

APPENDIX V
CALIBRATION DATA

METERING SYSTEM CALIBRATION DATA SHEET

ANNUAL CALIBRATION

Project ID: Box 1 Time 1338-1428
 Initial Cal. Values: Y_d 1.006
 System Id No: 1 Date: 9/3/2010 By: 1.782 BEC
 Field Meter S/N: 1 Std. Meter S/N: 971478 Std meter Y 0.9913 (15 pt.)
 Barometric Pressure: 29.8 in. Hg Vacuum: 1 in. Hg
 Leak Check 0.000 cfm @ 15 in. Hg Pressure Check Good

ORIFICE MANOMETER dH ("H ₂ O)	Std. Dry Gas Meter V _s Ft ³	Field Dry Gas Meter V _f Ft ³	Std. Meter T _s °F	Field Meter			Time Min.	DGM Cal. Factor, Yd Yd ** %	Orifice Calib. Factor, dH@ dH@ *** diff.
				In T _i °F	Out T _o °F	Avg T _f °F			
start volume 0.5	881.669	692.182	82	----	80		12.25	0.991	1.5 OK
	886.732	697.226	81	----	80	80			
	5.063	5.044	81.5		80				
1	887.191	697.688	82	----	80		9.00	0.988	1.8 OK
	892.352	702.856	82	----	84	82			
	5.161	5.168	82		82				
2	892.702	703.206	82	----	85		6.50	0.987	1.8 OK
	897.871	708.408	83	----	88	86.5			
	5.169	5.202	82.5		86.5				
3	898.169	708.708	83	----	88		5.25	0.987	1.9 OK
	903.283	713.862	84	----	91	89.5			
	5.114	5.154	83.5		89.5				
5	903.616	714.201	84	----	90		4.25	0.990	1.5 OK
	908.965	719.562	84	----	93	91.5			
	5.349	5.361	84		91.5				
** Individual values may vary + 5% from Initial Value								0.989	1.773

** Individual values may vary + 5% from Initial Value

*** Individual values may vary + 0.20 from average

METERING SYSTEM CALIBRATION DATA SHEET FOR CALIBRATION AFTER USE

Project ID: Hess
 Initial Cal. Values: Y_d 0.989 dH @ 1.773
 System Id No: 1 Date: 10/4/2010 By: BEC
 Field Meter S/N: 1 Std. Meter S/N 971478 Std meter Y 0.9913 (15 pt.)
 Barometric Pressure: 29.74 in. Hg Vacuum: 3 in. Hg
 Leak Check 0.000 cfm @ 15 in. Hg Pressure Check Good

ORIFICE MANOMETER dH ("H ₂ O)	Std. Dry Gas Meter V _s , Ft ³	Field Dry Gas Meter V _f , Ft ³	Std. Meter T _s , °F	Field Meter			Time Min.	DGM Cal. Factor, Yd **	Orifice Calib. Factor, dH@ ***
				In T _i , °F	Out T _o , °F	Avg T _f , °F			
start volume 1.2	937.700	819.897	57	-----	57		8.50	0.979 *	1.885
	942.734	824.981	57	-----	57				
	5.034	5.084	57	-----	57				
1.2	942.734	824.981	57	-----	58		8.50	0.978 *	1.890
	947.757	830.071	58	-----	60				
	5.023	5.090	57.5	-----	59				
1.2	947.757	830.071	58	-----	60		9.00	0.978 *	1.932
	953.013	835.416	58	-----	62				
	5.256	5.345	58	-----	61				
AVERAGES							0.978	1.902	

** Individual values may vary + 5% from Initial Value

** Individual values may vary + 5% from Initial Value
 *** Individual values may vary + 0.20 from average

METERING SYSTEM CALIBRATION DATA SHEET ANNUAL CALIBRATION

Project ID: Box 3 Time 1516-1606 dH @ 1.682

Initial Cal. Values: Y_d 1.039 Date: 9/2/2010 By: BEC

System Id No: 3 Std. Meter S/N 971478 Std meter Y 0.9913 (15 pt.)

Field Meter S/N: 30.12 in. Hg Vacuum: 1 in. Hg

Barometric Pressure: 0.000 cfm @ 15 in. Hg Pressure Check good

ORIFICE MANOMETER dH ("H ₂ O)	Std. Dry Gas Meter V _s , Ft ³	Field Dry Gas Meter V _f , Ft ³	Std. Meter T _s , °F	Field Meter			Time Min.	DGM Cal. Factor, Yd	Orifice Calib. Factor, dH@ *** diff.
				In T _i , °F	Out T _o , °F	Avg T _f , °F			
start volume 0.5	826.136	389.804	91	----	86		12.25	0.996	4.1 OK
	831.266	394.874	91	----	90	88			
	5.130	5.070	91	----	88				
1	831.587	395.191	91	----	91		9.00	0.999	3.9 OK
	836.796	400.354	92	----	93	92			
	5.209	5.163	91.5	----	92				
2	837.329	400.878	92	----	94		6.25	1.000	3.8 OK
	842.411	405.921	92	----	96	95			
	5.082	5.043	92	----	95				
3	842.763	406.270	92	----	97		5.25	1.002	3.6 OK
	848.002	411.469	92	----	98	97.5			
	5.239	5.199	92	----	97.5				
5	848.541	411.999	92	----	99		4.00	1.006	3.2 OK
	853.679	417.069	92	----	100	99.5			
	5.138	5.070	92	----	99.5				
** Individual values may vary + 5% from Initial Value								1.000	1.722

** Individual values may vary + 5% from Initial Value

*** Individual values may vary + 0.20 from average

METERING SYSTEM CALIBRATION DATA SHEET FOR CALIBRATION AFTER USE

Project ID: Hess
 Initial Cal. Values: Y_d 1.000 dH @ 1.722
 System Id No: 3 Date: 10/4/2010 By: BEC
 Field Meter S/N: 3 Std. Meter S/N 971478 Std meter Y 0.9913 (15 pt.)
 Barometric Pressure: 29.74 in. Hg Vacuum: 3 in. Hg
 Leak Check 0.000 cfm @ 15 in. Hg Pressure Check Good

ORIFICE MANOMETER dH ("H ₂ O)	Std. Dry Gas Meter V _s Ft ³	Field Dry Gas Meter V _f Ft ³	Std. Meter T _s °F	Field Meter			Time Min.	DGM Cal. Factor, Yd **	Orifice Calib. Factor, dH@ ***
				In T _i °F	Out T _o °F	Avg T _f °F			
1.1 start volume	953.331	537.266	56	-----	55	56	9.00	0.999 *	1.765
	958.601	542.481	56	-----	57				
	5.270	5.215	56	-----	56				
1.1	958.601	542.481	56	-----	57	58.5	9.00	1.002 *	1.781
	963.839	547.671	57	-----	60				
	5.238	5.190	56.5	-----	58.5				
1.1	963.839	547.671	57	-----	60	61.5	9.00	0.998 *	1.790
	969.054	552.881	57	-----	63				
	5.215	5.210	57	-----	61.5				
AVERAGES								1.000	1.778
** Individual values may vary + 5% from Initial Value									

** Individual values may vary +5% from Initial Value
 *** Individual values may vary +0.20 from average

METERING SYSTEM CALIBRATION DATA SHEET ANNUAL CALIBRATION

Project ID: Box 5 Time 1239-1330 dH@ 1.712

Initial Cal. Values: Y_d 1.017 Date: 9/3/2010 By: BEC

System Id No: 5 Std. Meter S/N 971478 Std meter Y 0.9913 (15 pt.)

Field Meter S/N: 5 in. Hg Vacuum: 1 in. Hg

Barometric Pressure: 29.8 in. Hg Pressure Check Good

Leak Check 0.000 cfm @ 15 in. Hg

ORIFICE MANOMETER dH ("H ₂ O)	Std. Dry Gas Meter V _s , Ft ³	Field Dry Gas Meter V _f , Ft ³	Std. Meter T _s , °F	Field Meter			Time Min.	DGM Cal. Factor, Yd	Orifice Calib.	
				In T _i , °F	Out T _o , °F	Avg T _f , °F			dH@	Factor, dH@ *** diff.
start volume 0.5	853.949	206.355	77	----	75		12.75	0.997	2.0	OK
	859.018	211.379	77	----	77	76				
	5.069	5.024	77		76					
1	859.285	211.652	78	----	77		9.00	0.998	1.9	OK
	864.418	216.738	78	----	79	78				
	5.133	5.086	78		78					
2	864.843	217.161	78	----	79		6.50	0.994	2.2	OK
	870.054	222.350	78	----	81	80				
	5.211	5.189	78		80					
3	870.522	222.807	78	----	81		5.25	0.997	2.0	OK
	875.759	228.016	78	----	83	82				
	5.237	5.209	78		82					
5	876.286	228.544	78	----	83		4.00	0.994	2.2	OK
	881.504	233.730	79	----	84	83.5				
	5.218	5.186	78.5		83.5					
** Individual values may vary + 5% from Initial Value							AVERAGES	0.996		1.745

** Individual values may vary + 5% from Initial Value

*** Individual values may vary + 0.20 from average

METERING SYSTEM CALIBRATION DATA SHEET FOR CALIBRATION AFTER USE

Project ID: Hess Meth 33 (1) dH @ 1.745
 Initial Cal. Values: Y_d 0.996
 System Id No: 5 Date: 10/4/2010 By: BEC
 Field Meter SN: 5 Std. Meter S/N 971478 Std meter Y 0.9913 (15 pt.)
 Barometric Pressure: 29.74 in. Hg Vacuum: 4 in. Hg
 Leak Check 0.000 cfm @ 15 in. Hg Pressure Check Good

ORIFICE MANOMETER dH ("H ₂ O)	Std. Dry Gas Meter V _s Ft ³	Field Dry Gas Meter V _f Ft ³	Std. Meter T _s °F	Field Meter			Time Min.	DGM Cal. Factor, Yd **	Orifice Calib. Factor, dH@ ***
				In T _i °F	Out T _o °F	Avg T _f °F			
0.95 start volume	985.724	985.950	56		61		9.50	0.987 *	1.793
	990.828	991.114	56		61				
	5.104	5.164	56		61				
0.95	990.828	991.114	56		61		9.50	0.982 *	1.807
	995.909	996.287	56		62				
	5.081	5.173	56		61.5				
0.95	995.909	996.287	56		61		9.50	0.982 *	1.813
	1000.979	1001.454	56		63				
	5.070	5.167	56		62				
** Individual values may vary + 5% from Initial Value								0.983	1.805
AVERAGES									

** Individual values may vary + 5% from Initial Value
 *** Individual values may vary + 0.20 from average

METERING SYSTEM CALIBRATION DATA SHEET FOR CALIBRATION AFTER USE

Project ID: Hess Meth 33 (2) Initial Cal. Values: Y_d 0.996 dH @ 1.745
 System Id No: 5 Date: 10/4/2010 By: BEC
 Field Meter S/N: 5 Std. Meter S/N 971478 Std meter Y 0.9913 (15 pt.)
 Barometric Pressure: 29.74 in. Hg Vacuum: 7 in. Hg
 Leak Check 0.000 cfm @ 15 in. Hg Pressure Check Good

ORIFICE MANOMETER dH ("H ₂ O)	Std. Dry Gas Meter V _s Ft ³	Field Dry Gas Meter V _f Ft ³	Std. Meter T _s °F	Field Meter			Time Min.	DGM Cal. Factor, Yd **	Orifice Calib. Factor, dH@ ***
				In T _i °F	Out T _o °F	Avg T _f °F			
start volume 0.9	2.379	2.879	57	-----	63	63.5	9.75	0.977 *	1.840
	7.405	8.037	56	-----	64				
	5.026	5.158	56.5	-----	63.5				
0.9	7.405	8.037	56	-----	64	64.5	9.75	0.984 *	1.822
	12.451	13.186	57	-----	65				
	5.046	5.149	56.5	-----	64.5				
0.9	12.451	13.186	57	-----	65	65.5	9.75	0.980 *	1.822
	17.496	18.359	57	-----	66				
	5.045	5.173	57	-----	65.5				
AVERAGES								0.981	1.828
** Individual values may vary + 5% from Initial Value									

** Individual values may vary + 5% from Initial Value
 *** Individual values may vary + 0.20 from average

METERING SYSTEM CALIBRATION DATA SHEET FOR CALIBRATION AFTER USE

Project ID: Hess Meth 29

Initial Cal. Values: Y_d	0.996	dH @	1.745
System Id No:	5	Date:	10/4/2010
Field Meter S/N:	5	By:	BEC
Barometric Pressure:	29.74	Std. Meter S/N	971478
Leak Check	0.000	in. Hg	15
	cfm @	Std meter Y	0.9913 (15 pt.)
		Vacuum:	3 in. Hg
		Pressure Check	Good

ORIFICE MANOMETER dH ("H ₂ O)	Std. Dry Gas Meter V _s , Ft ³	Field Dry Gas Meter V _f , Ft ³	Std. Meter T _s , °F	Field Meter			Time Min.	DGM Cal. Factor, Yd **	Orifice Calib. Factor, dH@ ***
				In T _i , °F	Out T _o , °F	Avg T _f , °F			
1.6 start volume	18.215	19.089	57	----	66		7.50	0.985 *	1.809
	23.404	24.384	57	----	67	66.5			
	5.189	5.295	57		66.5				
1.6	23.404	24.384	57	----	66		7.50	0.984 *	1.816
	28.583	29.678	57	----	67	66.5			
	5.179	5.294	57		66.5				
1.6	28.583	29.678	57	----	67		7.50	0.985 *	1.800
	33.779	34.995	57	----	68	67.5			
	5.196	5.317	57		67.5				
AVERAGES								0.985	1.808
** Individual values may vary + 5% from Initial Value									

** Individual values may vary + 5% from Initial Value

*** Individual values may vary + 0.20 from average

METERING SYSTEM CALIBRATION DATA SHEET FOR CALIBRATION AFTER USE

Project ID: Hess Meth 8

Initial Cal. Values: Y_d 0.996 dH @ 1.745
 System Id No: 5 Date: 10/4/2010 By: BEC
 Field Meter S/N: 5 Std. Meter S/N 971478 Std meter Y 0.9913 (15 pt.)
 Barometric Pressure: 29.74 in. Hg Vacuum: 7 in. Hg
 Leak Check 0.000 cfm @ 15 in. Hg Pressure Check Good

ORIFICE MANOMETER dH ("H ₂ O)	Std. Dry Gas Meter V _s Ft ³	Field Dry Gas Meter V _f Ft ³	Std. Meter T _s °F	Field Meter		Time Min.	DGM Cal. Factor, Yd **	Orifice Calib. Factor, dH@ ***
				In T _i °F	Out T _o °F			
start volume 1.25	34.389	35.619	57	-----	68	8.50	0.983 *	1.831
	39.553	40.915	58	-----	68			
	5.164	5.296	57.5	-----	68			
1.25	39.553	40.915	58	-----	68	8.50	0.983 *	1.835
	44.717	46.206	58	-----	68			
	5.164	5.291	58	-----	68			
1.25	44.717	46.206	58	-----	68	8.50	0.984 *	1.829
	49.887	51.501	58	-----	69			
	5.170	5.295	58	-----	68.5			
AVERAGES							0.984	1.831

** Individual values may vary + 5% from Initial Value

** Individual values may vary + 5% from Initial Value

*** Individual values may vary + 0.20 from average

METERING SYSTEM CALIBRATION DATA SHEET FOR CALIBRATION AFTER USE

Project ID: Hess RM 18
 Initial Cal. Values: Y_d 0.996 dH @ 1.745
 System Id No: 5 Date: 10/4/2010 By: BEC
 Field Meter S/N: 5 Std. Meter S/N 971478 Std meter Y 0.9913 (15 pt.)
 Barometric Pressure: 29.74 in. Hg Vacuum: 2 in. Hg
 Leak Check 0.000 cfm @ 15 in. Hg Pressure Check Good

ORIFICE MANOMETER dH ("H ₂ O)	Std. Dry Gas Meter V _s Ft ³	Field Dry Gas Meter V _f Ft ³	Std. Meter T _s °F	Field Meter			Time Min.	DGM Cal. Factor, Yd **	Orifice Calib. Factor, dH@ ***
				In T _i °F	Out T _o °F	Avg T _f °F			
1 start volume	969.900	969.981	54		54		9.25	0.988 *	1.783
	975.027	975.115	55		56				
	5.127	5.134	54.5		55				
1	975.027	975.115	55		56		9.25	0.983 *	1.794
	980.134	980.273	55		58				
	5.107	5.158	55		57				
1	980.134	980.273	55		58		9.25	0.982 *	1.794
	985.234	985.450	56		61				
	5.100	5.177	55.5		59.5				
AVERAGES								0.984	1.790
** Individual values may vary + 5% from Initial Value									

** Individual values may vary + 5% from Initial Value

*** Individual values may vary + 0.20 from average

FIELD VERIFICATION OF PITOT CONFORMITY TO EPA RM 2 and
VERIFICATION OF THE THERMOCOUPLE'S ACCURACY VIA ALT 011

Date: 9/14/10

Project: Hersing

Pitot Verification per EPA RM2:

033

426

Pre-test

- Are the face openings vertically aligned?
Are the face openings parallel to each other?
Are the face openings parallel to the horizontal axis?
Are face openings elliptical and symmetrical?

Y
Y
Y
Y

Y
Y
Y
Y

If all answers are YES, then a C_p of 0.84 is assigned.

✓

✓

If all answers are not yes, the pitot is to be fixed or replaced with a conforming pitot.

Post-test

- Are the face openings vertically aligned?
Are the face openings parallel to each other?
Are the face openings parallel to the horizontal axis?
Are face openings elliptical and symmetrical?

Y
Y
Y
Y

Y
Y
Y
Y

If all answers are YES, then the assigned C_p of 0.84 is valid.

✓

✓

If all answers are not yes, the pitot is to be fixed or replaced with a conforming pitot and traverses repeated.

Thermocouple Verification per EMC ALT-011:

Pre-test

- Does the thermocouple respond consistently with expectations
(response increased in higher temperature and decreased
when moved to lower temperature)?

Y

Y

Temperature as measured by reference Hg thermometer:

67

67

Temperature as measured by the thermocouple:

66

67

(Keep thermometer and thermocouple in an area of steady
temperature shielded from the sun and wind.)

Allowable difference is 2° F or 1° C.

Post-test

- Did the thermocouple respond consistently with expectations
(response increased in higher temperature and decreased
when moved to lower temperature)?

Y

Y

Temperature as measured by reference Hg thermometer:

65

65

Temperature as measured by the thermocouple:

65

66

(Keep thermometer and thermocouple in an area of steady
temperature shielded from the sun and wind.)

Allowable difference is 2° F or 1° C.

✓

✓

8-2

8-3

FIELD VERIFICATION OF PITOT CONFORMITY TO EPA RM 2 and
VERIFICATION OF THE THERMOCOUPLE'S ACCURACY VIA ALT 011

Date: 9/15/10 Project: Hess WGS

Pitot Verification per EPA RM2:

RM29
8'-1 8'-4

Pre-test

- Are the face openings vertically aligned?
- Are the face openings parallel to each other?
- Are the face openings parallel to the horizontal axis?
- Are face openings elliptical and symmetrical?

<u>Y</u>	<u>Y</u>
<u>Y</u>	<u>Y</u>
<u>Y</u>	<u>Y</u>
<u>Y</u>	<u>Y</u>

If all answers are YES, then a C_p of 0.84 is assigned.

If all answers are not yes, the pitot is to be fixed or replaced with a conforming pitot.

Post-test

- Are the face openings vertically aligned?
- Are the face openings parallel to each other?
- Are the face openings parallel to the horizontal axis?
- Are face openings elliptical and symmetrical?

<u>Y</u>	<u>Y</u>
<u>Y</u>	<u>Y</u>
<u>Y</u>	<u>Y</u>
<u>Y</u>	<u>Y</u>

If all answers are YES, then the assigned C_p of 0.84 is valid.

If all answers are not yes, the pitot is to be fixed or replaced with a conforming pitot and traverses repeated.

Thermocouple Verification per EMC ALT-011:

Pre-test

- Does the thermocouple respond consistently with expectations (response increased in higher temperature and decreased when moved to lower temperature)?

<u>Y</u>	<u>Y</u>
<u>68</u>	<u>68</u>
<u>68</u>	<u>67</u>

Temperature as measured by reference Hg thermometer:

Temperature as measured by the thermocouple:

(Keep thermometer and thermocouple in an area of steady temperature shielded from the sun and wind.)

Allowable difference is 2° F or 1° C.

Post-test

- Did the thermocouple respond consistently with expectations (response increased in higher temperature and decreased when moved to lower temperature)?

<u>Y</u>	<u>Y</u>
<u>74</u>	<u>74</u>
<u>75</u>	<u>75</u>

Temperature as measured by reference Hg thermometer:

Temperature as measured by the thermocouple:

(Keep thermometer and thermocouple in an area of steady temperature shielded from the sun and wind.)

Allowable difference is 2° F or 1° C.

21.3

22

FIELD VERIFICATION OF PITOT CONFORMITY TO EPA RM 2 and
VERIFICATION OF THE THERMOCOUPLE'S ACCURACY VIA ALT 011

Date: 9/15/10 Project: WGS ~~EN~~ Aero

Pitot Verification per EPA RM2:

Rm8
8'-3

Pre-test

- Are the face openings vertically aligned?
- Are the face openings parallel to each other?
- Are the face openings parallel to the horizontal axis?
- Are face openings elliptical and symmetrical?

Y
Y
Y
Y

If all answers are YES, then a C_p of 0.84 is assigned.

If all answers are not yes, the pitot is to be fixed or replaced with a conforming pitot.

Post-test

- Are the face openings vertically aligned?
- Are the face openings parallel to each other?
- Are the face openings parallel to the horizontal axis?
- Are face openings elliptical and symmetrical?

Y
Y
Y
Y

If all answers are YES, then the assigned C_p of 0.84 is valid.

If all answers are not yes, the pitot is to be fixed or replaced with a conforming pitot and traverses repeated.

Thermocouple Verification per EMC ALT-011:

Pre-test

Does the thermocouple respond consistently with expectations
(response increased in higher temperature and decreased
when moved to lower temperature)?

68y

Temperature as measured by reference Hg thermometer:

68

Temperature as measured by the thermocouple:

69

(Keep thermometer and thermocouple in an area of steady
temperature shielded from the sun and wind.)

Allowable difference is 2° F or 1° C.

Post-test

Did the thermocouple respond consistently with expectations
(response increased in higher temperature and decreased
when moved to lower temperature)?

Temperature as measured by reference Hg thermometer:

74

Temperature as measured by the thermocouple:

75

(Keep thermometer and thermocouple in an area of steady
temperature shielded from the sun and wind.)

Allowable difference is 2° F or 1° C.

**FIELD VERIFICATION OF PITOT CONFORMITY TO EPA RM 2 and
VERIFICATION OF THE THERMOCOUPLE'S ACCURACY VIA ALT 011**

Date: 9/14

Project: Hers

Pitot Verification per EPA RM2:

Pre-test

- Are the face openings vertically aligned?
- Are the face openings parallel to each other?
- Are the face openings parallel to the horizontal axis?
- Are face openings elliptical and symmetrical?

~~RM15~~

CTM-027

~~Y
Y
Y
Y~~

Y
Y
Y
Y

If all answers are YES, then a C_p of 0.84 is assigned.

If all answers are not yes, the pitot is to be fixed or replaced with a conforming pitot.

Post-test

- Are the face openings vertically aligned?
- Are the face openings parallel to each other?
- Are the face openings parallel to the horizontal axis?
- Are face openings elliptical and symmetrical?

~~_____

_____~~

Y
Y
Y
Y

If all answers are YES, then the assigned C_p of 0.84 is valid.

If all answers are not yes, the pitot is to be fixed or replaced with a conforming pitot and traverses repeated.

Thermocouple Verification per EMC ALT-011:

Pre-test

Does the thermocouple respond consistently with expectations
(response increased in higher temperature and decreased
when moved to lower temperature)?

~~Y~~

Temperature as measured by reference Hg thermometer:

~~67~~

67

Temperature as measured by the thermocouple:

~~67~~

66

(Keep thermometer and thermocouple in an area of steady
temperature shielded from the sun and wind.)

Allowable difference is 2° F or 1° C.

Post-test

Did the thermocouple respond consistently with expectations
(response increased in higher temperature and decreased
when moved to lower temperature)?

~~Y~~

Y

Temperature as measured by reference Hg thermometer:

~~_____
_____~~

68

Temperature as measured by the thermocouple:

~~_____
_____~~

68

(Keep thermometer and thermocouple in an area of steady
temperature shielded from the sun and wind.)

Allowable difference is 2° F or 1° C.

8-3

8-2

FIELD VERIFICATION OF PITOT CONFORMITY TO EPA RM 2 and
VERIFICATION OF THE THERMOCOUPLE'S ACCURACY VIA ALT 011

Date: 9/17/10

Project: Hens WBS

Pitot Verification per EPA RM2:

Pre-test

- Are the face openings vertically aligned?
- Are the face openings parallel to each other?
- Are the face openings parallel to the horizontal axis?
- Are face openings elliptical and symmetrical?

8 RM15 8-3 →	RM18
<u>✓</u>	<u>✓</u>
<u>✓</u>	<u>✓</u>
<u>✓</u>	<u>✓</u>
<u>✓</u>	<u>✓</u>

If all answers are YES, then a C_p of 0.84 is assigned.

If all answers are not yes, the pitot is to be fixed or replaced with a conforming pitot.

Post-test

- Are the face openings vertically aligned?
- Are the face openings parallel to each other?
- Are the face openings parallel to the horizontal axis?
- Are face openings elliptical and symmetrical?

<u>✓</u>	<u>✓</u>
<u>✓</u>	<u>✓</u>
<u>✓</u>	<u>✓</u>
<u>✓</u>	<u>✓</u>

If all answers are YES, then the assigned C_p of 0.84 is valid.

If all answers are not yes, the pitot is to be fixed or replaced with a conforming pitot and traverses repeated.

Thermocouple Verification per EMC ALT-011:

Pre-test

Does the thermocouple respond consistently with expectations
(response increased in higher temperature and decreased
when moved to lower temperature)?

<u>✓</u>	<u>✓</u>
----------	----------

Temperature as measured by reference Hg thermometer:

68

68

Temperature as measured by the thermocouple:

67

67

(Keep thermometer and thermocouple in an area of steady
temperature shielded from the sun and wind.)

Allowable difference is 2° F or 1° C.

Post-test

Did the thermocouple respond consistently with expectations
(response increased in higher temperature and decreased
when moved to lower temperature)?

<u>✓</u>	<u>✓</u>
----------	----------

Temperature as measured by reference Hg thermometer:

72

72

Temperature as measured by the thermocouple:

72

72

(Keep thermometer and thermocouple in an area of steady
temperature shielded from the sun and wind.)

Allowable difference is 2° F or 1° C.

FIELD VERIFICATION OF PITOT CONFORMITY TO EPA RM 2 and
VERIFICATION OF THE THERMOCOUPLE'S ACCURACY VIA ALT 011

Date: 9/21/10

Project: Hers WGS

CTM-033 (R4)
8-2

Pitot Verification per EPA RM2:

Pre-test

- Are the face openings vertically aligned? Y _____
Are the face openings parallel to each other? Y _____
Are the face openings parallel to the horizontal axis? Y _____
Are face openings elliptical and symmetrical? Y _____

If all answers are YES, then a C_p of 0.84 is assigned.

If all answers are not yes, the pitot is to be fixed or replaced with a conforming pitot.

Post-test

- Are the face openings vertically aligned? Y _____
Are the face openings parallel to each other? Y _____
Are the face openings parallel to the horizontal axis? Y _____
Are face openings elliptical and symmetrical? Y _____

If all answers are YES, then the assigned C_p of 0.84 is valid. ✓

If all answers are not yes, the pitot is to be fixed or replaced with a conforming pitot and traverses repeated.

Thermocouple Verification per EMC ALT-011:

Pre-test

- Does the thermocouple respond consistently with expectations
(response increased in higher temperature and decreased
when moved to lower temperature)? Y _____

Temperature as measured by reference Hg thermometer: 60 _____

Temperature as measured by the thermocouple: 61 _____

(Keep thermometer and thermocouple in an area of steady
temperature shielded from the sun and wind.)

Allowable difference is 2° F or 1° C.

Post-test

- Did the thermocouple respond consistently with expectations
(response increased in higher temperature and decreased
when moved to lower temperature)? Y _____

Temperature as measured by reference Hg thermometer: 68 _____

Temperature as measured by the thermocouple: 68 _____

(Keep thermometer and thermocouple in an area of steady
temperature shielded from the sun and wind.)

Allowable difference is 2° F or 1° C. ✓

FIELD VERIFICATION OF NOZZLE DIAMETER - Cynaire / CTM-033

Date: 9-14-10

Project: Hess WGS

Location: WGS - OUTLET

Run #: 1

Nozzle ID: Kit #1

Nozzle material: S.S.

Diameter 1: 0.187

Nozzle condition: Good

Diameter 2: 0.187

Diameter 3: 0.187

Average: 0.187

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

Date: 9-14-10

Location: WGS - OUTLET

Run #: 2

Nozzle ID: Kit #1

Nozzle material: S.S.

Diameter 1: 0.187

Nozzle condition: Good

Diameter 2: 0.187

Diameter 3: 0.187

Average: 0.187

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

Date: 9-14-10

Location: WGS - OUTLET

Run #: 3

Nozzle ID: Kit #1

Nozzle material: S.S.

Diameter 1: 0.187

Nozzle condition: Good

Diameter 2: 0.187

Diameter 3: 0.187

Average: 0.187

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

Date: 9-21-10

Location: WGS - OUTLET

Run #: 4

Nozzle ID: Kit #1

Nozzle material: S.S.

Diameter 1: 0.187

Nozzle condition: Good

Diameter 2: 0.187

Diameter 3: 0.187

Average: 0.187

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

FIELD VERIFICATION OF NOZZLE DIAMETER

Cyanide / CARB 426

Date: 9-14-10

Project: Hess WGS

Location: WGS - OUTLET

Run #: 1

Nozzle ID: Kit # 2

Nozzle material: S.S.

Diameter 1: 0.187

Nozzle condition: Good

Diameter 2: 0.187

Diameter 3: 0.187

Average: 0.187

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

Date: 9-14-10

Location: WGS - OUTLET

Run #: 2

Nozzle ID: Kit # 2

Nozzle material: S.S.

Diameter 1: 0.187

Nozzle condition: Good

Diameter 2: 0.187

Diameter 3: 0.187

Average: 0.187

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

Date: 9-14-10

Location: WGS - ^{OUTLET} #2

Run #: 3

Nozzle ID: Kit # 2

Nozzle material: S.S.

Diameter 1: 0.187

Nozzle condition: Good

Diameter 2: 0.187

Diameter 3: 0.187

Average: 0.187

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

Date: _____

Location: _____

Run #: _____

Nozzle ID: _____

Nozzle material: _____

Diameter 1: _____

Nozzle condition: _____

Diameter 2: _____

Diameter 3: _____

Average: _____

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

FIELD VERIFICATION OF NOZZLE DIAMETER - LEAD / EPA 29

Date: 9-15-10

Project: Hess WGS

Location: WGS- OUTLET

Run #: 1

Nozzle ID: 0.200 - #1

Nozzle material: GLASS QUARTZ

Diameter 1: 0.200

Nozzle condition: NEW

Diameter 2: 0.200

Diameter 3: 0.200

Average: 0.200

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

Date: 9-15-10

Location: WGS- OUTLET

Run #: 2

Nozzle ID: 0.200 - #2

Nozzle material: QUARTZ

Diameter 1: 0.200

Nozzle condition: NEW

Diameter 2: 0.200

Diameter 3: 0.200

Average: 0.200

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

Date: 9-15-10

Location: WGS- OUTLET

Run #: 3

Nozzle ID: 0.200 - #3

Nozzle material: QUARTZ

Diameter 1: 0.200

Nozzle condition: NEW

Diameter 2: 0.200

Diameter 3: 0.200

Average: 0.200

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

Date: _____

Location: _____

Run #: _____

Nozzle ID: _____

Nozzle material: _____

Diameter 1: _____

Nozzle condition: _____

Diameter 2: _____

Diameter 3: _____

Average: _____

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

FIELD VERIFICATION OF NOZZLE DIAMETER $\text{SO}_3 / \text{H}_2\text{SO}_4$ mist / EPA 8

Date: 9-15-10

Project: Hess WGS

Location: WGS - OUTLET

Run #: 1

Nozzle ID: Kit # 1

Nozzle material: S.S.

Diameter 1: 0.187

Nozzle condition: GOOD

Diameter 2: 0.187

Diameter 3: 0.187

Average: 0.187

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

Date: 9-15-10

Location: WGS - OUTLET

Run #: 2

Nozzle ID: Kit # 1

Nozzle material: S.S.

Diameter 1: 0.187

Nozzle condition: GOOD

Diameter 2: 0.187

Diameter 3: 0.187

Average: 0.187

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

Date: 9-15-10

Location: WGS - OUTLET

Run #: 3

Nozzle ID: Kit # 1

Nozzle material: S.S.

Diameter 1: 0.187

Nozzle condition: GOOD

Diameter 2: 0.187

Diameter 3: 0.187

Average: 0.187

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

Date: _____

Location: _____

Run #: _____

Nozzle ID: _____

Nozzle material: _____

Diameter 1: _____

Nozzle condition: _____

Diameter 2: _____

Diameter 3: _____

Average: _____

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

FIELD VERIFICATION OF NOZZLE DIAMETER

Amman # / CTM-024

Date: 9-16-10

Project: Hess WGS

Location: WGS-OUTLET

Run #: 1

Nozzle ID: 0.200-#4

Nozzle material: QUARTZ

Diameter 1: 0.200

Nozzle condition: NEW

Diameter 2: 0.200

Diameter 3: 0.200

Average: 0.200

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

Date: 9-16-10

Location: WGS-OUTLET

Run #: 2

Nozzle ID: 0.200-#4

Nozzle material: QUARTZ

Diameter 1: 0.200

Nozzle condition: NEW

Diameter 2: 0.200

Diameter 3: 0.200

Average: 0.200

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

Date: 9-17-10

Location: WGS-OUTLET

Run #: 3

Nozzle ID: 0.200-#4

Nozzle material: QUARTZ

Diameter 1: 0.200

Nozzle condition: NEW

Diameter 2: 0.200

Diameter 3: 0.200

Average: 0.200

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

Date: _____

Location: _____

Run #: _____

Nozzle ID: _____

Nozzle material: _____

Diameter 1: _____

Nozzle condition: _____

Diameter 2: _____

Diameter 3: _____

Average: _____

Maximum allowable difference between the highest and lowest readings is 0.004" (0.1 mm)

THE LINDE GROUP

*Linde***CERTIFICATE OF ANALYSIS****EPA PROTOCOL MIXTURE****PROCEDURE # : G1**

CUSTOMER: ARROW ENV. CONSULTING
SALES#: 107593517
PROD#: 1151290
P.O.# : 100825

CYLINDER # : CC-91156
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 580

CERTIFICATION DATE: 9/9/2010**EXPIRATION DATE:** 9/9/2013**CERTIFICATION HISTORY**

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Oxygen	9/9/2010	2.49 %	2.49 %	+/- 1%
Carbon Dioxide	9/9/2010	22.1 %	22.1 %	+/- 1%

BALANCE Nitrogen**PREVIOUS CERTIFICATION DATES:** None**REFERENCE STANDARDS**

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Oxygen	GMIS-1	CC-68305	5.03 %
Carbon Dioxide	GMIS-1	CC-80872	24.9 %

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Oxygen	Horiba MPA-510	570694081	PM	9/9/2010
Carbon Dioxide	Horiba VIA-510	571417045	NDIR	9/9/2010

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: 
MATTHEW JACKSON

Linde Gas North America LLC

DATE: 9/9/2010

Shipped from: 80 Industrial Drive, Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

**EPA PROTOCOL MIXTURE
PROCEDURE #: G1**

CUSTOMER: Arrow Env. Consulting
SGI ORDER #: 142767
ITEM#: 8
P.O.#: 090211

CYLINDER #: CC-133137
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 590

CERTIFICATION DATE: 3/3/2009
EXPIRATION DATE: 2/24/2012

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Carbon Monoxide	2/17/2009	56.46 ppm	56.4 ppm	+/- 1%
	2/24/2009	56.3 ppm		
Oxygen	3/3/2009	5.03 %	5.03 %	+/- 1%

BALANCE Nitrogen

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Carbon Monoxide	NTRM-81679	CC-135124	101 ppm
Oxygen	GMIS-1	CC-94583	10.00 %

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Carbon Monoxide	Horiba VIA-510	H0002L2Y	NDIR	2/10/2009
Oxygen	CAI-300	S03001	PM	2/18/2009

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST:


MATTHEW BOOTH

DATE: 3/3/2009

THE LINDE GROUP

*Linde***CERTIFICATE OF ANALYSIS****EPA PROTOCOL MIXTURE
PROCEDURE #: G1**

CUSTOMER: Arrow Env. Consulting
SALES#: 107261001
PROD#: 1133640
P.O.#: 100306

CYLINDER #: CC-94408
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 590

CERTIFICATION DATE: 3/31/2010**EXPIRATION DATE:** 3/31/2013**CERTIFICATION HISTORY**

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Carbon Dioxide	3/31/2010	9.00 %	9.00 %	+/- 1%
Oxygen	3/31/2010	21.5 %	21.5 %	+/- 1%

BALANCE

Nitrogen

PREVIOUS CERTIFICATION DATES: None**REFERENCE STANDARDS**

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Carbon Dioxide	GMIS-1	CC-109878	9.98 %
Oxygen	NTRM-82659Y	CC-237244	24.52 %

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Carbon Dioxide	CAI-300	S03001	NDIR	3/4/2010
Oxygen	CAI-300	S03001	PM	3/17/2010

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST:

CODY HAMLIN

Linde Gas North America LLC

DATE: 3/31/2010

Shipped from: 80 Industrial Drive, Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE

PROCEDURE #: G1

CUSTOMER: Arrow Env. Consulting
SGI ORDER #: 155250
ITEM#: 1
P.O.#: 091107

CYLINDER #: CC-88570
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 350

CERTIFICATION DATE: 12/2/2009

EXPIRATION DATE: 12/2/2012

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Carbon Monoxide	11/23/2009 12/2/2009	253.9 ppm 253.6 ppm	254 ppm	+/- 1%

BALANCE Nitrogen

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Carbon Monoxide	GMIS-1	CC-94844	504 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Carbon Monoxide	Horiba VIA-510	H0002L2Y	NDIR	12/2/2009

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST:


MATTHEW BOOTH

DATE: 12/2/2009

Shipped from: 80 Industrial Drive, Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

**EPA PROTOCOL MIXTURE
PROCEDURE #: G1**

CUSTOMER: Arrow Env. Consulting
SGI ORDER #: 146592
ITEM#: 1
P.O.#: 090507

CYLINDER #: CC-136238
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 350

CERTIFICATION DATE: 5/27/2009
EXPIRATION DATE: 5/27/2012

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Carbon Monoxide	5/18/2009 5/27/2009	531.3 ppm 533.8 ppm	533 ppm	+/- 1%

BALANCE Nitrogen

PREVIOUS CERTIFICATION DATES: None

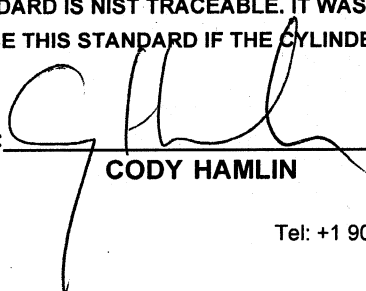
REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Carbon Monoxide	NTRM-81687	CC-131179	992 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Carbon Monoxide	Horiba VIA-510	H002L2Y	NDIR	4/28/2009

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: 
CODY HAMLIN

DATE: 5/27/2009



Spectra Gases, Inc.

3434 Route 22 West, Branchburg, New Jersey 08876 USA

ISO 9001:2000

Shipped from: 80 Industrial Drive, Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE PROCEDURE #: G1

CUSTOMER: Arrow Env. Consulting
SGI ORDER #: 146592
ITEM#: 4
P.O.#: 090507

CYLINDER #: CC-113905
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 660

CERTIFICATION DATE: 5/27/2009

EXPIRATION DATE: 5/27/2011

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Nitric Oxide	5/13/2009	54.74 ppm	54.7 ppm	+/- 1%
NOx	5/27/2009	54.7 ppm	54.8 ppm	Reference Value Only

BALANCE Nitrogen

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Nitric Oxide	NTRM-81684	CC-202740	98.8 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Nitric Oxide	CAI-400-CLD	6L09004	Cheml	4/14/2009

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST:

CODY HAMLIN

DATE: 5/27/2009

THE LINDE GROUP

Linde

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE
PROCEDURE #: G1

CUSTOMER: Arrow Env. Consulting
SALES#: 107261001
PROD#: 1133639
P.O.#: 100306

CYLINDER #: CC-270624
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 660

CERTIFICATION DATE: 3/31/2010
EXPIRATION DATE: 3/31/2012

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Nitric Oxide	3/24/2010	111.7 ppm	111.3 ppm	+/- 1%
NOx	3/31/2010	110.9 ppm	111.3 ppm	Reference Value Only

BALANCE

Nitrogen

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Nitric Oxide	GMIS-1	CC-118422	248 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Nitric Oxide	CAI-400-CLD	6L09004	Cheml	3/15/2010

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST:

CODY HAMLIN

Linde Gas North America LLC

DATE: 3/31/2010

THE LINDE GROUP

Linde

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE
PROCEDURE #: G1

CUSTOMER: ARROW ENV. CONSULTING
SALES#: 107593517
PROD#: 1151289
P.O.#: 100825

CYLINDER #: CC-85174
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 660

CERTIFICATION DATE: 9/9/2010

EXPIRATION DATE: 9/9/2012

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Nitric Oxide	9/2/2010	227.8 ppm	228 ppm	+/- 1%
NOx	9/9/2010	228.4 ppm	228 ppm	Reference Value Only

BALANCE Nitrogen

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

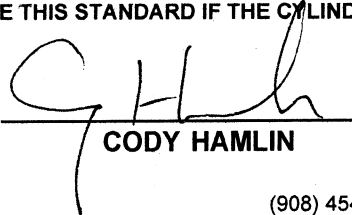
COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Nitric Oxide	GMIS-1	CC-118422	248 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Nitric Oxide	CAI-400-CLD	6L09004	Cheml	8/30/2010

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST:


CODY HAMLIN

Linde Gas North America LLC

DATE: 9/9/2010

THE LINDE GROUP

Linde

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE

PROCEDURE #: G1

CUSTOMER: Arrow Env. Consulting
SALES#: 107261001
PROD#: 1133631
P.O.#: 100306

CYLINDER #: CC-106769
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 660

CERTIFICATION DATE: 3/31/2010

EXPIRATION DATE: 9/31/2010

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Nitrogen Dioxide	3/24/2010	54.10 ppm	54.3 ppm	+/- 2%
	3/31/2010	54.54 ppm		

BALANCE

Air

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Nitrogen Dioxide	NTRM-82660	CC-200725	97.6 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Nitrogen Dioxide	Thermo-42i-HL	621417605	Cheml	3/8/2010

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST:

CODY HAMLIN

Linde Gas North America LLC

DATE: 3/31/2010

THE LINDE GROUP

*Linde***CERTIFICATE OF ANALYSIS****EPA PROTOCOL MIXTURE****PROCEDURE # : G1**

CUSTOMER: Arrow Env. Consulting
SALES#: 107261001
PROD#: 1133634
P.O.# : 100306

CYLINDER # : CC-53329
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 590

CERTIFICATION DATE: 3/31/2010**EXPIRATION DATE:** 3/31/2013**CERTIFICATION HISTORY**

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Methane	3/31/2010	25.6 ppm	25.6 ppm	+/- 1%

BALANCE Air**PREVIOUS CERTIFICATION DATES:** None**REFERENCE STANDARDS**

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Methane	GMIS-1	CC-53279	99.2 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Methane	H. Packard 6890	US00001434	GC - FID	3/24/2010

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST:
FRED PIKULA

Linde Gas North America LLC

DATE:

3/31/2010

Shipped from: 80 Industrial Drive, Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE

PROCEDURE # : G1

CUSTOMER: Arrow Env. Consulting
SGI ORDER # : 137249
ITEM# : 6
P.O.# : 081006

CYLINDER # : CC-19925
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 590

CERTIFICATION DATE: 10/23/2008
EXPIRATION DATE: 10/23/2011

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Methane	10/23/2008	44.5 ppm	44.5 ppm	+/- 1%

BALANCE Air

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Methane	GMIS-1	CC-57093	49.7 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Methane	H. Packard 6890	US00001434	GC - FID	10/8/2008

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: 
FRED PIKULA

DATE: 10/23/2008



Spectra Gases, Inc.

3434 Route 22 West, Branchburg, New Jersey 08876 USA

ISO 9001:2000

Shipped from: 80 Industrial Drive, Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE

PROCEDURE #: G1

CUSTOMER: Arrow Env. Consulting
SGI ORDER #: 142788
ITEM#: 2
P.O.#: 090211

CYLINDER #: CC-88551
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 590

CERTIFICATION DATE: 2/24/2009

EXPIRATION DATE: 2/24/2012

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Methane	2/24/2009	85.2 ppm	85.2 ppm	+/- 1%

BALANCE

Air

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Methane	GMIS-1	CC-53279	98.8 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Methane	Horiba VIA-510	57141706	NDIR	1/28/2009

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST:

MATTHEW BOOTH

DATE: 2/24/2009

Tel: +1 908-252-9300 Fax: +1 908-252-0811

www.spectragases.com

Shipped from: 80 Industrial Drive, Alpha, NJ 08865

RECERTIFICATION OF ANALYSIS

EPA PROTOCOL MIXTURE PROCEDURE #: G1

CUSTOMER: Arrow Env. Consulting
SGI ORDER #: 139597
ITEM#: 2
P.O.#: Verbal-Andy

CYLINDER #: CC-143627
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 660

CERTIFICATION DATE: 12/8/2008
EXPIRATION DATE: 12/8/2011

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Sulfur Dioxide	11/14/2006 12/8/2008	41.80 ppm 42.16 ppm	42.0 ppm	+/- 1%

BALANCE Nitrogen

PREVIOUS CERTIFICATION DATES: 11/14/2006 by Spectra Gases

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Sulfur Dioxide	NTRM-81694	CC-162835	96.1 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Sulfur Dioxide	Horiba VIA-510	851221093	NDIR	12/8/2008

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: 
FRED PIKULA

DATE: 12/8/2008

Shipped from: 80 Industrial Drive, Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

**EPA PROTOCOL MIXTURE
PROCEDURE #: G1**

CUSTOMER: Arrow Env. Consulting
SGI ORDER #: 151316
ITEM#: 7
P.O.#: 090812

CYLINDER #: CC-17894
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 660

CERTIFICATION DATE: 9/9/2009
EXPIRATION DATE: 9/9/2011

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Sulfur Dioxide	9/2/2009 9/9/2009	90.71 ppm 91.44 ppm	91.1 ppm	+/- 1%

BALANCE Nitrogen

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Sulfur Dioxide	NTRM-81694	CC-162845	96.1 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Sulfur Dioxide	Horiba VIA-510	851221093	NDIR	8/20/2009

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: 
CODY HAMLIN

DATE: 9/9/2009



Spectra Gases, Inc.

3434 Route 22 West, Branchburg, New Jersey 08876 USA

ISO 9001:2000

Shipped from: 80 Industrial Drive, Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE PROCEDURE #: G1

CUSTOMER: Arrow Env. Consulting
SGI ORDER #: 151316
ITEM#: 8
P.O.#: 090812

CYLINDER #: CC-126897
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 660

CERTIFICATION DATE: 9/9/2009
EXPIRATION DATE: 9/9/2011

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Sulfur Dioxide	8/28/2009 9/9/2009	191.7 ppm 192.1 ppm	191.9 ppm	+/- 1%

BALANCE Nitrogen

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

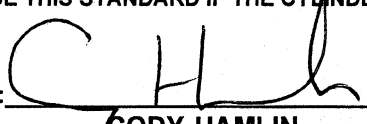
COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Sulfur Dioxide	GMIS-1	CC-128150	194.4 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Sulfur Dioxide	Horiba VIA-510	851221093	NDIR	8/20/2009

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST:


CODY HAMLIN

DATE: 9/9/2009