	567	144	20
09/21/22 14:00	568	147	20
09/21/22 15:00	564	141	20
09/21/22 16:00	562	203	17
09/21/22 17:00	560	129	20
09/21/22 18:00	562	134	20
09/21/22 19:00	563	180	18

**Appendix B**

**Network Environmental's Complete RATA report**

Report of a...

# Relative Accuracy Test Audit

Performed for ...

**Cleveland-Cliffs, Inc.**  
**Tilden Mining Company, L.C.**  
Ishpeming, Michigan

On...

**Unit 1**

At the...

**Tilden Mine**  
National Mine, Michigan

September 20-21, 2022

Project #: 053.57

By...

**Network Environmental, Inc.**  
Grand Rapids, MI



performed for

Cleveland-Cliffs, Inc.  
Tilden Mining Company, L.C.  
1 Tilden Mine Road  
P.O. Box 2000  
Ishpeming, MI 49849-0901  
Contact: Tom O'Brien  
Telephone: (906) 475-3306  
e-mail: thomas.obrien@clevelandcliffs.com

Performed at the:

Tilden Mine  
National Mine, MI

Performed by

Network Environmental, Inc.  
2629 Remico Street SW  
Suite B  
Grand Rapids, MI 49519  
Contact: David D. Engelhardt  
Telephone: (616) 530-6330  
Fax: (616) 530-0001  
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## **I. INTRODUCTION**

Network Environmental, Inc. was retained by the Tilden Mining Company, L.C. of Ishpeming, Michigan to perform a relative accuracy test audit (RATA) at the Tilden Mine located in National Mine, Michigan.

The purpose of the testing was to conduct a Relative Accuracy Test Audit (RATA) on the Continuous Emission Monitoring System (CEMS) that services Unit 1. There are two (2) exhaust stacks (North & South) on Unit 1. Each exhaust stack has its own CEMS. The CEMS on Unit 1 is for Oxides of Nitrogen (NO<sub>x</sub>), Sulfur Dioxide (SO<sub>2</sub>), air flow rate, Oxygen (O<sub>2</sub>) and moisture.

The RATA's were performed over the period of September 20-21, 2022. Stephan K. Byrd, Richard D. Eerdmans and David D. Engelhardt of Network Environmental, Inc. conducted the RATA's in accordance with Part 60 of Title 40 of the Code of Federal Regulations. The following reference test methods were employed to conduct the RATA sampling:

- Air Flow Rates – U.S. EPA Methods 1-2
- Oxygen & Carbon Dioxide (O<sub>2</sub> & CO<sub>2</sub>) – U.S. EPA Method 3A
- Moisture – U.S. EPA Method 4
- Sulfur Dioxide (SO<sub>2</sub>) – U.S. EPA Method 6C
- Oxides of Nitrogen (NO<sub>x</sub>) – U.S. EPA Method 7E

Assisting with the RATA's were Mr. Jason Sammon of CEMSOURCE and Mr. Dan McGrath of the Tilden Mine.

**II. PRESENTATION OF RESULTS**

**II.1 TABLE 1  
NO<sub>x</sub> (LBS/HR) RELATIVE ACCURACY DETERMINATION  
UNIT 1  
NORTH WASTE GAS STACK  
CLEVELAND CLIFFS, INC.  
TILDEN MINING COMPANY, L.C.  
NATIONAL MINE, MICHIGAN  
SEPTEMBER 20, 2022**

Run #	Time	REFERENCE METHOD			CEM	DIFF
		NO <sub>x</sub> <sup>(1)</sup>	DSCFM <sup>(2)</sup>	Lbs/Hr <sup>(3)</sup>	Lbs/Hr <sup>(3)</sup>	
1 <sup>(4)</sup>	11:27-11:52	115.5	241,080	198.98	234.2	-35.22
2	14:20-14:45	121.9	240,703	209.63	199.2	10.43
3	15:06-15:31	112.4	238,484	191.50	191.6	-0.10
4	15:50-16:15	113.2	239,725	193.85	196.6	-2.75
5	16:33-16:58	115.2	235,711	193.95	197.1	-3.15
6	17:25-17:50	113.8	240,703	195.62	196.3	-0.68
7	18:08-18:33	108.8	244,271	189.76	187.8	1.96
8	18:57-19:22	102.8	243,809	178.99	174.6	4.39
9	19:45-20:10	109.1	241,556	188.17	183.2	4.97
10	20:35-21:00	109.3	240,391	187.66	184.7	2.96

Mean Reference Value = 192.1256

Absolute Value of the Mean of the Differences = 2.0033

Standard Deviation = 4.2895

Confidence Co-efficient = 3.2972

**Relative Accuracy = 2.76% of the mean of the reference method**

Relative Accuracy Needs To Be Less Than 20% Of Reference Method

- (1) Concentration in terms of PPM by volume on a dry basis
- (2) DSCFM = Dry Standard Cubic Feet Per Minute (Standard Temperature & Pressure = 68 °F & 29.92 in. Hg)
- (3) Lbs/Hr = Pounds Per Hour
- (4) Not used in relative accuracy calculation



**II.2 TABLE 2**  
**SO<sub>2</sub> (LBS/HR) RELATIVE ACCURACY DETERMINATION**  
**UNIT 1**  
**NORTH WASTE GAS STACK**  
**CLEVELAND CLIFFS, INC.**  
**TILDEN MINING COMPANY, L.C.**  
**NATIONAL MINE, MICHIGAN**  
**SEPTEMBER 20, 2022**

Run #	Time	REFERENCE METHOD			CEM	DIFF
		SO <sub>2</sub> <sup>(1)</sup>	DSCFM <sup>(2)</sup>	Lbs/Hr <sup>(3)</sup>	Lbs/Hr <sup>(3)</sup>	
1 <sup>(4)</sup>	11:27-11:52	13.3	241,080	31.95	37.8	-5.85
2	14:20-14:45	11.9	240,703	28.42	31.2	-2.78
3	15:06-15:31	13.3	238,484	31.43	31.7	-0.27
4	15:50-16:15	13.7	239,725	32.76	33.0	-0.24
5	16:33-16:58	13.8	235,711	32.24	33.1	-0.86
6	17:25-17:50	13.7	240,703	32.88	33.2	-0.32
7	18:08-18:33	13.4	244,271	32.50	32.1	0.40
8	18:57-19:22	13.6	243,809	33.03	32.1	0.93
9	19:45-20:10	14.5	241,556	34.80	33.5	1.30
10	20:35-21:00	14.0	240,391	33.34	32.0	1.34

Mean Reference Value = 32.3778

Absolute Value of the Mean of the Differences = 0.0556

Standard Deviation = 1.2837

Confidence Co-efficient = 0.9868

**Relative Accuracy = 3.22% of the mean of the reference method**

Relative Accuracy Needs To Be Less Than 20% Of Reference Method

(1) Concentration in terms of PPM by volume on a dry basis

(2) DSCFM = Dry Standard Cubic Feet Per Minute (Standard Temperature & Pressure = 68 °F & 29.92 in. Hg)

(3) Lbs/Hr = Pounds Per Hour

(4) Not used in relative accuracy calculation

**II.3 TABLE 3**  
**NO<sub>x</sub> (PPM) RELATIVE ACCURACY DETERMINATION**  
**UNIT 1**  
**NORTH WASTE GAS STACK**  
**CLEVELAND CLIFFS, INC.**  
**TILDEN MINING COMPANY, L.C.**  
**NATIONAL MINE, MICHIGAN**  
**SEPTEMBER 20, 2022**

Run #	Time	REFERENCE METHOD	CEM	DIFF
		NO <sub>x</sub> <sup>(1)</sup>	NO <sub>x</sub> <sup>(1)</sup>	
1	11:27-11:52	115.5	114.1	1.4
2 <sup>(2)</sup>	14:20-14:45	121.9	116.0	5.9
3	15:06-15:31	112.4	111.6	0.8
4	15:50-16:15	113.2	113.1	-0.1
5	16:33-16:58	115.2	114.9	-0.6
6	17:25-17:50	113.8	114.4	-0.6
7	18:08-18:33	108.8	109.5	-0.7
8	18:57-19:22	102.8	102.4	0.4
9	19:45-20:10	109.1	108.5	0.6
10	20:35-21:00	109.3	108.4	0.9

Mean Reference Value = 111.1111

Absolute Value of the Mean of the Differences = 0.3556

Standard Deviation = 0.6839

Confidence Co-efficient = 0.5257

**Relative Accuracy = 0.79% of the mean of the reference method**

Relative Accuracy Needs To Be Less Than 20% Of Reference Method

(1) Concentration in terms of PPM by volume on a dry basis

(2) Not used in relative accuracy calculation

**II.4 TABLE 4**  
**SO<sub>2</sub> (PPM) RELATIVE ACCURACY DETERMINATION**  
**UNIT 1**  
**NORTH WASTE GAS STACK**  
**CLEVELAND CLIFFS, INC.**  
**TILDEN MINING COMPANY, L.C.**  
**NATIONAL MINE, MICHIGAN**  
**SEPTEMBER 20, 2022**

Run #	Time	REFERENCE METHOD	CEM	DIFF
		SO <sub>2</sub> <sup>(1)</sup>	SO <sub>2</sub> <sup>(1)</sup>	
1	11:27-11:52	13.3	13.2	0.1
2 <sup>(2)</sup>	14:20-14:45	11.9	13.1	-1.2
3	15:06-15:31	13.3	13.3	0.0
4	15:50-16:15	13.7	13.7	0.0
5	16:33-16:58	13.8	13.9	-0.1
6	17:25-17:50	13.7	13.9	-0.2
7	18:08-18:33	13.4	13.5	-0.1
8	18:57-19:22	13.6	13.5	0.1
9	19:45-20:10	14.5	14.3	0.2
10	20:35-21:00	14.0	13.5	0.5

Mean Reference Value = 13.7000

Absolute Value of the Mean of the Differences = 0.0556

Standard Deviation = 0.2068

Confidence Co-efficient = 0.1590

**Relative Accuracy = 1.57% of the mean of the reference method**

Relative Accuracy Needs To Be Less Than 20% Of Reference Method

- (1) Concentration in terms of PPM by volume on a dry basis  
(2) Not used in relative accuracy calculation



**II.5 TABLE 5**  
**O<sub>2</sub> (%) RELATIVE ACCURACY DETERMINATION**  
**UNIT 1**  
**NORTH WASTE GAS STACK**  
**CLEVELAND CLIFFS, INC.**  
**TILDEN MINING COMPANY, L.C.**  
**NATIONAL MINE, MICHIGAN**  
**SEPTEMBER 20, 2022**

Run #	Time	REFERENCE METHOD	CEM	DIFF
		O <sub>2</sub> <sup>(1)</sup>	O <sub>2</sub> <sup>(1)</sup>	
1 <sup>(2)</sup>	11:27-11:52	19.0	18.8	0.2
2	14:20-14:45	19.0	18.9	0.1
3	15:06-15:31	19.0	18.8	0.2
4	15:50-16:15	19.0	18.8	0.2
5	16:33-16:58	19.0	18.8	0.2
6	17:25-17:50	18.9	18.8	0.1
7	18:08-18:33	19.0	18.9	0.1
8	18:57-19:22	19.0	18.9	0.1
9	19:45-20:10	18.9	18.8	0.1
10	20:35-21:00	18.9	18.9	0.0

Mean Reference Value = 18.9667

Absolute Value of the Mean of the Differences = 0.1222

Standard Deviation = 0.0667

Confidence Co-efficient = 0.0512

**Relative Accuracy = 0.91% of the mean of the reference method**

Relative Accuracy Needs To Be Less Than 20% Of Reference Method

(1) Concentration in terms of % by volume on a dry basis

(2) Not used in relative accuracy calculation



**II.6 TABLE 6  
AIR FLOW (KSCFH) RELATIVE ACCURACY DETERMINATION  
UNIT 1  
NORTH WASTE GAS STACK  
CLEVELAND CLIFFS, INC.  
TILDEN MINING COMPANY, L.C.  
NATIONAL MINE, MICHIGAN  
SEPTEMBER 20, 2022**

Run #	Time	REFERENCE METHOD	CEM	DIFF
		KSCFH <sup>(1)</sup>	KSCFH <sup>(1)</sup>	
1 <sup>(2)</sup>	11:27-11:52	15,719	18,790	-3,071
2	14:20-14:45	15,831	15,772	59
3	15:06-15:31	15,691	15,669	22
4	15:50-16:15	15,728	15,846	-118
5	16:33-16:58	15,507	15,687	-180
6	17:25-17:50	15,805	15,721	84
7	18:08-18:33	16,053	15,750	303
8	18:57-19:22	16,052	15,641	411
9	19:45-20:10	15,848	15,473	375
10	20:35-21:00	15,798	15,573	225

Mean Reference Value = 15,812.556

Absolute Value of the Mean of the Differences = 131.222

Standard Deviation = 210.461

Confidence Co-efficient = 161.775

**Relative Accuracy = 1.85% of the mean of the reference method**

Relative Accuracy Needs To Be Less Than 20% Of Reference Method

(1) Thousand Standard Cubic Feet Per Hour

(2) Not used in relative accuracy calculation

**II.7 TABLE 7**  
**MOISTURE (%) RELATIVE ACCURACY DETERMINATION**  
**UNIT 1**  
**NORTH WASTE GAS STACK**  
**CLEVELAND CLIFFS, INC.**  
**TILDEN MINING COMPANY, L.C.**  
**NATIONAL MINE, MICHIGAN**  
**SEPTEMBER 20, 2022**

Run #	Time	REFERENCE METHOD	CEM	DIFF
		Moisture <sup>(1)</sup>	Moisture <sup>(1)</sup>	
1 <sup>(2)</sup>	11:27-11:52	7.98	8.5	-0.52
2	14:20-14:45	8.77	8.9	-0.13
3	15:06-15:31	8.81	8.2	0.61
4	15:50-16:15	8.55	8.1	0.45
5	16:33-16:58	8.80	8.4	0.40
6	17:25-17:50	8.62	8.6	0.02
7	18:08-18:33	8.70	8.8	-0.10
8	18:57-19:22	8.87	8.7	0.17
9	19:45-20:10	8.55	8.6	-0.05
10	20:35-21:00	8.70	8.4	0.30

Mean Reference Value = 8.7078

Absolute Value of the Mean of the Differences = 0.1856

Standard Deviation = 0.2677

Confidence Co-efficient = 0.2058

**Relative Accuracy = 4.49% of the mean of the reference method**

Relative Accuracy Needs To Be Less Than 20% Of Reference Method

(1) Concentration in terms of % by volume on a dry basis

(2) Not used in relative accuracy calculation

**II.8 TABLE 8**  
**NO<sub>x</sub> (LBS/HR) RELATIVE ACCURACY DETERMINATION**  
**UNIT 1**  
**SOUTH WASTE GAS STACK**  
**CLEVELAND CLIFFS, INC.**  
**TILDEN MINING COMPANY, L.C.**  
**NATIONAL MINE, MICHIGAN**  
**SEPTEMBER 21, 2022**

Run #	Time	REFERENCE METHOD			CEM	DIFF
		NO <sub>x</sub> <sup>(1)</sup>	DSCFM <sup>(2)</sup>	Lbs/Hr <sup>(3)</sup>	Lbs/Hr <sup>(3)</sup>	
1	12:37-13:02	199.5	455,032	648.40	567.7	80.70
2	13:42-14:07	199.6	449,709	641.19	563.5	77.69
3	14:29-14:54	203.8	449,465	654.22	602.0	52.22
4	15:23-15:48	195.8	451,669	631.64	555.9	75.74
5	16:09-16:34	214.9	449,153	689.63	588.6	101.03
6	16:56-17:21	187.1	450,877	602.72	522.6	80.12
7	17:42-18:07	186.9	477,145	637.15	504.5	132.65
8	18:28-18:53	188.8	453,445	611.39	521.5	89.89
9	19:18-19:43	266.4	452,027	860.29	719.2	141.09

Mean Reference Value = 664.0700

Absolute Value of the Mean of the Differences = 92.3478

Standard Deviation = 28.4332

Confidence Co-efficient = 21.8557

**Relative Accuracy = 17.20% of the mean of the reference method**

Relative Accuracy Needs To Be Less Than 20% Of Reference Method

(1) Concentration in terms of PPM by volume on a dry basis

(2) DSCFM = Dry Standard Cubic Feet Per Minute (Standard Temperature & Pressure = 68 °F & 29.92 in. Hg)

(3) Lbs/Hr = Pounds Per Hour



**II.9 TABLE 9**  
**SO<sub>2</sub> (LBS/HR) RELATIVE ACCURACY DETERMINATION**  
**UNIT 1**  
**SOUTH WASTE GAS STACK**  
**CLEVELAND CLIFFS, INC.**  
**TILDEN MINING COMPANY, L.C.**  
**NATIONAL MINE, MICHIGAN**  
**SEPTEMBER 21, 2022**

Run #	Time	REFERENCE METHOD			CEM	DIFF
		SO <sub>2</sub> <sup>(1)</sup>	DSCFM <sup>(2)</sup>	Lbs/Hr <sup>(3)</sup>	Lbs/Hr <sup>(3)</sup>	
1	12:37-13:02	14.3	455,032	64.73	59.8	4.93
2	13:42-14:07	13.7	449,709	61.28	57.5	3.78
3	14:29-14:54	14.8	449,465	65.93	64.3	1.63
4	15:23-15:48	13.6	451,669	61.06	54.9	6.16
5	16:09-16:34	15.8	449,153	70.69	59.9	10.79
6	16:56-17:21	13.0	450,877	58.29	53.1	5.19
7	17:42-18:07	13.3	477,145	62.84	47.9	14.94
8	18:28-18:53	12.5	453,445	56.44	48.1	8.34
9	19:18-19:43	12.6	452,027	56.75	45.0	11.75

Mean Reference Value = 62.0011

Absolute Value of the Mean of the Differences = 7.5011

Standard Deviation = 4.2863

Confidence Co-efficient = 3.2947

**Relative Accuracy = 17.41% of the mean of the reference method**

Relative Accuracy Needs To Be Less Than 20% Of Reference Method

(1) Concentration in terms of PPM by volume on a dry basis

(2) DSCFM = Dry Standard Cubic Feet Per Minute (Standard Temperature & Pressure = 68 °F & 29.92 in. Hg)

(3) Lbs/Hr = Pounds Per Hour

**II.10 TABLE 10**  
**NO<sub>x</sub> (PPM) RELATIVE ACCURACY DETERMINATION**  
**UNIT 1**  
**SOUTH WASTE GAS STACK**  
**CLEVELAND CLIFFS, INC.**  
**TILDEN MINING COMPANY, L.C.**  
**NATIONAL MINE, MICHIGAN**  
**SEPTEMBER 21, 2022**

Run #	Time	REFERENCE METHOD	CEM	DIFF
		NO <sub>x</sub> <sup>(1)</sup>	NO <sub>x</sub> <sup>(1)</sup>	
1	12:37-13:02	199.5	198.8	0.7
2	13:42-14:07	199.6	200.4	-0.8
3	14:29-14:54	203.8	206.0	-2.2
4	15:23-15:48	195.8	197.2	-1.4
5	16:09-16:34	214.9	213.2	1.7
6	16:56-17:21	187.1	188.9	-1.8
7	17:42-18:07	186.9	184.7	2.2
8	18:28-18:53	188.8	186.1	2.7
9	19:18-19:43	266.4	261.9	4.5

Mean Reference Value = 204.7556

Absolute Value of the Mean of the Differences = 0.6222

Standard Deviation = 2.3172

Confidence Co-efficient = 1.7812

**Relative Accuracy = 1.17% of the mean of the reference method**

Relative Accuracy Needs To Be Less Than 20% Of Reference Method

(1) Concentration in terms of PPM by volume on a dry basis

**II.11 TABLE 11**  
**SO<sub>2</sub> (PPM) RELATIVE ACCURACY DETERMINATION**  
**UNIT 1**  
**SOUTH WASTE GAS STACK**  
**CLEVELAND CLIFFS, INC.**  
**TILDEN MINING COMPANY, L.C.**  
**NATIONAL MINE, MICHIGAN**  
**SEPTEMBER 21, 2022**

Run #	Time	REFERENCE METHOD	CEM	DIFF
		SO <sub>2</sub> <sup>(1)</sup>	SO <sub>2</sub> <sup>(1)</sup>	
1	12:37-13:02	14.3	15.1	-0.8
2	13:42-14:07	13.7	14.7	-1.0
3	14:29-14:54	14.8	15.8	-1.0
4	15:23-15:48	13.6	14.0	-0.4
5	16:09-16:34	15.8	15.6	0.2
6	16:56-17:21	13.0	13.8	-0.8
7	17:42-18:07	13.3	12.6	0.7
8	18:28-18:53	12.5	12.3	0.2
9	19:18-19:43	12.6	11.8	0.8

Mean Reference Value = 13.7333

Absolute Value of the Mean of the Differences = 0.2333

Standard Deviation = 0.7211

Confidence Co-efficient = 0.5543

**Relative Accuracy = 5.74% of the mean of the reference method**

Relative Accuracy Needs To Be Less Than 20% Of Reference Method

(1) Concentration in terms of PPM by volume on a dry basis

**II.12 TABLE 12**  
**O<sub>2</sub> (%) RELATIVE ACCURACY DETERMINATION**  
**UNIT 1**  
**SOUTH WASTE GAS STACK**  
**CLEVELAND CLIFFS, INC.**  
**TILDEN MINING COMPANY, L.C.**  
**NATIONAL MINE, MICHIGAN**  
**SEPTEMBER 21, 2022**

Run #	Time	REFERENCE METHOD	CEM	DIFF
		O <sub>2</sub> <sup>(1)</sup>	O <sub>2</sub> <sup>(1)</sup>	
1	12:37-13:02	17.0	16.9	0.1
2	13:42-14:07	17.0	16.9	0.1
3	14:29-14:54	17.0	16.9	0.1
4	15:23-15:48	17.0	16.9	0.1
5	16:09-16:34	17.0	16.8	0.2
6	16:56-17:21	17.1	17.0	0.1
7	17:42-18:07	17.1	16.9	0.2
8	18:28-18:53	17.1	16.9	0.2
9	19:18-19:43	17.1	16.8	0.3

Mean Reference Value = 17.0444

Absolute Value of the Mean of the Differences = 0.1556

Standard Deviation = 0.0726

Confidence Co-efficient = 0.0558

**Relative Accuracy = 1.24% of the mean of the reference method**

Relative Accuracy Needs To Be Less Than 20% Of Reference Method

(1) Concentration in terms of % by volume on a dry basis



**II.13 TABLE 13  
AIR FLOW (KSCFH) RELATIVE ACCURACY DETERMINATION  
UNIT 1  
SOUTH WASTE GAS STACK  
CLEVELAND CLIFFS, INC.  
TILDEN MINING COMPANY, L.C.  
NATIONAL MINE, MICHIGAN  
SEPTEMBER 21, 2022**

Run #	Time	REFERENCE METHOD	CEM	DIFF
		KSCFH <sup>(1)</sup>	KSCFH <sup>(1)</sup>	
1	12:37-13:02	31,342	27,217	4,125
2	13:42-14:07	30,777	26,862	3,915
3	14:29-14:54	30,817	27,954	2,863
4	15:23-15:48	30,982	26,930	4,052
5	16:09-16:34	30,810	26,411	4,399
6	16:56-17:21	30,833	26,382	4,451
7	17:42-18:07	30,675	26,026	4,649
8	18:28-18:53	31,051	26,705	4,346
9	19:18-19:43	30,964	26,135	4,829

Mean Reference Value = 30,916.778

Absolute Value of the Mean of the Differences = 4,181.000

Standard Deviation = 571.646

Confidence Co-efficient = 439.405

**Relative Accuracy = 14.94% of the mean of the reference method**

Relative Accuracy Needs To Be Less Than 20% Of Reference Method

(1) Thousand Standard Cubic Feet Per Hour



**II.14 TABLE 14**  
**MOISTURE (%) RELATIVE ACCURACY DETERMINATION**  
**UNIT 1**  
**SOUTH WASTE GAS STACK**  
**CLEVELAND CLIFFS, INC.**  
**TILDEN MINING COMPANY, L.C.**  
**NATIONAL MINE, MICHIGAN**  
**SEPTEMBER 21, 2022**

Run #	Time	REFERENCE METHOD	CEM	DIFF
		Moisture <sup>(1)</sup>	Moisture <sup>(1)</sup>	
1	12:37-13:02	12.89	12.1	0.79
2	13:42-14:07	12.33	12.3	0.03
3	14:29-14:54	12.49	12.5	-0.01
4	15:23-15:48	12.53	12.3	0.23
5	16:09-16:34	12.43	12.3	0.13
6	16:56-17:21	12.26	12.2	0.06
7	17:42-18:07	12.54	12.1	0.44
8	18:28-18:53	12.38	12.1	0.28
9	19:18-19:43	12.41	12.2	0.21

Mean Reference Value = 12.4733

Absolute Value of the Mean of the Differences = 0.2400

Standard Deviation = 0.2490

Confidence Co-efficient = 0.1914

**Relative Accuracy = 3.46% of the mean of the reference method**

Relative Accuracy Needs To Be Less Than 20% Of Reference Method

(1) Concentration in terms of % by volume on a dry basis

### **III. DISCUSSION OF RESULTS**

The results of the RATA's are presented in Tables 1 through 14 (Section II.1 through II.14) as follows:

#### **North**

- Table 1 – NO<sub>x</sub> Lbs/Hr
- Table 2 – SO<sub>2</sub> Lbs/Hr
- Table 3 – NO<sub>x</sub> PPM
- Table 4 – SO<sub>2</sub> PPM
- Table 5 – O<sub>2</sub> %
- Table 6 – Air Flow
- Table 7 – Moisture

#### **South**

- Table 8 – NO<sub>x</sub> Lbs/Hr
- Table 9 – SO<sub>2</sub> Lbs/Hr
- Table 10 – NO<sub>x</sub> PPM
- Table 11 – SO<sub>2</sub> PPM
- Table 12 – O<sub>2</sub> %
- Table 13 – Air Flow
- Table 14 – Moisture

The results of the RATA's are summarized as follows:

Source	Parameter	EPA Performance Specification	Actual Performance	RATA Frequency
Unit 1 North	NO <sub>x</sub> – Lbs/Hr	≤20% of RM	2.76% of RM	Annual
	SO <sub>2</sub> – Lbs/Hr	≤20% of RM	3.22% of RM	Annual
	NO <sub>x</sub> – PPM	≤20% of RM	0.79% of RM	Annual
	SO <sub>2</sub> – PPM	≤20% of RM	1.57% of RM	Annual
	O <sub>2</sub> – %	≤20% of RM or ±1.0% Diff	0.91% RM 0.12 Avg. Diff	Annual
	Air Flow – KSCFH	≤20% of RM	1.85% of RM	Annual
	Moisture – %	≤20% of RM	4.49% of RM	Annual

Source	Parameter	EPA Performance Specification	Actual Performance	RATA Frequency
Unit 1 South	NO <sub>x</sub> – Lbs/Hr	≤20% of RM	17.20% of RM	Annual
	SO <sub>2</sub> – Lbs/Hr	≤20% of RM	17.41% of RM	Annual
	NO <sub>x</sub> – PPM	≤20% of RM	1.17% of RM	Annual
	SO <sub>2</sub> – PPM	≤20% of RM	5.74% of RM	Annual
	O <sub>2</sub> – %	≤20% of RM or ±1.0% Diff	1.24% RM 0.16 Avg. Diff	Annual
	Air Flow – KSCFH	≤20% of RM	14.94% of RM	Annual
	Moisture – %	≤20% of RM	3.46% of RM	Annual

**IV. CEMS SPECIFICATIONS**

Location	Parameter	Manufacturer / Model #	Serial #
Unit 1 North	NO <sub>x</sub> / O <sub>2</sub>	Teledyne Monitor Labs / T200H/O <sub>2</sub>	148
	SO <sub>2</sub>	Teledyne Monitor Labs / T100H	146
	Air Flow	Teledyne Monitor Labs / UF150	1501325
Location	Parameter	Manufacturer / Model #	Serial #
Unit 1 South	NO <sub>x</sub> / O <sub>2</sub>	Teledyne Monitor Labs / T200H/O <sub>2</sub>	149
	SO <sub>2</sub>	Teledyne Monitor Labs / T100H	147
	Air Flow	Teledyne Monitor Labs / UF150	1501324



## **V. SAMPLING AND ANALYTICAL PROTOCOL**

The RATA's were performed in accordance with 40 CFR Part 60. Sampling was performed on the 161" ID North stack and the 233" ID South stack. Twenty-Four (24) point traverses were used on all stacks for the air flow determinations. The actual sampling point dimensions for the velocity traverses can be found in Appendix F.

The sampling methods used for the reference method determinations were as follows:

**V.1 Oxides of Nitrogen** – The NO<sub>x</sub> sampling was conducted in accordance with U.S. EPA Reference Method 7E. A Thermo Environmental Model 42H gas analyzer was used to monitor the exhaust stacks. A heated Teflon sample line was used to transport the exhaust gases to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner stack gases were passed to the analyzer. The analyzer produces instantaneous readouts of the NO<sub>x</sub> concentrations (PPM).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 987.0 PPM was used to establish the initial instrument calibration. Calibration gases of 484.0 PPM and 251.0 PPM were used to determine the calibration error of the analyzer. The sampling system (from the back of the stack probe to the analyzer) was injected, using the 484.0 PPM gas to determine the system bias. After each sample, a system zero and system injection of 484.0 PPM were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified. A 51.0 PPM NO<sub>2</sub> gas was used to determine conversion efficiency for the analyzer. The conversion efficiency was 94.51%.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data from the unit. All reference method data was corrected using Equation 7E-5 from U.S. EPA Method 7E. A schematic diagram of the sampling train is shown in Figure 1.

**V.2 Sulfur Dioxide** – The SO<sub>2</sub> sampling was conducted in accordance with U.S. EPA Reference Method 6C. A Bovar Model 721M gas analyzer was used to monitor the exhausts. Sample gas was extracted through a heated probe. A heated teflon sample line was used to transport the exhaust gases to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner stack gases were passed to the analyzer. The analyzer produces instantaneous readouts of the SO<sub>2</sub> concentrations (PPM).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 95.2 PPM was used to establish the initial instrument calibration. A calibration gas of 50.2 PPM was used to determine the calibration error of the analyzer. The sampling system (from the back of the stack probe to the analyzer) was injected using the 50.2 PPM gas to determine the system bias. After each sample, a system zero and system injection of 50.2 PPM were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data from the exhaust.

**V.3 Oxygen** – The O<sub>2</sub> sampling was conducted in accordance with U.S. EPA Reference Method 3A. A heated Teflon sample line was used to transport the exhaust gases from the exhaust stacks to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner the stack gases were passed to a Servomex Series 1400 O<sub>2</sub> analyzer. This analyzer produces instantaneous readouts of the oxygen concentrations (%).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 20.85% was used to establish the initial instrument calibration. Calibration gases of 5.90% and 12.0% were used to determine the calibration error of the analyzer. The sampling system (from the back of the stack probe to the analyzer) was injected using the 12.0% gas to determine the system bias. After each sample, a system zero and system injection of 12.0% were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data. All reference method data was corrected using Equation 7E-5 from U.S. EPA Method 7E. A schematic diagram of the sampling train is shown in Figure 1.

**V.4 Carbon Dioxide** - The CO<sub>2</sub> sampling was conducted in accordance with U.S. EPA Reference Method 3A. A heated Teflon sample line was used to transport the exhaust gases from the exhaust stacks to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner the stack gases were passed to a Servomex Series 1400 CO<sub>2</sub> analyzer. This analyzer produces instantaneous readouts of the carbon dioxide concentrations (%).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 21.1% was used to establish the initial instrument calibration. Calibration gases of 5.95% and 12.06% were used to determine the calibration error of the analyzer. The sampling system (from the back of the stack probe to the analyzer) was injected using the 5.95% gas to determine the system bias. After each sample, a system zero and system injection of 5.95% were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data. All reference method data was corrected using Equation 7E-5 from U.S. EPA Method 7E. A schematic diagram of the sampling train is shown in Figure 1.

**V.5 Moisture** - Moisture samples were collected in accordance with U.S. EPA Method 4. Samples were withdrawn from the stack and passed through a condensing coil with drop out before being passed through pre-weighed silica gel. The water collected was measured to the nearest 0.5 g and the silica gel was re-weighed to the nearest 0.5 g. The moisture collected along with the sample volume was used to determine the percent moisture in the exhaust. Each sample was twenty five (25) minutes in duration and had a minimum sample volume of twenty-one (21) standard cubic feet. A diagram of the moisture sampling train is shown in Figure 2.

**V.6 Air Flows** - The air flow rates were determined in conjunction with the other sampling by employing U.S. EPA Reference Methods 1 and 2. Sampling was performed on the 161" ID North stack and the 233" ID South stack. Twenty-Four (24) point traverses were used on all the stacks. The actual sampling point dimensions for the velocity traverses can be found in Appendix F.


Velocity pressures were determined using an S-Type pitot tube. Temperatures were measured using a Type K thermocouple. A diagram of the air flow sampling train is shown in Figure 3.

This report was prepared by:



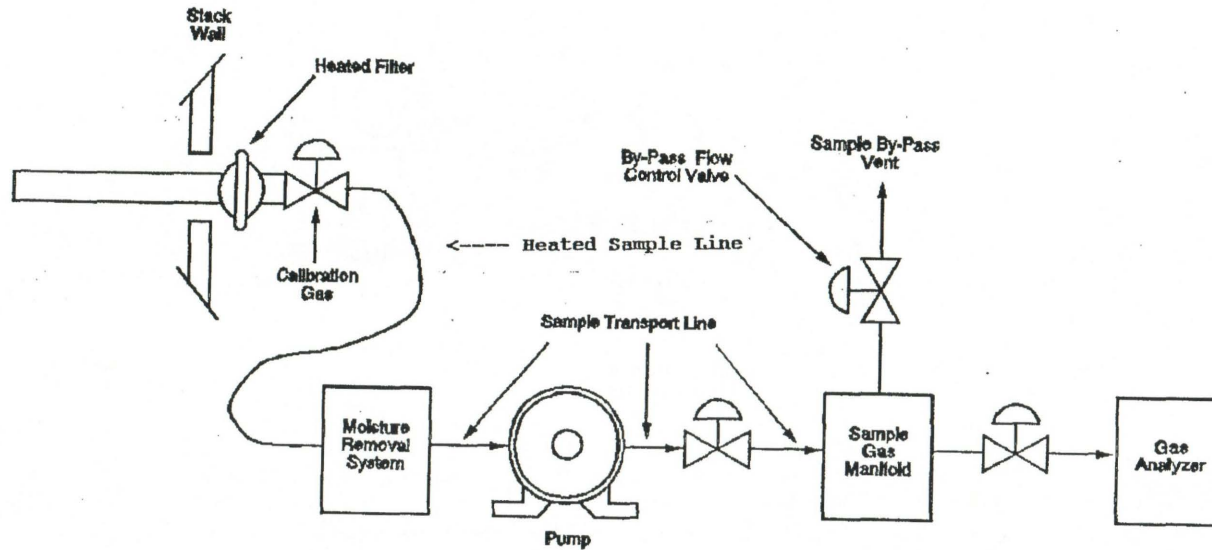
David D. Engelhardt  
Vice President

This report was reviewed by:



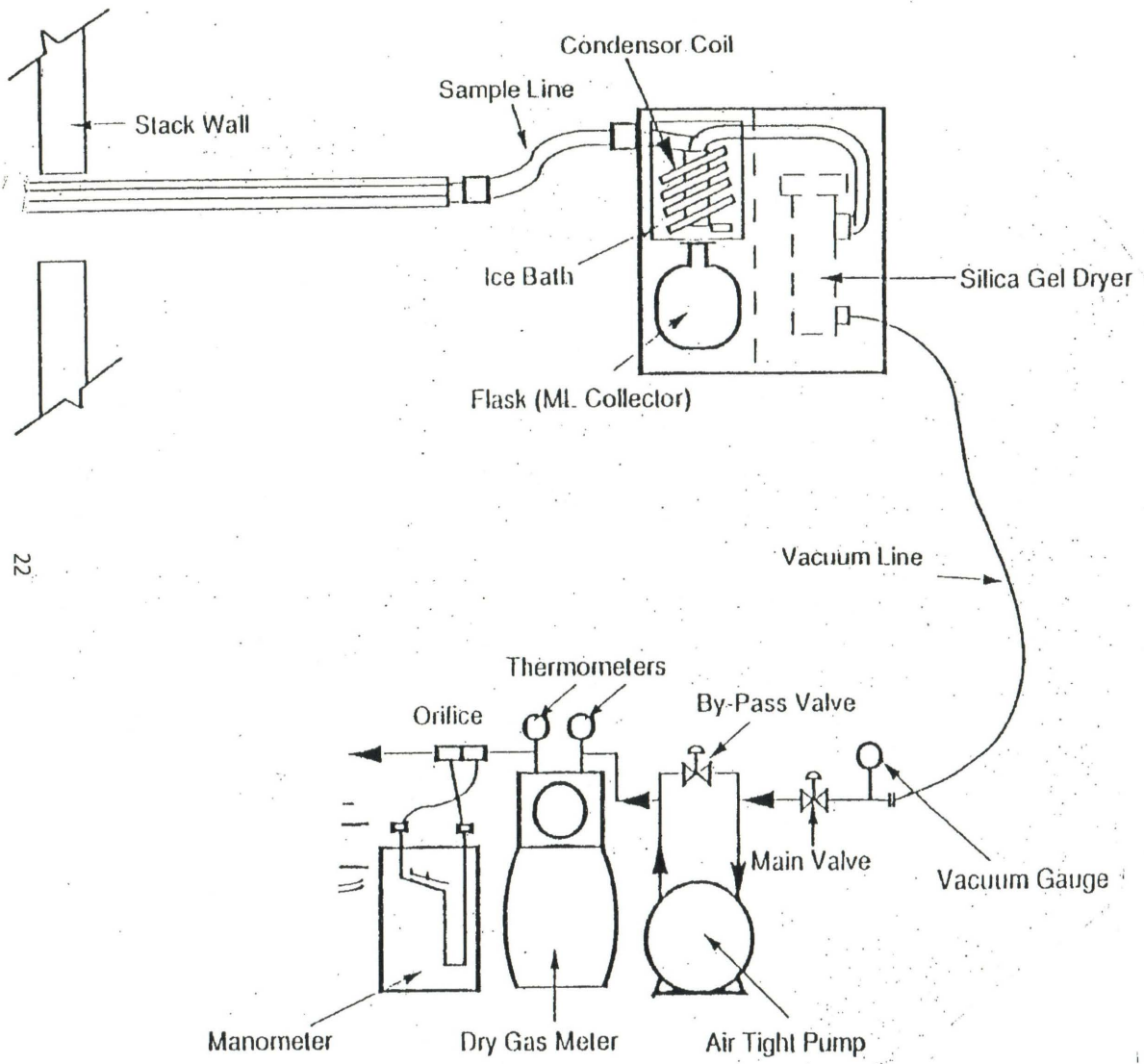
Stephan K. Byrd  
President





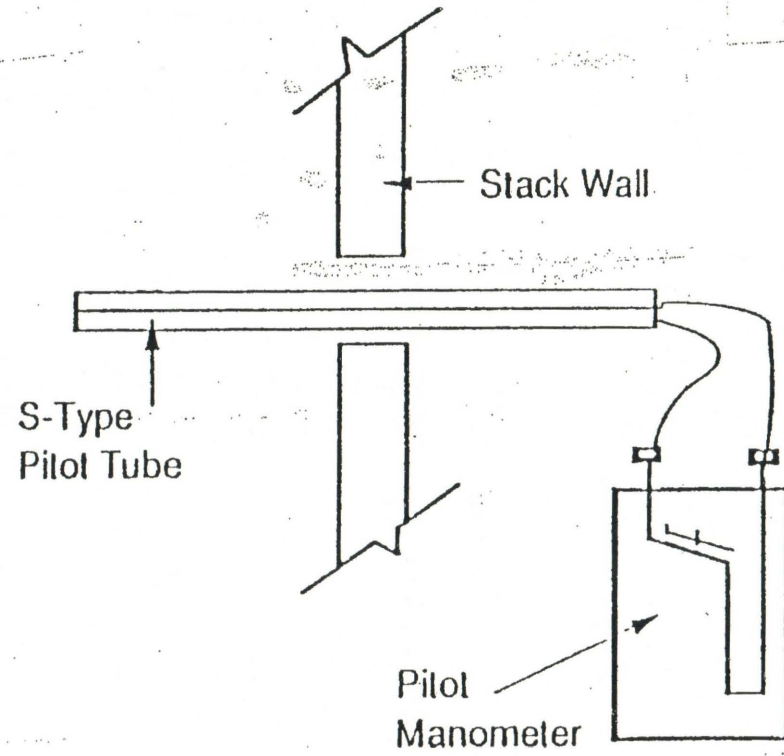
**Figure 1**  
**NO<sub>x</sub>, O<sub>2</sub> & CO<sub>2</sub>**  
**Sampling Train**





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**Figure 2**  
**Moisture**  
**Sampling Train**



**Figure 3**  
**Air Flow**  
**Sampling Train**

**APPENDIX A**

**REFERENCE METHOD DAS & CALIBRATION DATA**