Calibration Data

Airtech Environmental Services, Inc.
Meter Box Full Test Calibration

Date: 9/13/2010

Operator: j burton

Meter Box ID M-2				Meter Box ΔH@				1.810	Meter Box Y_d			0.9904	Barometric Pressure (in. Hg.)		29.50
Time	Orifice Data				Meter Box Data								Results		
θ (min)	K'	Vacuum	T_{amb}	V_{cr}	$V_{initial}$	V_{final}	V_d	ΔH	T_i	T_o	T_{avg}	V_{mstd}	Q	Y_d	ΔH@
5.0	0.3455	23.0	80	2.193	473.80	476.08	2.28	0.63	77	74	75.5	2.219	0.439	0.9882	1.789
5.0	0.3455	23.0	81	2.191	476.08	478.37	2.29	0.63	78	75	76.5	2.225	0.438	0.9849	1.776
5.0	0.3455	23.0	82	2.189	478.37	480.66	2.29	0.63	78	75	76.5	2.225	0.438	0.9839	1.776
5.0	0.4434	21.0	82	2.809	481.00	483.93	2.93	1.05	79	76	77.5	2.844	0.562	0.9877	1.812
5.0	0.4434	21.0	82	2.809	483.93	486.88	2.95	1.05	80	77	78.5	2.858	0.562	0.9829	1.791
5.0	0.4434	21.0	82	2.809	486.88	489.82	2.94	1.05	80	78	79.0	2.846	0.562	0.9871	1.805
5.0	0.5926	20.0	83	3.751	490.20	494.12	3.92	1.9	81	78	79.5	3.799	0.750	0.9874	1.838
5.0	0.5926	20.0	83	3.751	494.12	498.04	3.92	1.9	83	79	81.0	3.788	0.750	0.9901	1.844
5.0	0.5926	20.0	83	3.751	498.04	501.96	3.92	1.9	84	79	81.5	3.785	0.750	0.9910	1.845
5.0	0.7965	17.0	83	5.042	502.60	507.80	5.20	3.3	86	80	83.0	5.024	1.008	1.0035	1.826
5.0	0.7965	17.0	83	5.042	507.80	513.03	5.23	3.3	88	81	84.5	5.039	1.008	1.0005	1.810
5.0	0.7965	17.0	83	5.042	513.03	518.27	5.24	3.3	86	82	84.0	5.054	1.008	0.9976	1.802
													Average	0.9904	1.810

Nomenclature	
K'	Critical Orifice Coefficient
T_{amb}	Ambient Temperature (°F)
V_{cr}	Volume Through Orifice (scf)
V_d	Gas Meter Volume (ft^3)
ΔH	Orifice Pressure Differential (in. H_2O)
T_i	Meter Inlet Temperature (°F)
T_o	Meter Outlet Temperauture (°F)
T_{avg}	Average Meter Box Temperature (°F)
V_{mstd}	Volume Metered Standardized (scf)
Q	Flow Rate (scfm)
Y_d	Meter Correction Factor (dimensionless)
ΔH@	ΔH yielding 0.75 scfm

Vacuum Guage (in. Hg.)		Thermometers (°F)				Equations
Standard	Vacuum Gauge	Standard	Ch. No 1	Ch. No 2	Ch. No 3	
5	5.0	32	32	33	33	$V_{cr} = \frac{K' * P_b * \theta}{(T_{amb} + 460)} ^{\wedge} 0.5$
10	10.0	50	49	51	51	$V_{mstd} = \frac{17.64 * V_d * (P_b + (\Delta H/13.6))}{(T_{m\_o} + 460)}$
15	15.0	100	99	101	102	
20	20.0	150	150	152	152	$Q = V_{cr} / \theta$
25	25.0	212	212	214	214	
		250	249	252	252	$Y_d = V_{cr} / V_{mstd}$
		300	301	302	302	
		350	350	352	352	$\Delta H@ = \frac{.0319 * \Delta H * (T_{avg} + 460) * \theta^{\wedge}2}{P_b * Y_d^{\wedge}2 * V_m^{\wedge}2}$
		400	400	402	402	
		500	500	502	502	
		600	600	602	602	

Airtech Environmental Services
Meter Post Calibration

Average Field Sample Rate (ΔH)	1.500	Date	8/9/2011
Highest Field Vacuum (inches Hg)	10	Client	BREC
Critical Orifice ID	AA-63	Project No.	3648
Orifice Flow Rate (cfm)	0.776	Meter ID	M-2

	Run 1	Run 2	Run 3
Initial Volume (ft^3)	348.00	351.88	355.76
Final Volume (ft^3)	351.88	355.76	359.64
Volume Metered (ft^3)	3.88	3.88	3.88
DGM Inlet Temperature (°F)	84	85	85
DGM Outlet Temperature (°F)	80	81	81
Average DGM Temperature (°F)	82.0	83.0	83.0
Ambient Temperature (°F)	84	83	84
Elapsed Time (min.)	5	5	5
ΔH (inches H_2O)	1.75	1.75	1.75
Barometric Pressure (inches Hg)	29.5	29.5	29.5
Pump Vacuum (inches Hg)	20	20	20
K'	0.5885	0.5885	0.5885
Vcr (ft^3)	3.722	3.725	3.722
Vmstd (ft^3)	3.741	3.735	3.735
Post Test Yc	0.9947	0.9975	0.9965
Full Test Yd	0.9904	0.9904	0.9904
% Difference	-0.44	-0.71	-0.62
	Average % Difference		-0.59

Airtech Environmental Services, Inc.
Meter Box Full Test Calibration

Date: 5/23/2011

Operator: j burton

Meter Box ID M-3				Meter Box ΔH@			1.807	Meter Box Y_d			0.9891	Barometric Pressure (in. Hg.)			29.50
Time	Orifice Data			Meter Box Data								Results			
θ (min)	K'	Vacuum	T_{amb}	V_{cr}	$V_{initial}$	V_{final}	V_d	ΔH	T_i	T_o	T_{avg}	V_{mstd}	Q	Y_d	ΔH@
5.0	0.3445	20.0	76	2.195	740.70	742.98	2.28	0.64	75	73	74	2.225	0.439	0.9863	1.817
5.0	0.3445	20.0	76	2.195	742.93	745.27	2.29	0.64	76	74	75.0	2.231	0.439	0.9838	1.804
5.0	0.3445	20.0	76	2.195	745.27	747.57	2.30	0.64	76	74	75.0	2.241	0.439	0.9795	1.789
5.0	0.4436	19.0	76	2.826	748.00	750.96	2.96	1.10	77	74	75.5	2.884	0.565	0.9798	1.858
5.0	0.4436	19.0	76	2.826	750.96	753.90	2.94	1.10	78	75	76.5	2.859	0.565	0.9884	1.887
5.0	0.4436	19.0	76	2.826	753.90	756.85	2.95	1.10	79	75	77.0	2.867	0.565	0.9859	1.876
5.0	0.5385	17.0	77	3.746	757.20	761.09	3.89	1.8	81	76	78.5	3.776	0.749	0.9920	1.770
5.0	0.5885	17.0	77	3.746	761.09	764.99	3.90	1.8	82	76	79.0	3.782	0.749	0.9904	1.763
5.0	0.5885	17.0	77	3.746	764.99	768.89	3.90	1.8	83	77	80.0	3.775	0.749	0.9922	1.766
5.0	0.7954	15.0	77	5.063	769.50	774.76	5.26	3.3	86	78	82.0	5.092	1.013	0.9943	1.786
5.0	0.7954	15.0	77	5.063	774.76	780.04	5.28	3.3	88	79	83.5	5.097	1.013	0.9933	1.778
5.0	0.7954	15.0	77	5.063	780.04	785.32	5.28	3.3	98	80	89.0	5.046	1.013	1.0033	1.796
													Average	0.9891	1.807

Nomenclature	
K'	Critical Orifice Coefficient
T_{amb}	Ambient Temperature (°F)
V_{cr}	Volume Through Orifice (scf)
V_d	Gas Meter Volume (ft^3)
ΔH	Orifice Pressure Differential (in. H_2O)
T_i	Meter Inlet Temperature (°F)
T_o	Meter Outlet Temperauture (°F)
T_{avg}	Average Meter Box Temperature (°F)
V_{mstd}	Volume Metered Standardized (scf)
Q	Flow Rate (scfm)
Y_d	Meter Correction Factor (dimensionless)
ΔH@	ΔH yielding 0.75 scfm

Vacuum Guage (in. Hg.)		Thermometers (°F)				Equations
Standard	Vacuum Gauge	Standard	Ch. No. 1	Ch. No. 2	Ch. No. 3	
5	5.0	32	33	33	33	$V_{cr} = \frac{K' * P_b * \theta}{(T_{amb} + 460)\ ^\wedge 0.5}$
10	10.0	50	51	51	51	$V_{mstd} = \frac{17.64 * V_d * (P_b + (\Delta H / 13.6))}{(T_{avg} + 460)}$
15	15.0	100	101	101	102	
20	20.0	150	152	151	151	$Q = V_{cr} / \theta$
25	25.0	212	213	213	214	
		250	252	252	251	$Y_d = V_{cr} / V_{mstd}$
		300	301	301	302	
		350	352	352	351	$\Delta H@ = \frac{.0319 * \Delta H * (T_{avg} + 460) * \theta^2}{P_b * Y_d^2 * V_m^2}$
		400	401	402	402	
		500	502	502	501	
		600	602	602	602	

Airtech Environmental Services
Meter Post Calibration

Average Field Sample Rate (ΔH)	1.050	Date	8/9/2011
Highest Field Vacuum (inches Hg)	4	Client	BREC
Critical Orifice ID	BB-55	Project No.	3648
Orifice Flow Rate (cfm)	0.59	Meter ID	M-3

	Run 1	Run 2	Run 3
Initial Volume (ft^3)	494.00	496.95	499.88
Final Volume (ft^3)	496.95	499.88	502.83
Volume Metered (ft^3)	2.95	2.93	2.95
DGM Inlet Temperature (°F)	81	81	82
DGM Outlet Temperature (°F)	78	79	79
Average DGM Temperature (°F)	79.5	80.0	80.5
Ambient Temperature (°F)	82	81	82
Elapsed Time (min.)	5	5	5
ΔH (inches H_2O)	1.05	1.05	1.05
Barometric Pressure (inches Hg)	29.5	29.5	29.5
Pump Vacuum (inches Hg)	20	20	20
K'	0.4436	0.4436	0.4436
Vcr (ft^3)	2.811	2.813	2.811
Vmstd (ft^3)	2.853	2.831	2.848
Post Test Yc	0.9851	0.9937	0.9870
Full Test Yd	0.9891	0.9891	0.9891
% Difference	0.40	-0.47	0.22
Average % Difference			0.05

Airtech Environmental Services, Inc.
Meter Box Full Test Calibration

Date: 4/13/2011

Operator: j burton

Meter Box ID M-5				Meter Box ΔH@			1.903	Meter Box Y_d			0.9918	Barometric Pressure (in. Hg.)			29.50
Time	Orifice Data				Meter Box Data								Results		
θ (min)	K'	Vacuum	T_{amb}	V_{cr}	$V_{initial}$	V_{final}	V_d	ΔH	T_i	T_o	T_{avg}	V_{mstd}	Q	Y_d	ΔH@
5.0	0.3445	22.0	68	2.211	309.00	311.19	2.19	0.66	69	66	67.5	2.164	0.442	1.0219	1.995
5.0	0.3445	22.0	66	2.216	311.19	313.38	2.19	0.66	71	67	69.0	2.158	0.443	1.0268	2.001
5.0	0.3445	22.0	66	2.216	313.38	315.58	2.20	0.66	72	68	70.0	2.164	0.443	1.0240	1.986
5.0	0.4436	21.0	66	2.853	315.90	318.83	2.93	1.10	73	69	71.0	2.879	0.571	0.9908	1.870
5.0	0.4436	21.0	67	2.850	318.83	321.75	2.92	1.10	75	69	72.0	2.864	0.570	0.9952	1.886
5.0	0.4436	21.0	67	2.850	321.75	324.69	2.94	1.10	76	70	73.0	2.878	0.570	0.9903	1.864
5.0	0.5885	19.0	66	3.785	325.00	328.97	3.97	2.0	78	71	74.5	3.884	0.757	0.9744	1.864
5.0	0.5885	19.0	66	3.785	328.97	332.93	3.96	2.0	80	72	76.0	3.864	0.757	0.9796	1.879
5.0	0.5885	19.0	66	3.785	332.93	336.89	3.96	2.0	82	73	77.5	3.853	0.757	0.9823	1.884
5.0	0.7954	17.0	66	5.115	337.30	342.73	5.43	3.7	86	74	80.0	5.281	1.023	0.9687	1.862
5.0	0.7954	17.0	66	5.115	342.73	348.15	5.42	3.7	88	75	81.5	5.257	1.023	0.9731	1.874
5.0	0.7954	17.0	66	5.115	348.15	353.58	5.43	3.7	91	76	83.5	5.247	1.023	0.9749	1.874
													Average	0.9918	1.903

Nomenclature	
K'	Critical Orifice Coefficient
T_{amb}	Ambient Temperature (°F)
V_{cr}	Volume Through Orifice (scf)
V_d	Gas Meter Volume (ft^3)
ΔH	Orifice Pressure Differential (in. H_2O)
T_i	Meter Inlet Temperature (°F)
T_o	Meter Outlet Temperauture (°F)
T_{avg}	Average Meter Box Temperature (°F)
V_{mstd}	Volume Metered Standardized (scf)
Q	Flow Rate (scfm)
Y_d	Meter Correction Factor (dimensionless)
ΔH@	ΔH yielding 0.75 scfm

Vacuum Guage (in. Hg.)		Thermometers (°F)				Equations
Standard	Vacuum Gauge	Standard	Ch. No. 1	Ch. No. 2	Ch. No. 3	
5	5.0	32	31	32	31	$V_{cr} = \frac{K' * P_b * \theta}{(T_{amb} + 460)} * 0.5$
10	10.0	50	49	51	50	$V_{mstd} = \frac{17.64 * V_d * (P_b + (\Delta H/13.6))}{(T_{avg} + 460)}$
15	15.0	100	99	101	100	$Q = V_{cr} * \theta$
20	20.0	150	149	151	150	$Y_d = V_{cr} / V_{mstd}$
25	25.0	212	213	213	212	$\Delta H@ = \frac{.0319 * \Delta H * (T_{avg} + 460) * \theta^2}{P_b * Y_d^2 * V_m^2}$
		250	251	251	251	
		300	301	301	301	
		350	351	351	350	
		400	400	402	400	
		500	500	502	501	
		600	601	602	600	

Airtech Environmental Services
Meter Post Calibration

Average Field Sample Rate (ΔH)	1.500	Date	8/10/2011
Highest Field Vacuum (inches Hg)	10	Client	BREC
Critical Orifice ID	AA-63	Project No.	3648
Orifice Flow Rate (cfm)	0.786	Meter ID	M-5

	Run 1	Run 2	Run 3
Initial Volume (ft^3)	26.00	29.93	33.85
Final Volume (ft^3)	29.93	33.85	37.78
Volume Metered (ft^3)	3.93	3.92	3.93
DGM Inlet Temperature (°F)	87	88	90
DGM Outlet Temperature (°F)	80	82	82
Average DGM Temperature (°F)	83.5	85.0	86.0
Ambient Temperature (°F)	74	75	76
Elapsed Time (min.)	5	5	5
ΔH (inches H_2O)	2.00	2.00	2.00
Barometric Pressure (inches Hg)	29.5	29.5	29.5
Pump Vacuum (inches Hg)	20	20	20
K'	0.5885	0.5885	0.5885
Vcr (ft^3)	3.756	3.753	3.749
Vmstd (ft^3)	3.782	3.762	3.764
Post Test Yc	0.9933	0.9977	0.9960
Full Test Yd	0.9953	0.9953	0.9953
% Difference	0.20	-0.24	-0.07
Average % Difference			**-0.04**

Airtech Environmental Services, Inc.
Meter Box Full Test Calibration

Date: 9/13/2010 **Operator:** j burton

Meter Box ID M-14				Meter Box ΔH@			1.802	Meter Box Y_d			1.0087	Barometric Pressure (in. Hg.)		29.50
Time	**Orifice Data**				**Meter Box Data**								**Results**	
θ (min)	K'	Vacuum	T_{amb}	V_{cr}	$V_{initial}$	V_{final}	V_d	ΔH	T_i	T_o	T_{avg}	V_{mstd}	Q	Y_d	ΔH@
5.0	0.3455	22.0	83	2.187	510.30	512.57	2.27	0.63	82	89	85.5	2.169	0.437	1.0083	1.772
5.0	0.3455	22.0	83	2.187	512.57	514.83	2.26	0.63	83	80	81.5	2.175	0.437	1.0054	1.775
5.0	0.3455	22.0	83	2.187	514.83	517.09	2.26	0.63	84	81	82.5	2.171	0.437	1.0072	1.778
5.0	0.4434	20.0	84	2.804	517.40	520.33	2.93	1.05	85	82	83.5	2.813	0.561	0.9969	1.766
5.0	0.4434	20.0	84	2.804	520.33	523.27	2.94	1.05	87	82	84.5	2.817	0.561	0.9954	1.757
5.0	0.4434	20.0	84	2.804	523.27	526.17	2.90	1.05	89	83	86.0	2.771	0.561	1.0119	1.811
5.0	0.5926	18.0	84	3.748	526.60	530.50	3.90	1.9	91	84	87.5	3.724	0.750	1.0062	1.817
5.0	0.5926	18.0	84	3.748	530.50	534.40	3.90	1.9	93	85	89.0	3.714	0.750	1.0090	1.822
5.0	0.5926	18.0	84	3.748	534.40	538.30	3.90	1.9	94	86	90.0	3.707	0.750	1.0108	1.826
5.0	0.7965	15.0	84	5.037	538.90	544.13	5.23	3.4	97	87	92.0	4.972	1.007	1.0130	1.823
5.0	0.7965	15.0	84	5.037	544.13	549.36	5.23	3.4	100	89	94.5	4.950	1.007	1.0176	1.831
5.0	0.7965	15.0	84	5.037	549.36	554.58	5.22	3.4	102	90	96.0	4.927	1.007	1.0223	1.843
													Average	1.0087	1.802

Nomenclature	
K'	Critical Orifice Coefficient
T_{amb}	Ambient Temperature (°F)
V_{cr}	Volume Through Orifice (scf)
V_d	Gas Meter Volume (ft^3)
ΔH	Orifice Pressure Differential (in. H_2O)
T_i	Meter Inlet Temperature (°F)
T_o	Meter Outlet Temperauture (°F)
T_{avg}	Average Meter Box Temperature (°F)
V_{mstd}	Volume Metered Standardized (scf)
Q	Flow Rate (scfm)
Y_d	Meter Correction Factor (dimensionless)
ΔH@	ΔH yielding 0.75 scfm

Vacuum Guage (in. Hg.)		Thermometers (°F)				Equations
Standard	Vacuum Gauge	Standard	Ch. No. 1	Ch. No. 2	Ch. No. 3	
5	5.0	32	32	33	32	$V_{cr} = \frac{K' * P_b * \theta}{(T_{amb} + 460)} - 0.5$
10	10.0	50	51	51	50	
15	15.0	100	100	101	100	$V_{mstd} = \frac{17.64 * V_d * (P_b + (\Delta H/13.6))}{(T_{avg} + 460)}$
20	20.0	150	151	151	150	
25	25.0	212	213	213	212	$Q = V_{cr} / \theta$
		250	251	251	250	
		300	300	301	300	$Y_d = V_{cr} / V_{mstd}$
		350	350	350	349	
		400	400	400	399	$\Delta H@ = \frac{.0319 * \Delta H * (T_{avg} + 460) * \theta^2}{P_b * Y_d^2 * V_m^2}$
		500	500	500	498	
		600	600	599	598	

Airtech Environmental Services
Meter Post Calibration

Average Field Sample Rate (ΔH)	1.500	Date	8/9/2011
Highest Field Vacuum (inches Hg)	10	Client	BREC
Critical Orifice ID	AA-63	Project No.	3648
Orifice Flow Rate (cfm)	0.76	Meter ID	M-14

	Run 1	Run 2	Run 3
Initial Volume (ft^3)	105.00	108.80	112.67
Final Volume (ft^3)	108.80	112.67	116.51
Volume Metered (ft^3)	3.80	3.87	3.84
DGM Inlet Temperature (°F)	91	92	92
DGM Outlet Temperature (°F)	85	86	86
Average DGM Temperature (°F)	88.0	89.0	89.0
Ambient Temperature (°F)	90	90	90
Elapsed Time (min.)	5	5	5
ΔH (inches H_2O)	1.80	1.80	1.80
Barometric Pressure (inches Hg)	29.5	29.5	29.5
Pump Vacuum (inches Hg)	18	18	18
K'	0.5885	0.5885	0.5885
Vcr (ft^3)	3.701	3.701	3.701
Vmstd (ft^3)	3.625	3.685	3.656
Post Test Yc	1.0211	1.0045	1.0124
Full Test Yd	1.0087	1.0087	1.0087
% Difference	-1.23	0.42	-0.36
	Average % Difference		**-0.39**

Airtech Environmental Services, Inc.
Meter Box Full Test Calibration

Date: 2/3/2011 **Operator:** j burton

Meter Box ID M-15				Meter Box ΔH@			1.843	Meter Box Y_d			1.0159	Barometric Pressure (in. Hg.)		29.50
Time	**Orifice Data**			**Meter Box Data**								**Results**		
θ (min)	K'	Vacuum	T_{amb}	V_{cr}	$V_{initial}$	V_{final}	V_d	ΔH	T_i	T_o	T_{avg}	V_{mstd}	Q	Y_d	ΔH@
5.0	0.3455	22.0	76	2.201	23.00	25.19	2.19	0.65	71	68	69.5	2.156	0.440	1.0211	1.880
5.0	0.3455	22.0	76	2.201	25.19	27.38	2.19	0.65	72	68	70.0	2.154	0.440	1.0220	1.882
5.0	0.3455	22.0	76	2.201	27.38	29.56	2.18	0.65	73	69	71.0	2.140	0.440	1.0287	1.902
5.0	0.4434	21.0	76	2.825	30.50	33.36	2.86	1.10	73	71	72.0	2.805	0.565	1.0070	1.874
5.0	0.4434	21.0	76	2.825	33.36	36.22	2.86	1.10	74	72	73.0	2.800	0.565	1.0089	1.878
5.0	0.4434	21.0	76	2.825	36.22	39.07	2.85	1.10	75	72	73.5	2.788	0.565	1.0134	1.893
5.0	0.5926	19.0	76	3.775	39.60	43.43	3.83	1.9	77	73	75.0	3.743	0.755	1.0088	1.767
5.0	0.5926	19.0	76	3.775	43.43	47.22	3.79	1.9	78	73	75.5	3.700	0.755	1.0204	1.807
5.0	0.5926	19.0	76	3.775	47.22	51.05	3.83	1.9	80	74	77.0	3.729	0.755	1.0126	1.774
5.0	0.7965	17.0	76	5.075	51.40	56.55	5.15	3.4	83	74	78.5	5.019	1.015	1.0111	1.808
5.0	0.7965	17.0	76	5.075	56.55	61.68	5.13	3.4	84	75	79.5	4.990	1.015	1.0169	1.826
5.0	0.7965	17.0	76	5.075	61.68	66.81	5.13	3.4	86	76	81.0	4.976	1.015	1.0197	1.831
													Average	1.0159	1.843

Nomenclature	
K'	Critical Orifice Coefficient
T_{amb}	Ambient Temperature (°F)
V_{cr}	Volume Through Orifice (scf)
V_d	Gas Meter Volume (ft^3)
ΔH	Orifice Pressure Differential (in. H_2O)
T_i	Meter Inlet Temperature (°F)
T_o	Meter Outlet Temperauture (°F)
$T_{a.g}$	Average Meter Box Temperature (°F)
V_{mstd}	Volume Metered Standardized (scf)
Q	Flow Rate (scfm)
Y_d	Meter Correction Factor (dimensionless)
ΔH@	ΔH yielding 0.75 scfm

Vacuum Guage (in. Hg.)		Thermometers (°F)				Equations
Standard	Vacuum Gauge	Standard	Ch No 1	Ch No 2	Ch No 3	
5	5.0	32	31	32	32	$V_{cr} = \frac{K' * P_b * \theta}{(T_{amb} + 460)^{0.5}}$
10	10.0	50	49	50	50	$V_{mstd} = \frac{17.64 * V_d * (P_b + (\Delta H/13.6))}{(T_{avg} + 460)}$
15	15.0	100	99	101	100	$Q = V_{cr} / \theta$
20	20.0	150	150	151	150	$Y_d = V_{cr} / V_{mstd}$
25	25.0	212	212	213	213	$\Delta H@ = \frac{.0319 * \Delta H * (T_{avg} + 460) * \theta^2}{P_b * Y_d^2 * V_m^2}$
		250	250	252	251	
		300	300	302	301	
		350	350	352	351	
		400	400	402	401	
		500	500	502	501	
		600	600	602	601	

Airtech Environmental Services
Meter Post Calibration

Average Field Sample Rate (ΔH)	1.500	Date	8/9/2011
Highest Field Vacuum (inches Hg)	10	Client	BREC
Critical Orifice ID	AA-63	Project No.	3648
Orifice Flow Rate (cfm)	0.75	Meter ID	M-15

	Run 1	Run 2	Run 3
Initial Volume (ft^3)	174.50	178.25	182.02
Final Volume (ft^3)	178.25	182.02	185.78
Volume Metered (ft^3)	3.75	3.77	3.76
DGM Inlet Temperature (°F)	85	86	87
DGM Outlet Temperature (°F)	79	80	80
Average DGM Temperature (°F)	82.0	83.0	83.5
Ambient Temperature (°F)	85	85	85
Elapsed Time (min.)	5	5	5
ΔH (inches H_2O)	1.80	1.80	1.80
Barometric Pressure (inches Hg)	29.5	29.5	29.5
Pump Vacuum (inches Hg)	19	19	19
K'	0.5885	0.5885	0.5885
Vcr (ft^3)	3.718	3.718	3.718
Vmstd (ft^3)	3.617	3.629	3.616
Post Test Yc	1.0281	1.0246	1.0282
Full Test Yd	1.0159	1.0159	1.0159
% Difference	-1.20	-0.85	-1.21
Average % Difference			-1.09

Airtech Environmental Services, Inc.
Meter Box Full Test Calibration

Date: 5/2/2011

Operator: J Burton

Meter Box ID M-16				Meter Box ΔH@			1.845	Meter Box Y_d			0.9907	Barometric Pressure (in. Hg.)			29.55
Time	**Orifice Data**				**Meter Box Data**								**Results**		
θ (min)	K'	Vacuum	T_{amb}	V_{cr}	$V_{initial}$	V_{final}	V_d	ΔH	T_i	T_o	T_{a_g}	V_{mstd}	Q	Y_d	ΔH@
5.0	0.3445	23.0	72	2.207	150.60	152.86	2.26	0.67	68	66	67	2.239	0.441	0.9856	1.901
5.0	0.3445	23.0	72	2.207	152.86	155.13	2.27	0.67	69	66	67.5	2.247	0.441	0.9822	1.886
5.0	0.3445	23.0	72	2.207	155.13	157.40	2.27	0.67	70	67	68.5	2.243	0.441	0.9840	1.890
5.0	0.4436	21.0	72	2.842	157.70	160.62	2.92	1.10	71	67	69.0	2.885	0.568	0.9849	1.877
5.0	0.4436	21.0	72	2.842	160.62	163.55	2.93	1.10	72	68	70.0	2.890	0.568	0.9834	1.867
5.0	0.4436	21.0	72	2.842	163.55	166.46	2.91	1.10	74	69	71.5	2.862	0.568	0.9930	1.899
5.0	0.5885	20.0	72	3.770	167.00	170.87	3.87	1.85	76	70	73.0	3.802	0.754	0.9915	1.810
5.0	0.5885	20.0	72	3.770	170.87	174.73	3.86	1.85	77	70	73.5	3.789	0.754	0.9950	1.822
5.0	0.5885	20.0	72	3.770	174.73	178.61	3.88	1.85	78	71	74.5	3.801	0.754	0.9917	1.806
5.0	0.7954	17.0	72	5.095	179.20	184.41	5.21	3.3	80	72	76.0	5.108	1.019	0.9974	1.792
5.0	0.7954	17.0	72	5.095	184.41	189.62	5.21	3.3	82	72	77.0	5.099	1.019	0.9993	1.795
5.0	0.7954	17.0	72	5.095	189.62	194.84	5.22	3.3	84	73	78.5	5.094	1.019	1.0001	1.793
													Average	0.9907	1.845

Nomenclature	
K'	Critical Orifice Coefficient
T_{amb}	Ambient Temperature (°F)
V_{cr}	Volume Through Orifice (scf)
V_d	Gas Meter Volume (ft^3)
ΔH	Orifice Pressure Differential (in. H_2O)
T_i	Meter Inlet Temperature (°F)
T_o	Meter Outlet Temperauture (°F)
T_{a_g}	Average Meter Box Temperature (°F)
V_{mstd}	Volume Metered Standardized (scf)
Q	Flow Rate (scfm)
Y_d	Meter Correction Factor (dimensionless)
ΔH@	ΔH yielding 0.75 scfm

Vacuum Guage (in. Hg.)		Thermometers (°F)				Equations
Standard	Vacuum Gauge	Standard	Ch. No. 1	Ch. No. 2	Ch. No. 3	
5	5.0	32	33	32	33	$V_{cr} = \frac{K' * P_b * \theta}{(T_{amb} + 460)} ^ 0.5$
10	10.0	50	51	51	50	$V_{mstd} = \frac{17.64 * V_d * (P_b + (\Delta H/13.6))}{(T_{a\_g} + 460)}$
15	15.0	100	101	101	101	$Q = V_{cr} / \theta$
20	20.0	150	152	152	152	$Y_d = V_{cr} / V_{mstd}$
25	25.0	212	213	214	214	$\Delta H@ = \frac{.0319 * \Delta H * (T_{a\_g} + 460) * \theta^2}{P_b * Y_d^2 * V_m^2}$
		250	251	252	251	
		300	301	301	302	
		350	351	352	351	
		400	401	402	402	
		500	502	501	502	
		600	601	601	602	

Airtech Environmental Services
Meter Post Calibration

Average Field Sample Rate (ΔH)	1.500	Date	8/9/2011
Highest Field Vacuum (inches Hg)	10	Client	BREC
Critical Orifice ID	AA-63	Project No.	3648
Orifice Flow Rate (cfm)	0.772	Meter ID	M-16

	Run 1	Run 2	Run 3
Initial Volume (ft^3)	627.50	631.36	635.21
Final Volume (ft^3)	631.36	635.21	639.08
Volume Metered (ft^3)	3.86	3.85	3.87
DGM Inlet Temperature (°F)	86	87	88
DGM Outlet Temperature (°F)	82	82	82
Average DGM Temperature (°F)	84.0	84.5	85.0
Ambient Temperature (°F)	88	87	87
Elapsed Time (min.)	5	5	5
ΔH (inches H_2O)	1.80	1.80	1.80
Barometric Pressure (inches Hg)	29.5	29.5	29.5
Pump Vacuum (inches Hg)	20	20	20
K'	0.5885	0.5885	0.5885
Vcr (ft^3)	3.708	3.711	3.711
Vmstd (ft^3)	3.709	3.696	3.712
Post Test Yc	0.9998	1.0042	0.9999
Full Test Yd	0.9907	0.9907	0.9907
% Difference	-0.91	-1.36	-0.93
Average % Difference			-1.07

Airtech Environmental Services, Inc.
Meter Box Full Test Calibration

Date: 11/1/2010

Operator: j burton

Meter Box ID M-20				Meter Box ΔH@			1.785	Meter Box Y_d			0.9952	Barometric Pressure (in. Hg.)		29.50
Time	**Orifice Data**				**Meter Box Data**								**Results**	
θ (min)	K'	Vacuum	T_{amb}	V_{cr}	$V_{initial}$	V_{final}	V_d	ΔH	T_i	T_o	$T_{a:g}$	V_{mstd}	Q	Y_d	ΔH@
5.0	0.3455	22.0	67	2.220	956.60	958.89	2.29	0.64	73	67	70	2.252	0.444	0.9857	1.766
5.0	0.3455	22.0	67	2.220	958.89	961.17	2.28	0.64	75	69	72.0	2.234	0.444	0.9938	1.788
5.0	0.3455	22.0	67	2.220	961.17	963.46	2.29	0.64	77	70	73.5	2.237	0.444	0.9922	1.777
5.0	0.4434	20.0	67	2.849	963.70	966.67	2.97	1.05	79	72	75.5	2.894	0.570	0.9845	1.740
5.0	0.4434	20.0	67	2.849	966.67	969.63	2.96	1.05	80	72	76.0	2.881	0.570	0.9888	1.753
5.0	0.4434	20.0	67	2.849	969.63	972.59	2.96	1.05	82	74	78.0	2.871	0.570	0.9925	1.760
5.0	0.5926	18.0	68	3.804	993.00	997.01	4.01	1.9	90	81	85.5	3.843	0.761	0.9897	1.759
5.0	0.5926	18.0	68	3.804	997.01	1001.01	4.00	1.9	93	82	87.5	3.820	0.761	0.9958	1.775
5.0	0.5926	18.0	68	3.804	1001.01	1005.05	4.04	1.9	94	83	88.5	3.851	0.761	0.9878	1.743
5.0	0.7995	16.0	68	5.132	1005.70	1011.05	5.35	3.5	95	84	89.5	5.111	1.026	1.0042	1.834
5.0	0.7995	16.0	69	5.127	1011.05	1016.36	5.31	3.5	98	85	91.5	5.054	1.025	1.0145	1.869
5.0	0.7995	16.0	69	5.127	1016.36	1021.69	5.33	3.5	99	86	92.5	5.064	1.025	1.0125	1.858
													Average	0.9952	1.785

Nomenclature	
K'	Critical Orifice Coefficient
T_{amb}	Ambient Temperature (°F)
V_{cr}	Volume Through Orifice (scf)
V_d	Gas Meter Volume (ft^3)
ΔH	Orifice Pressure Differential (in. H_2O)
T_i	Meter Inlet Temperature (°F)
T_o	Meter Outlet Temperauture (°F)
$T_{a:g}$	Average Meter Box Temperature (°F)
V_{mstd}	Volume Metered Standardized (scf)
Q	Flow Rate (scfm)
Y_d	Meter Correction Factor (dimensionless)
ΔH@	ΔH yielding 0.75 scfm

Vacuum Guage (in. Hg.)		Thermometers (°F)				Equations
Standard	Vacuum Gauge	Standard	Ch. No 1	Ch. No 2	Ch. No 3	
5	5.0	32	33	31	31	$V_{cr} = \frac{K' * P_b * \theta}{(T_{amb} + 460)\ ^\wedge 0.5}$
10	10.0	50	51	50	49	$V_{mstd} = \frac{17.64 * V_d * (P_b + (\Delta H / 13.6))}{(T_{a:g} + 460)}$
15	15.0	100	101	100	100	$Q = V_{cr} / \theta$
20	20.0	150	151	151	150	$Y_d = V_{cr} / V_{mstd}$
25	25.0	212	213	213	213	$\Delta H@ = \frac{.0319 * \Delta H * (T_{a:g} + 460) * \theta^\wedge 2}{P_b * Y_d\ ^\wedge 2 * V_m\ ^\wedge 2}$
		250	251	251	251	
		300	300	301	301	
		350	350	352	351	
		400	400	402	402	
		500	501	502	501	
		600	601	602	602	

Airtech Environmental Services
Meter Post Calibration

Average Field Sample Rate (ΔH)	1.500	Date	8/8/2011
Highest Field Vacuum (inches Hg)	5	Client	BREC
Critical Orifice ID	AA-63	Project No.	3648
Orifice Flow Rate (cfm)	0.766	Meter ID	M-20

	Run 1	Run 2	Run 3
Initial Volume (ft^3)	825.60	829.43	833.26
Final Volume (ft^3)	829.43	833.26	837.08
Volume Metered (ft^3)	3.83	3.83	3.82
DGM Inlet Temperature (°F)	90	90	90
DGM Outlet Temperature (°F)	84	84	84
Average DGM Temperature (°F)	87.0	87.0	87.0
Ambient Temperature (°F)	90	89	88
Elapsed Time (min)	5	5	5
ΔH (inches H_2O)	1.80	1.80	1.80
Barometric Pressure (inches Hg)	29.5	29.5	29.5
Pump Vacuum (inches Hg)	18	18	18
K'	0.5885	0.5885	0.5885
Vcr (ft^3)	3.701	3.705	3.708
Vmstd (ft^3)	3.660	3.660	3.650
Post Test Yc	1.0113	1.0122	1.0158
Full Test Yd	0.9952	0.9952	0.9952
% Difference	-1.62	-1.71	-2.07
Average % Difference			-1.80

Meter Box Full Test Calibration

DATE: 7/8/2011 M26-

Operator: Joe Ward

Meter Box No: DB30B-0711-2018				Meter Box H@: 0.0000						Meter Box Yd 0.9958						Barometric Pressure: 29.78		
#1				Standard Meter Gas Volume			Meter Box Gas Volume (ft³)			Std. Meter Temperature (ÞF)			Meter Box Temperature (ÞF)					
Q	P	H	Yds	Initial	Final	Vf	Initial	Final	Vf	Inlet	Outlet	Avg.	Inlet	Outlet	Avg.	Time	Yd	H@
0.04	-0.30	0.00	1.0000	0.0	1.000	1.000	.000	1.015	1.015	76.0	76.0	76.0	81.0	81.0	81.0	27.04	0.9951	0.0000
0.04	-0.30	0.00	1.0000	0.0	1.000	1.000	0.000	1.014	1.014	76.0	76.0	76.0	80.0	80.0	80.0	27.06	0.9943	0.0000
0.02	-0.30	0.00	1.0000	0.0	.500	.500	.000	.503	.503	77.0	77.0	77.0	80.0	80.0	80.0	29.91	1.0003	0.0000
0.02	-0.30	0.00	1.0000	0.0	.500	.500	.000	.502	.502	77.0	77.0	77.0	80.0	80.0	80.0	29.52	1.0023	0.0000
0.03	-0.30	0.00	1.0000	0.0	.500	.500	.000	.507	.507	78.0	78.0	78.0	81.0	81.0	81.0	17.92	0.9924	0.0000
0.03	-0.30	0.00	1.0000	0.0	.500	.500	.000	.508	.508	78.0	78.0	78.0	81.0	81.0	81.0	17.79	0.9905	0.0000
															AVERAGE		0.9958	0.0000

Millennium Instruments Inc.
2402 Springridge Drive unit A
Spring Grove IL. 60081
PHONE#(815)675-3225
FAX#(815)675-6965
E-mail millennium@millinst.com
www.millinst.com

Vacuum Gauge

(in. Hg)	Gauge
5.0	5.5
10.0	10.5
15.0	16.0
20.0	21.0
25.0	26.0

Meter Box Full Test Calibration

DATE: 7/10/2011 M-26 — Operator: Joe Ward

Meter Box No DB30B-0711-2018				Meter Box H@			0.0000			Meter Box Yd			0.9902			Barometric Pressure:		29.75
#2				Standard Meter Gas Volume			Meter Box Gas Volume (ft³)			Std. Meter Temperature (ºF)			Meter Box Temperature (ºF)					
Q	P	H	Yds	Initial	Final	Vf	Initial	Final	Vf	Inlet	Outlet	Avg.	Inlet	Outlet	Avg.	Time	Yd	H@
0.01	-0.30	0.00	1.0000	0.0	.280	.280	.000	.294	.294	75.0	75.0	75.0	92.0	92.0	92.0	18.56	0.9834	0.0000
0.01	-0.30	0.00	1.0000	0.0	.285	.285	0.000	.299	.299	75.0	75.0	75.0	92.0	92.0	92.0	18.64	0.9842	0.0000
0.03	-0.30	0.00	1.0000	0.0	1.000	1.000	.000	1.033	1.033	75.0	75.0	75.0	93.0	93.0	93.0	29.14	1.0014	0.0000
0.03	-0.30	0.00	1.0000	0.0	1.000	1.000	.000	1.032	1.032	75.0	75.0	75.0	93.0	93.0	93.0	29.10	1.0023	0.0000
0.02	-0.30	0.00	1.0000	0.0	.500	.500	.000	.527	.527	75.0	75.0	75.0	95.0	95.0	95.0	22.89	0.9850	0.0000
0.02	-0.30	0.00	1.0000	0.0	.500	.500	.000	.527	.527	75.0	75.0	75.0	95.0	95.0	95.0	22.80	0.9850	0.0000
															AVERAGE		0.9902	0.0000

Millennium Instruments Inc.
2402 Springridge Drive unit A
Spring Grove IL. 60081
PHONE#(815)675-3225
FAX#(815)675-6965
E-mail millennium@millinst.com
www.millinst.com

Vacuum Gauge

(in. Hg)	Gauge
5.0	5.0
10.0	10.0
15.0	15.0
20.0	20.0

Pyrometer Calibration Sheet

Pyrometer No.:001

Office: Spring Grove
Client: Airtech Environmental
Job or Reference No.:DB30B-0711-2018

Temperature Scale Used ☑ Fahrenheit ☐ Celsius

☑ Full Test ☐ Post Test

Calibration Reference Settings for Fahrenheit Scale	Pyrometer Reading	Calibration Reference Settings for Celsius Scale
50° F	50° F	10°C
100° F	100° F	38°C
150° F	150° F	66°C
200° F	200° F	93°C
250° F	250° F	121°C
300° F	300° F	149°C
350° F	350° F	177°C
400° F	400° F	204°C
450° F	450° F	232°C
500° F	500° F	260°C
550° F	550° F	288°C
600° F	600° F	316°C

Method 30B Post-Test Meter Calibration

Average Field Sample Rate (lpm)	0.5	**Date**	8/8/2011
Highest Field Vacuum (inches Hg)	10.0	**Client**	BREC
Critical Orifice ID	.5LPM	**Project No.**	3648
Orifice Flow Rate (lpm)	0.479	**Meter ID**	M-26 A

	Run 1	Run 2	Run 3	
Initial Volume (l^3)	0.000	4.798	9.564	
Final Volume (l^3)	4.798	9.564	14.362	
Volume Metered (l^3)	4.798	4.766	4.798	
DGM Temperature (°F)	104	105	107	
Ambient Temperature (°F)	88	87	88	
Elapsed Time (min.)	10.0	10.0	10.0	
Setting (l/min)	0.4	0.4	0.4	
Barometric Pressure (inches Hg)	29.50	29.50	29.50	
Pump Vacuum (inches Hg)	19.0	19.0	19.0	
K'	0.012	0.012	0.012	
Vcr (l^3)	4.281	4.285	4.281	
Vmstd (l^3)	4.431	4.394	4.408	
Post Test Yc	0.96609	0.97519	0.97123	
Full Test Yd	0.9958	0.9958	0.9958	
% Difference	2.98	2.07	2.47	
	Average Difference		**2.51**	

Method 30B Post-Test Meter Calibration

Average Field Sample Rate (lpm)	0.5	Date	8/8/2011
Highest Field Vacuum (inches Hg)	10.0	Client	BREC
Critical Orifice ID	.5LPM	Project No.	3648
Orifice Flow Rate (lpm)	0.480	Meter ID	M-26 B

	Run 1	Run 2	Run 3	
Initial Volume (l^3)	0.000	4.802	9.592	
Final Volume (l^3)	4.802	9.592	14.401	
Volume Metered (l^3)	4.802	4.790	4.809	
DGM Temperature (°F)	106	108	107	
Ambient Temperature (°F)	88	87	88	
Elapsed Time (min.)	10.0	10.0	10.0	
Setting (l/min)	0.4	0.4	0.4	
Barometric Pressure (inches Hg)	29.50	29.50	29.50	
Pump Vacuum (inches Hg)	20.0	20.0	20.0	
K'	0.012	0.012	0.012	
Vcr (l^3)	4.281	4.285	4.281	
Vmstd (l^3)	4.419	4.393	4.418	
Post Test Yc	0.96871	0.97546	0.96901	
Full Test Yd	0.9902	0.9902	0.9902	
% Difference	2.17	1.49	2.14	
	Average Difference		1.93	

R-20095

Meter Box Full Test Calibration

DATE: 7/10/2011

Operator: Joe Ward

Meter Box No: DB30B-0711-2019				Meter Box H@: 0.0000						Meter Box Yd 1.0072						Barometric Pressure: 29.79		
#1				Standard Meter Gas Volume			Meter Box Gas Volume (ft( )			Std. Meter Temperature (ÞF)			Meter Box Temperature (ÞF)					
Q	P	H	Yds	Initial	Final	Vf	Initial	Final	Vf	Inlet	Outlet	Avg.	Inlet	Outlet	Avg.	Time	Yd	H@
0.04	-0.30	0.00	1.0000	0.0	1.000	1.000	.000	1.018	1.018	75.0	75.0	75.0	91.0	91.0	91.0	26.40	1.0124	0.0000
0.04	-0.30	0.00	1.0000	0.0	1.000	1.000	0.000	1.019	1.019	75.0	75.0	75.0	91.0	91.0	91.0	26.38	1.0115	0.0000
0.02	-0.30	0.00	1.0000	0.0	.520	.520	.000	.536	.536	75.0	75.0	75.0	93.0	93.0	93.0	22.14	1.0035	0.0000
0.02	-0.30	0.00	1.0000	0.0	.500	.500	.000	.516	.516	75.0	75.0	75.0	94.0	94.0	94.0	22.09	1.0041	0.0000
0.02	-0.30	0.00	1.0000	0.0	.500	.500	.000	.523	.523	76.0	76.0	76.0	104.0	104.0	104.0	32.22	1.0067	0.0000
0.02	-0.30	0.00	1.0000	0.0	.500	.500	.000	.524	.524	76.0	76.0	76.0	104.0	104.0	104.0	32.20	1.0048	0.0000
															AVERAGE		1.0072	0.0000

Millennium Instruments Inc.
2402 Springridge Drive unit A
Spring Grove IL. 60081
PHONE#(815)675-3225
FAX#(815)675-6965
E-mail millennium@millinst.com
www.millinst.com

Vacuum Gauge

(in. Hg)	Gauge
5.0	5.5
10.0	10.5
15.0	16.0
20.0	21.0

New Ashtead

R-20078

Meter Box Full Test Calibration

DATE: 7/11/2011

Operator: Joe Ward

Meter Box No. DB30B-0711-2019				Meter Box H@: 0.0000						Meter Box Yd 0.9985						Barometric Pressure: 29.69		
#2				Standard Meter Gas Volume			Meter Box Gas Volume (ft³)			Std. Meter Temperature (ÞF)			Meter Box Temperature (ÞF)					
Q	P	H	Yds	Initial	Final	Vf	Initial	Final	Vf	Inlet	Outlet	Avg.	Inlet	Outlet	Avg.	Time	Yd	H@
0.03	-0.30	0.00	1.0000	0.0	1.000	1.000	.000	1.024	1.024	75.0	75.0	75.0	92.0	92.0	92.0	30.56	1.0083	0.0000
0.03	-0.30	0.00	1.0000	0.0	1.000	1.000	0.000	1.025	1.025	75.0	75.0	75.0	92.0	92.0	92.0	30.48	1.0074	0.0000
0.02	-0.30	0.00	1.0000	0.0	.500	.500	.000	.518	.518	75.0	75.0	75.0	94.0	94.0	94.0	22.10	1.0003	0.0000
0.02	-0.30	0.00	1.0000	0.0	.500	.500	.000	.518	.518	75.0	75.0	75.0	94.0	94.0	94.0	21.90	1.0003	0.0000
0.01	-0.30	0.00	1.0000	0.0	.500	.500	.000	.528	.528	76.0	76.0	76.0	98.0	98.0	98.0	38.94	0.9866	0.0000
0.01	-0.30	0.00	1.0000	0.0	.500	.500	.000	.527	.527	76.0	76.0	76.0	98.0	98.0	98.0	38.85	0.9884	0.0000
															AVERAGE		0.9985	0.0000

Millennium Instruments Inc.
2402 Springridge Drive unit A
Spring Grove IL. 60081
PHONE#(815)675-3225
FAX#(815)675-6965
E-mail millennium@millinst.com
www.millinst.com

Vacuum Gauge

(in. Hg)	Gauge
5.0	5.0
10.0	10.0
15.0	15.0
20.0	20.0

R-20078

Pyrometer Calibration Sheet

Pyrometer No.:001

Office: Spring Grove
Client: Ashtead Technology Rentals
Job or Reference No.:DB30B-0711-2019

Temperature Scale Used ☑ Fahrenheit ☐ Celsius

☑ Full Test ☐ Post Test

Calibration Reference Settings for Fahrenheit Scale	Pyrometer Reading	Calibration Reference Settings for Celsius Scale
50° F	50° F	10°C
100° F	100° F	38°C
150° F	150° F	66°C
200° F	200° F	93°C
250° F	250° F	121°C
300° F	300° F	149°C
350° F	350° F	177°C
400° F	400° F	204°C
450° F	450° F	232°C
500° F	500° F	260°C
550° F	550° F	288°C
600° F	600° F	316°C

Method 30B Post-Test Meter Calibration

Average Field Sample Rate (lpm)	0.5	Date	8/8/2011
Highest Field Vacuum (inches Hg)	10.0	Client	BREC
Critical Orifice ID	.5LPM	Project No.	3648
Orifice Flow Rate (lpm)	0.473	Meter ID	R-20078A

	Run 1	Run 2	Run 3	
Initial Volume (l^3)	0.000	4.676	9.411	
Final Volume (l^3)	4.676	9.411	14.181	
Volume Metered (l^3)	4.676	4.735	4.770	
DGM Temperature (°F)	106	108	112	
Ambient Temperature (°F)	87	88	88	
Elapsed Time (min.)	10.0	10.0	10.0	
Setting (l/min)	0.4	0.4	0.4	
Barometric Pressure (inches Hg)	29.50	29.50	29.50	
Pump Vacuum (inches Hg)	20.0	20.0	20.0	
K'	0.012	0.012	0.012	
Vcr (l^3)	4.285	4.281	4.281	
Vmstd (l^3)	4.303	4.342	4.344	
Post Test Yc	0.99572	0.98589	0.98555	
Full Test Yd	1.0072	1.0072	1.0072	
% Difference	1.14	2.12	2.15	
	Average Difference		1.80	

Method 30B Post-Test Meter Calibration

Average Field Sample Rate (lpm)	0.5	Date	8/8/2011
Highest Field Vacuum (inches Hg)	10.0	Client	BREC
Critical Orifice ID	.5LPM	Project No.	3648
Orifice Flow Rate (lpm)	0.487	Meter ID	R-20078B

	Run 1	Run 2	Run 3	
Initial Volume (l^3)	0.000	4.891	9.779	
Final Volume (l^3)	4.891	9.779	14.623	
Volume Metered (l^3)	4.891	4.888	4.844	
DGM Temperature (^oF)	116	116	115	
Ambient Temperature (^oF)	87	87	86	
Elapsed Time (min.)	10.0	10.0	10.0	
Setting (l/min)	0.5	0.5	0.5	
Barometric Pressure (inches Hg)	29.50	29.50	29.50	
Pump Vacuum (inches Hg)	18.0	18.0	18.0	
K'	0.012	0.012	0.012	
Vcr (l^3)	4.285	4.285	4.289	
Vmstd (l^3)	4.424	4.422	4.389	
Post Test Yc	0.96853	0.96912	0.97712	
Full Test Yd	0.9985	0.9985	0.9985	
% Difference	3.00	2.94	2.14	
	Average Difference		2.69	

Airtech Environmental Services, Inc.
S-Type Pitot Tube Inspection Form

Date 1/25/11
Pitot ID AE5-6-2
Operator EA

	Measured	Allowed
Outside Tube Diameter - Dt (inches)	0.250	NA
Base To Opening Distance - Pa (inches)	0.356	NA
Base To Opening Distance - Pb (inches)	0.356	NA
Pa/Dt	1.42	1.05-1.50
Pb/Dt	1.42	1.05-1.50
Angle $\alpha 1(^{\circ})$	2.7	10
Angle $\alpha 2(^{\circ})$	2.6	10
Angle $B1(^{\circ})$	4	5
Angle $B1(^{\circ})$	0.6	5
Opening to Opening Distance Pa+Pb (inches)	0.712	NA
Angle $Z(^{\circ})$	0.4	NA
z (inches)	0.0050	0.125
Angle $W(^{\circ})$	0	NA
w (inches)	0.000	0.031

Note Any Damage, Nicks or Dents to the Pitot Tube

Is the Pitot Tube Part of an Assembly Yes
If Yes, Complete the Section Below

Pitot	Measured	Minimum
Distance From Nozzle (inches)	0.75	0.75 in.
Pitot to Thermocouple Distance (inches)	2	2 in.
Pitot to Sample Probe Distance (inches)	6.25	3 in.

Does the Pitot Tube Meet the Above Requirements Yes
Is the Pitot Tube Free of Damage Yes

If Yes to Both, a Pitot Tube Coefficient of 0.84 is Assigned
If No to Either, then the Pitot Tube Must be Calibrated

Airtech Environmental Services, Inc.
S-Type Pitot Tube Inspection Form

Date 1/25/11
Pitot ID AE-5-6-3
Operator EA

	Measured	Allowed
Outside Tube Diameter - Dt (inches)	0.250	NA
Base To Opening Distance - Pa (inches)	0.362	NA
Base To Opening Distance - Pb (inches)	0.362	NA
Pa/Dt	1.45	1.05-1.50
Pb/Dt	1.45	1.05-1.50
Angle $\alpha 1(^{\circ})$	3.4	10
Angle $\alpha 2(^{\circ})$	2	10
Angle B1(°)	1.3	5
Angle B1(°)	2.1	5
Opening to Opening Distance Pa+Pb (inches)	0.724	NA
Angle Z (°)	0	NA
z (inches)	0.0000	0.125
Angle W (°)	0.9	NA
w (inches)	0.011	0.031

Note Any Damage, Nicks or Dents to the Pitot Tube

Is the Pitot Tube Part of an Assembly Yes
If Yes, Complete the Section Below

Pitot	Measured	Minimum
Distance From Nozzle (inches)	0.75	0.75 in.
Pitot to Thermocouple Distance (inches)	2	2 in.
Pitot to Sample Probe Distance (inches)	4.25	3 in.

Does the Pitot Tube Meet the Above Requirements Yes
Is the Pitot Tube Free of Damage Yes

If Yes to Both, a Pitot Tube Coefficient of 0.84 is Assigned
If No to Either, then the Pitot Tube Must be Calibrated

Airtech Environmental Services, Inc.
S-Type Pitot Tube Inspection Form

Date 1/25/11
Pitot ID AE-5-6-4WC
Operator EA

	Measured	Allowed
Outside Tube Diameter - Dt (inches)	0.250	NA
Base To Opening Distance - Pa (inches)	0.329	NA
Base To Opening Distance - Pb (inches)	0.329	NA
Pa/Dt	1.32	1.05-1.50
Pb/Dt	1.32	1.05-1.50
Angle $\alpha 1(^{\circ})$	2.3	10
Angle $\alpha 2(^{\circ})$	1.7	10
Angle $B1(^{\circ})$	3.9	5
Angle $B1(^{\circ})$	3.5	5
Opening to Opening Distance Pa+Pb (inches)	0.658	NA
Angle Z $(^{\circ})$	2.5	NA
z (inches)	0.0287	0.125
Angle W $(^{\circ})$	0.3	NA
w (inches)	0.003	0.031

Note Any Damage, Nicks or Dents to the Pitot Tube

Is the Pitot Tube Part of an Assembly Yes
If Yes, Complete the Section Below

Pitot	Measured	Minimum
Distance From Nozzle (inches)	0.75	0.75 in.
Pitot to Thermocouple Distance (inches)	2	2 in.
Pitot to Sample Probe Distance (inches)	5	3 in.

Does the Pitot Tube Meet the Above Requirements Yes
Is the Pitot Tube Free of Damage Yes

If Yes to Both, a Pitot Tube Coefficient of 0.84 is Assigned
If No to Either, then the Pitot Tube Must be Calibrated

Airtech Environmental Services, Inc.
S-Type Pitot Tube Inspection Form

Date 1/25/11
Pitot ID AE5-6-5
Operator EA

	Measured	Allowed
Outside Tube Diameter - Dt (inches)	0.250	NA
Base To Opening Distance - Pa (inches)	0.344	NA
Base To Opening Distance - Pb (inches)	0.344	NA
Pa/Dt	1.38	1.05-1.50
Pb/Dt	1.38	1.05-1.50
Angle $\alpha 1(^{\circ})$	1.2	10
Angle $\alpha 2(^{\circ})$	1.5	10
Angle $B1(^{\circ})$	3.1	5
Angle $B1(^{\circ})$	3.7	5
Opening to Opening Distance Pa+Pb (inches)	0.688	NA
Angle Z (°)	2.6	NA
z (inches)	0.0312	0.125
Angle W (°)	0.4	NA
w (inches)	0.005	0.031

Note Any Damage, Nicks or Dents to the Pitot Tube

Is the Pitot Tube Part of an Assembly Yes
If Yes, Complete the Section Below

Pitot	Measured	Minimum
Distance From Nozzle (inches)	0.75	0.75 in.
Pitot to Thermocouple Distance (inches)	2.25	2 in.
Pitot to Sample Probe Distance (inches)	5.25	3 in.

Does the Pitot Tube Meet the Above Requirements Yes
Is the Pitot Tube Free of Damage Yes

If Yes to Both, a Pitot Tube Coefficient of 0.84 is Assigned
If No to Either, then the Pitot Tube Must be Calibrated

Airtech Environmental Services, Inc.
S-Type Pitot Tube Inspection Form

Date January 26, 2011
Pitot ID AE5-12-3
Operator EA

	Measured	Allowed
Outside Tube Diameter - Dt (inches)	0.250	NA
Base To Opening Distance - Pa (inches)	0.338	NA
Base To Opening Distance - Pb (inches)	0.338	NA
Pa/Dt	1.35	1.05-1.50
Pb/Dt	1.35	1.05-1.50
Angle $\alpha 1(^{\circ})$	1.1	10
Angle $\alpha 2(^{\circ})$	1.1	10
Angle $B1(^{\circ})$	2.1	5
Angle $B2(^{\circ})$	3.5	5
Opening to Opening Distance Pa+Pb (inches)	0.676	NA
Angle Z $(^{\circ})$	4.3	NA
z (inches)	0.05	0.125
Angle W $(^{\circ})$	0.9	NA
w (inches)	0.01	0.031

Note Any Damage, Nicks or Dents to the Pitot Tube

Is the Pitot Tube Part of an Assembly Yes
If Yes, Complete the Section Below

	Measured	Allowed
Distance From Nozzle,X (inches)	0.75	0.75 in.
Pitot to Thermocouple Distance,W (inches)	2.25	2 in.
Pitot to Sample Probe Distance,Y (inches)	3.500	3 in.

Does the Pitot Tube Meet the Above Requirements **Yes**
Is the Pitot Tube Free of Damage **Yes**

If Yes to Both, a Pitot Tube Coefficient of 0.84 is Assigned
If No to Either, then the Pitot Tube Must be Calibrated

Sample Probe Calibration

Probe Type: 12FT M-5 PROBE **I.D. Number:** 7/8/11-3

Thermocouple Calibration

Reference Type _____ Reference I.D. No _____ Pyrometer I.D. No: _____ Degrees:

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Specification
1	Ice-32F					
2	Ambient-70F					%Difference Š 1.5
3	Hot Oil-150F					
4	Boiling H™O-212					
5	Hot Oil-320F					

* Based on Absolute Temperature (Rankine)

Does assembly meet specifications?

Geometric Pitot Calibration

"S" Pitot

Measurement		Specification
α1(°)=1.000	α2(°)=0.000	Š10°
β1(°)=1.000	β2(°)=1.000	Š05°
γ (°)=0.000	θ (°)=0.000	
Pa(")=0.363	Pb(")=0.363	Pa + Pb = A
A(")=0.725	Dt(")=0.250	

Calculations

Z(")= A sin γ =	0.0000	Š 0.125"
W(")= A sin θ =	0.00000	Š 0.03125"

Standard Pitot

Measurement (inches)		Specification
Tube O.D.	_____	(D)
Static Hole I.D.	_____	- 0.1 x (D)
Length:		
Tip to Static	_____	6 x (D)
Static to Bend	_____	8 x (D)

Does assembly meet specifications? **YES** → **If "Yes", "S" pitot Cp=0.84; Std. Pitot=0.99. If "No", wind tunnel calibration is required.**

Wind Tunnel Calibration

Reference Pitot I.D. No: _____ Reference Pitot Cp: _____

Pitot Side 'A':

Trial No.	Reference ΔP	Probe ΔP	Probe Cp*	Deviation from Average Cp*
1				
2				
3				

Side 'A' Average Probe Cp= _____

Specification: Cp Deviations Š 0.01

Pitot Side 'B':

Trial No.	Reference ΔP	Probe ΔP	Probe Cp*	Deviation from Average Cp*
1				
2				
3				

Side 'B' Average Probe Cp= _____

Specification: Cp Deviations Š 0.01

*Probe Cp= (Reference Cp)[(Reference ΔP/ Probe ΔP); Cp Deviation= Trial Cp - Average Probe Cp

'A' Average Cp		'B' Average Cp		Difference	
	—		=		|Difference| Š 0.01

Does assembly meet specifications? → **If "Yes", Cp= Average of Side 'A' and 'B' Cp values. If "No", Pitot must be replaced.**

All specifications are from EPA-600/9-76-005, section 3.1

Probe Cp= 0.84 Calibrated by: Dscreen Date: 7/8/2011

CleanAir