PROCESS POLLUTANT DETERMINATION
FOR COMPLIANCE EMISSION TESTING

BANBURY MIXER NO. 5
TEST DATE OCTOBER 23 AND 24, 2018

Prepared For:

THE GOODYEAR TIRE AND RUBBER COMPANY
1901 GOODYEAR BOULEVARD
DANVILLE, VIRGINIA 24541

Prepared By:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
CHARLOTTE, NORTH CAROLINA

CEC Project 182-545

November 27, 2018

Civil & Environmental Consultants, Inc.

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REPORT CERTIFICATION

This report, testing details, and approach have been developed under the supervision (including review) of the persons named below. Results contained in this report relate only to the sources tested and the parameters included in the test program.

Civil & Environmental Consultants, Inc. (CEC) operates as an accredited air emission testing body (AETB) under a quality management system in conformance with ASTM D7036-04 (Reapproved 2011) “Standard Practice for Competence of Air Emission Testing Bodies”. CEC has been issued accreditation certificate number 3913.01, expiration November 30, 2017, by the joint American Association for Laboratory Accreditation (A2LA) and the Stack Testing Accreditation Council (STAC).

Date 11/27/18

Signature W. Quentin Best

W. Quentin Best, QSTI
Senior Project Manager
Civil & Environmental Consultants, Inc.

Date 11/27/18

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1.0 INTRODUCTION

Civil & Environmental Consultants, Inc. (CEC) of Charlotte, North Carolina was contracted by The Goodyear Tire and Rubber Company (Goodyear) to conduct a compliance test on Banbury Mixer No. 5 (ID. No. EU-005) located in Danville, Virginia. The results of the total particulate matter (PM) provided in this report will be used to determine compliance with Title V Permit No. BRRO-30106 issued by the Commonwealth of Virginia Department of Environmental Quality (VDEQ).

The emission testing on the fabric filter exhaust of Banbury Mixer No. 5 was performed on October 23 and 24, 2018. Three 2-hour sampling runs were conducted for total particulate matter and PM10. United States Environmental Protection Agency (US EPA) Methods 1 through 5 and 202 were used for the determination of total particulate matter concentrations and emission rates. The test runs were conducted concurrently during normal plant operations. The sampling and analytical procedures used in this test program were those established by the US EPA and VDEQ in standard reference test methods and appropriate sampling and analytical procedures.

Table 1 – List of Project Participants The Goodyear Tire & Rubber Company Danville, Virginia Facility			
Participant	**Title**	**Affiliation**	**Contact**
W. Quentin Best	Senior Professional	CEC, Inc.	Telephone: 980.237.0373 Facsimile: 980.237.0372 qbest@cecinc.com
Bryan L. Starnes	Project Manager	CEC, Inc.	
Matt Caton	Environmental Manager	The Goodyear Tire & Rubber Company	Telephone: 413.791.9170 matthew_caton@goodyear.com

Mr. Matt Caton of Goodyear was responsible for coordinating the referenced process and for the collection of process operations data. This data is presented in Appendix F.

This report contains the results of the emission tests conducted during the test program. Copies of reference method field data sheets, sample analysis data, example calculations and equipment calibration records are included as appendices to this report.

2.0 SUMMARY OF TEST RESULTS

This section presents a summary of the particulate matter sampling. Detailed sampling results and example calculations for the test program can be found in Appendix A. Field data sheets and sample recovery documentation are presented in Appendix B. Appendix C contains the laboratory report. Appendix D presents copies of the current reference method equipment calibration records. Appendix E contains copies of the Qualified Stack Test Individual (QSTI) certifications for CEC testing personnel. Appendix F contains documentation of the production during the compliance test.

2.1 SAMPLING RESULTS

The summary of the results for the tests performed at the Banbury Mixer No. 5 is presented in Table 2 below. The emission rates presented in the following tables were calculated based upon emission stream conditions measured during the test period. The calculations were conducted in accordance with the appropriate test methods.

Table 2 – Total Particulate Matter

Fabric Filter Exhaust from Banbury Mixer No. 5

Total Particulate Matter	Average Emission Rate				
	Run 1	Run 2	Run 3	Average	Limit
gr/dscf*	0.00034	0.00030	0.00032	0.00032	0.01
lb/hr**	0.25	0.23	0.24	0.24	

* gr/dscf = grains per dry standard cubic foot
** lb/hr = pound per hour

Goodyear has been issued Title V Permit No. BRRO-30106 by VDEQ. The applicable emission limit for particulate matter at the Banbury Mixer is 0.01 grains per dry standard cubic foot (gr/dscf). The results of the Banbury Mixer No. 5 test program demonstrate that the tested unit was in compliance with the applicable air emission limit for total particulate matter.

2.2 PRODUCTION RATES

Table 3 presents the production rates for the process tested at the Goodyear, Danville, Virginia facility.

Table 3 – Production Rates
The Goodyear Tire & Rubber Company
Danville, Virginia Facility

Sample Location	Run 1	Run 2	Run 3
Banbury Mixer No. 5	10/23/18	10/23/18	10/24/18
	1318-1537	1616-1842	0803-1048
	39 Batches 38,490 lbs.	41 Batches 39,574 lbs.	43 Batches 41,949 lbs.

3.0 PROCESS DESCRIPTION

The Goodyear facility operates nine Banbury mixers. Banbury No. 5 was chosen as a representative of the nine Banbury mixers.

Figure 1 details the airflow schematic for the referenced system. Production data and control device parameters during the sampling were recorded by Goodyear personnel and are presented in Appendix F. The sampling was performed during material processing.

Banbury Mixer No. 5

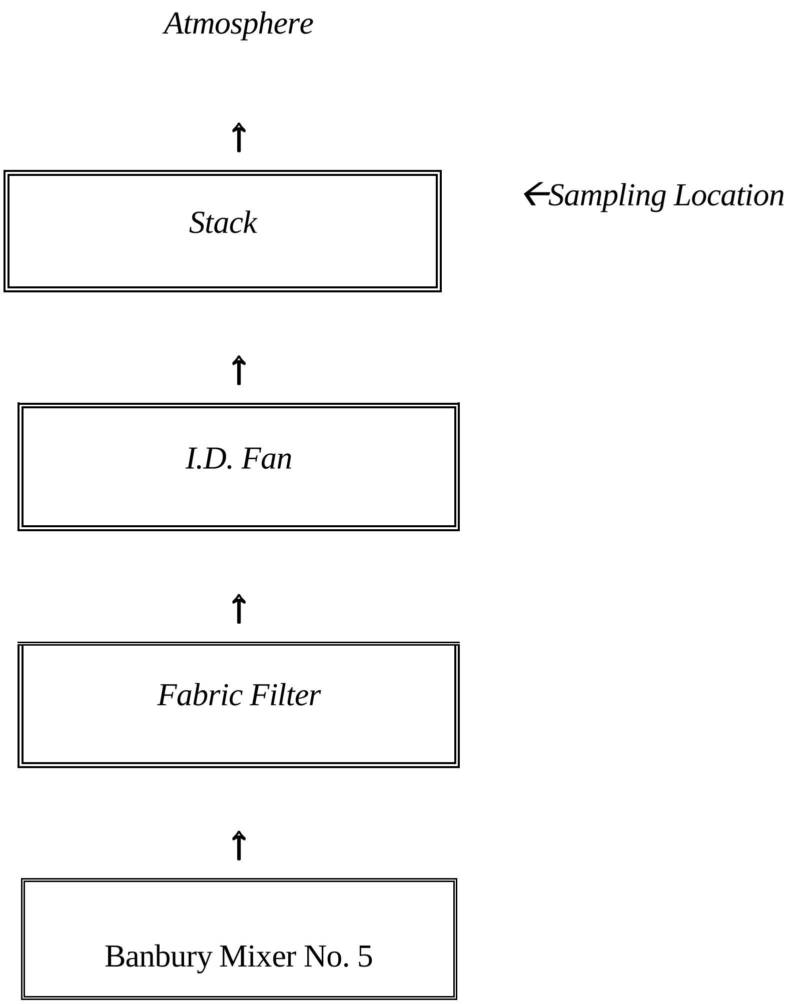


Figure 1 - Process Air Flow Schematic

4.0 SUMMARY OF THE REFERENCE TEST METHODS

This section describes the sampling strategy, sampling and analytical methods, and quality assurance/quality control procedures implemented during this project.

4.1 SAMPLING STRATEGY

The US EPA methods that were utilized in this sampling program were:

- Method 1 for the location of sampling ports and points, and determination of cyclonic flow;
- Method 2 for velocity / volumetric flow rate determination, and assignment of dry molecular weight of the stack gas;
- Method 4 for the determination of moisture in the stack gas;
- Method 5 for the determination of particulate matter; and
- Method 202 for the determination of condensable particulate matter.

These test methods are available in the Code of Federal Regulations Volume 40, Part 60, US EPA's web site www.epa.gov/ttn/emc/, and/or by request from CEC.

4.2 SAMPLING AND ANALYTICAL PROCEDURES

A sampling and analysis synopsis for these methods is discussed briefly in the following subsections.

4.2.1 US EPA Method 1-Sampling Point Determination

For this test program, the US EPA Method 1 was used to determine the appropriateness of the existing ports as the sampling location at the Banbury Mixer No. 5 stack. The duct diameters upstream and downstream from the sampling ports were determined prior to sampling. The number of traverse points was chosen with respect to sampling port location. For particulate traverses, Method 1 specifies a minimum of 8 traverse points for sampling ports located >8/>2 downstream/upstream stack diameters from flow disturbances and a maximum of 24 traverse points in circular ducts and 25 points in rectangular stacks when located >2/>0.5 downstream/ upstream stack diameters from flow disturbances.

The dimensions of the stack and the location of the sampling ports and points are detailed in Figure 2. Method 1 sampling criteria was maintained. The Banbury Mixer No. 5 Exhaust Stack was a rectangular duct divided into 25 equal traverse areas (five by five square matrix) with ports labeled A, B, C, D and E (five sample points per port). During the Method 5/202 sampling runs, the individual points were sampled for a period of five minutes, which yielded a total test of 125 minutes.

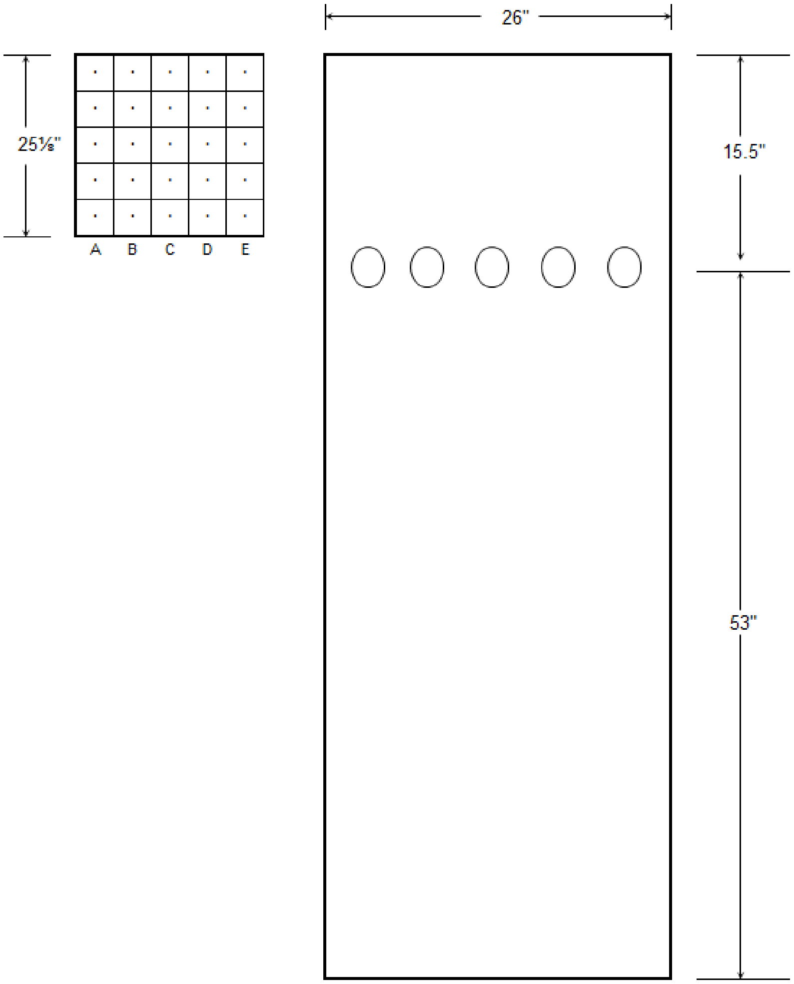
The Banbury Mixer No. 5 sampling location was determined to be less than 20° and in compliance with US EPA Method 1, Section 11.4.2 for cyclonic flow. A copy of this data can be found in Appendix B.

Banbury Mixer No. 5 Exhaust Stack

Table 4 – Stack Diameter and Upstream/Downstream Measurements
Banbury Mixer No.5 Exhaust Stack - The Goodyear Tire & Rubber Company
Danville, Virginia Facility- Method 1

System	Stack Equivalent Diameter (*De) (inches)	Upstream (inches)	Downstream (inches)	Total number of sampling points per run
Banbury Mixer No. 5 Stack Rectangular 25⅛ by 26 inches	25.56	15.5	53	25

*De = 2(length x width)/(length + width)



Not to Scale

Figure 2 - Location of Sampling Ports and Points

4.2.2 US EPA Method 2 Velocity and Volumetric Flow Rate Determination

Method 2 was used for determining the average gas velocity from measurements of gas density and the average velocity head with a Type S (Stausscheibe or reverse type) pitot tube (0.84 coefficient). This method is applicable for quantifying gas flows for stacks that are 12 inches and over in diameter which meet the criteria of Method 1.

During this project, the sampling locations met the criteria detailed in Method 1. Gas stream density was assigned a value per Method 2 Section 8.6. Moisture determination was performed by Method 4. The velocity traverses were performed using Method 2 where the principal components of the gas velocity measurement system were sequentially:

- A calibrated stainless steel Type S pitot tube and Type K thermocouple;
- Leak-free interface tubing between pitot tube and differential pressure gauge;
- A 0 to 10 inch inclined manometer; and
- An NIST traceable pyrometer.

The apparatus was set-up according to manufacturer and reference method recommendations. Pre-test and post-test leak checks were conducted using procedures outlined in Method 2, Section 8.0. Velocity head and temperature measurements were performed during each sampling run at the traverse points specified by Method 1. The effluent gas temperature was measured with chromel-alumel thermocouples equipped with a digital temperature indicator. The atmospheric and static pressure of each stack was also determined during each sample run. The volumetric flow rate calculations used were those specified in Method 2, Section 12. Figure No. 3 show a typical S-type Pitot tube velocity measurement system.

CEC conducted measurements of the face opening alignments, external tubing diameter, and base-to-opening plane distances of the pitot tubes. These measurements meet the design criteria in US EPA Method 2 for a Type “S” pitot tube, and therefore a baseline coefficient value of 0.84 inches was assigned to the Pitot tube. Verification of these measurements were recorded onto a Pitot tube calibration worksheet and presented in Appendix D of the final report.

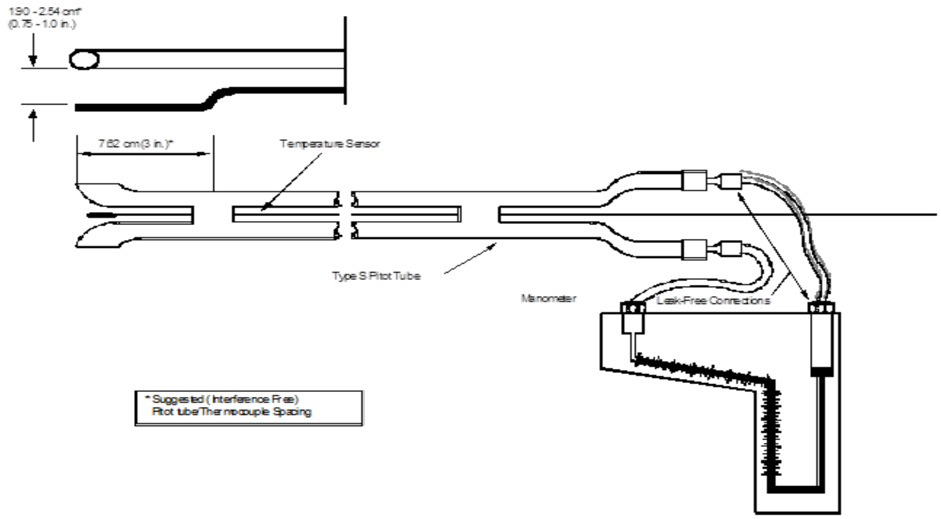


Figure 3 - S-Type Pitot Velocity Measurements System

4.2.3 US EPA Method 3 Molecular Weight Rate Determination

Method 3 is applicable for determining carbon dioxide and oxygen concentrations and dry molecular weight of a sample from a gas stream of a fossil-fuel combustion process. This method may also be applicable to other processes where it has been determined that compounds other than carbon dioxide, oxygen, carbon monoxide, and nitrogen are not present in concentrations sufficient to affect the results. However, US EPA Method 2, Section 8.6 states, “For processes emitting essentially air, an analysis needs not be conducted; use a dry molecular weight of 29.0.” The Banbury mixer was emitting essentially air, therefore the emission rate calculations were based on a dry molecular weight of 29.0.

4.2.4 US EPA Method 4 Moisture Determination

Method 4 involves the determination of stack gas moisture. The moisture content is used to correct the emission concentration or mass emission rate to a dry basis. EPA Method 4 and *Field Procedure 4* of the QA Handbook were used to measure stack gas moisture content. *Field Procedure 4* provides detailed information on the application of Method 4.

Preliminary flue gas moisture content (for purposes of setting the isokinetic flow rate) was determined using wet bulb/dry bulb thermometers and partial pressure, vapor and saturated vapor pressure equations. This technique is described in Method 4 and is summarized below:

- Moisten the wet bulb thermometer wick with deionized water;
- Insert both thermometers into the flue gas stream and monitor the wet bulb temperature;
- When the wet bulb temperature has stabilized, record both the wet bulb and dry bulb thermometer temperatures; and
- Calculate the flue gas moisture content (PMV) using the appropriate equations.

The moisture content for emission rate calculations was determined in conjunction with the Method 5 isokinetic sampling train. The reference method involves the withdrawal of gaseous and particulate pollutants from the emission source at an isokinetic rate using a Method 5 sampling system. The sampling and analytical procedure for reference Method 4 will be discussed in detail in Section 4.2.5 with the isokinetic sampling procedures.

4.2.5 US EPA Method 5 and 202 Total Particulate Matter Sampling and Analysis

Testing for total particulate matter was performed according to US EPA Methods 5 and 202. Gaseous and particulate pollutants were withdrawn isokinetically from the emission source and collected in a multi-component sampling train. In principle, filterable particulate matter includes any material that was condensed at or above the filtration temperature of approximately 250 degrees Fahrenheit and was collected on a tared glass fiber filter. The condensable particulate matter (CPM) is collected in the dry impinger system after the filterable particulate matter has been collected on the filter. The CPM is collected in the condenser system/ water drop out impinger and CPM filter. The gaseous components are bubbled through a measured volume of chilled deionized water to determine the moisture content of the emission source. The principal components of the sampling system were sequentially:

- A stainless steel sample nozzle and borosilicate probe liner;
- A heated (248°F ±25°F) probe and filter assembly with tared glass fiber filter;

- An impinger train consisting of a dry and wet impinger system. The dry impinger system consisted of a condenser and a dropout impinger; followed by an empty modified Greenburg Smith impinger and a CPM filter. Following the CPM filter, the wet impinger system consisted of two impingers. The first containing 100 ml of deionized water followed by a final impinger containing 200 grams of silica gel; and
- A metering system capable of maintaining an isokinetic sampling rate and accurately determining the sample volume according to specifications in APTD-0581.

After the test run, the impingers were weighed to determine moisture. The collected condensate measurements were recorded on the Method 4 moisture determination data analysis form. An impinger stem was added to the dropout impinger so that the stem extended below the water level. Nitrogen purged deionized water was added to the impinger to ensure the water level was over the stem for the duration of the purge. The sampling train was reassembled and connected to an ultra-high purity nitrogen gas cylinder for a one-hour purge with nitrogen at 14 liters per minute.

The tared filter, which collected the filterable particulate matter sample, was carefully removed from the glass filter support and sealed in a Petri dish. The nozzle, probe liner, and front filter-half of the filter assembly were brushed and rinsed with acetone into a glass storage container, which was sealed, and the liquid level was marked.

After the purge, liquid in the dropout impinger and backup impinger was collected into a clean sampling container (CPM container No. 1). The back filter-half, condenser, dropout impinger, backup impinger, the front half of the CPM filter assembly and connecting glassware were twice rinsed with deionized water into CPM container No.1. Following the water rinses, the glassware was rinsed once with acetone and rinsed twice with hexane and was recovered into CPM Container No.2. The CPM filter was removed from the filter holder and sealed in a labeled Petri dish. The sample containers were transported to Enthalpy Analytical, Inc. in Durham, North Carolina for gravimetrical analysis. Documentation of the laboratory analysis and chain-of-custody can be found in Appendix C. The condensable fractions of the sample runs were train blank corrected.

5.0 QUALITY ASSURANCE / QUALITY CONTROL RESULTS

CEC has established quality assurance and quality control (QA/QC) guidelines for providing quality sampling and analytical data from source tests. These QA/QC procedures were implemented to ensure the acceptability and reliability of the data generated.

In summary, an appropriate degree of data quality was maintained throughout this project. Leak checks and isokinetic QA criteria were met for the full sampling run. The sampling trains were leak checked prior to and immediately after sampling. Leak rates for the isokinetic sampling trains were less than the maximum criterion of 0.02 cubic feet per minute. The sampling rates were also within the 100% ±10% criterion established for isokinetic sampling. Quality control procedures for the particulate matter determinations have included the analysis of acetone rinse blanks. The result of the method blank is reported in Appendix C with the laboratory data. Table 5 presents the quality controls for isokinetic sampling.

Both qualitative and quantitative factors contribute to field measurement uncertainty and should be taken into consideration when interpreting the results presented in this test report. There are several factors that can affect qualitative and quantitative measurements.

Qualitative uncertainty factors include, but are not limited to, unknown chemical interferences, sample matrix interactions, environmental conditions, sample handling and instrument operation and maintenance. To reduce the impact of these qualitative uncertainty factors, CEC has developed a set of Standard Operating Procedures (SOPs) in accordance with our corporate quality assurance guidelines and ASTM D 7036-04.

Quantitative uncertainty factors known to directly affect uncertainty include the accuracy of calibration standards as well as the precision and accuracy of instrument measurements and the test methods utilized. To reduce the impact of these quantitative uncertainty factors, CEC utilizes testing and analytical methodology that has been approved by EPA or the American Society for Testing and Materials (ASTM) where applicable. In addition, CEC personnel perform routine instrument and equipment calibrations according to manufacturer's guidelines and/or test method specifications.

The limitations of the various methods, instruments, equipment, and materials utilized during this project have been reasonably considered to be in accordance with the project data quality objective, but the ultimate impact of the cumulative uncertainty of this project is not fully identified within the results of this test report.

Table 5 – Quality Assurance and Quality Control Data – Method 5/202

Banbury Mixer No. 5		Run 1	Run 2	Run 3	**Criteria**
Leak Checks	Method 5	0.002	0.001	0.003	< 0.020 cu. ft.
Isokinetics		99.2	99.9	99.9	100 ± 10%
Post Meter Calibration – Alternative (ALT-009)				Meter Box 300.045 Avg. Y = 1.019	0.976 ± 0.05

Field data and final laboratory results were entered into CEC's air quality data system by a staff professional, and reviewed by a project manager for verification of data. After QC review by the project manager, a senior professional verified the final report for completeness and reasonableness of data. The report was returned to the staff professional for review and preparation of the final draft. The report requires the signature of the staff professional and a project manager before release to the client. Data and final reports are archived in a secured area for a minimum period of seven years. CEC's field and laboratory test equipment has been maintained and calibrated in accordance with quality assurance procedures established by the US EPA in the QA handbook. Equipment calibrations including pre-test and post-test calibration data are presented in Appendix D

6.0 APPENDICES

This section contains detailed supportive documentation that encompasses the relevant aspects of the emission test program. Its contents serve as the foundation for the test report. The emission test report presents a summary of the information gathered during the sampling activities. The information contained in the appendices is necessary to facilitate the review of the emission test report and determine whether proper procedures were used to accomplish the test plan objectives.

Defensible data and the subsequent pollutant concentrations and emission rates are the primary objectives of the emission test program. To this end, the test results, example calculations, field data sheets, sample recovery, laboratory results, chain-of-custody documentation, and equipment calibrations have been provided to support these objectives.

APPENDIX A
SUMMARY OF RESULTS AND EXAMPLE CALCULATIONS

SUMMARY OF RESULTS
EPA METHOD 5 and 202
Determination of Total Particulate Matter Concentrations and Emission Rates

Run Number		1	2	3	Average
	Sample Identification	182545-01	182545-02	182545-03	----
	Date:	10/23/2018	10/23/2018	10/24/2018	----
q	Net Time of Test, minutes	125.0	125.0	125.0	----
	Sample Time, 24-hour clock	1318-1537	1616-1842	0803-1048	----
P_{bar}	Barometric Pressure, in. Hg	29.55	29.55	29.62	29.57
P_g	Static Pressure, in. H_2O	0.48	0.48	0.63	0.53
P_S	Stack Pressure, Absolute, in. Hg	29.59	29.59	29.67	29.61
V_M	Actual Meter Volume Sampled, cu. ft.	80.100	84.293	82.714	82.369
DH	Avg. Delta H, in. H_20	1.28	1.40	1.41	1.37
T_M	Avg. Gas Meter Temp., Deg. F	78.8	76.9	61.5	72.4
$V_{m(STD)}$	Volume Sampled at Stand. Cond., cu. ft.	75.874	80.154	81.163	79.064
V_C	Volume of Water Collected, ml	0.0	2.9	-0.1	0.9
$V_{wc(std)}$	Volume of Water Vapor at Std. Cond.,SCF	0.00	0.14	0.00	0.04
W_C	Volume of Water Collected in Silica Gel, g	15.1	17.2	16.6	16.3
$V_{wsg(std}$	Vol. of Water Vapor in Silica Gel at Std. Cond., SCF	0.71	0.81	0.78	0.77
B_{WS1}	Moisture Content of Gas Stream	0.009	0.012	0.009	0.010
P_{MV1}	Calculated Percent Moisture in Stack	0.9	1.2	0.9	1.0
P_{MV1S}	Saturated Percent Moisture in Stack	5.2	5.5	3.5	4.7
P_{MV1R}	Reported Percent Moisture in Stack	0.9	1.2	0.9	1.0
M_{FD1}	Mole Fraction of Dry Gas	0.991	0.988	0.991	0.990
M_d	Mole. Wt. Stack Gas, Dry Basis, lb/lb mole	29.0	29.0	29.0	29.0
M_S	Mole. Wt. Stack Gas, Wet Basis, lb/lb mole	28.90	28.87	28.90	28.89
Cp	Pitot Tube Coefficient	0.84	0.84	0.84	0.84
DPS	Avg. Sqrt. Delta P, in. H20	0.591	0.603	0.600	0.598
T_S	Avg. Stack Temp., Deg. F	92.3	94.6	80.3	89.1
V_S	Avg. Stack Velocity, ft/sec	34.1	34.9	34.2	34.4
A	Area Stack, ft^2	4.54	4.54	4.54	4.54

SUMMARY OF RESULTS
EPA METHOD 5 and 202
Determination of Total Particulate Matter Concentrations and Emission Rates

Run Number		1	2	3	Average
Q_{SD}	Gas Volume Flow, Dry Std. Cond. CFM	8,691	8,829	8,933	8,818
Q_A	Actual Gas Volume Flow, CFM	9,280	9,490	9,308	9,359
Q_{SW}	Gas Volume Flow, Wet Std. Cond., CFM	8,772	8,934	9,019	8,908
D_n	Sample Nozzle Diameter, inches	0.242	0.246	0.246	0.245
A_n	Area of Nozzle, ft^2	0.00032	0.00033	0.00033	0.00033
I	Percent Isokinetic	99.2	99.9	99.9	99.7
Mb #	Meter Box Number	300.045	300.045	300.045	---
DH@	DH@ of Meter Box @ 0.75 SCFM	1.732	1.732	1.732	---
Y_{qa}	Alt. Mthd 5 Posttest Calibration (ALT-009)	1.023	1.014	1.021	1.019
Y	Meter Calibration Factor	0.976	0.976	0.976	---

Summary of Results
EPA Methods 5 and 202
Determination of Total Particulate Matter Concentrations and Emission Rates

Run Number		1	2	3	Average
	Sample Identification	182545-01	182545-02	182545-03	
Filterable Particulate Matter (PM) Concentration and Emission Rates					
m_n	Particulate Catch, mg	13.0	12.7	14.6	13.4
C_s	PM Concentration, gr/dscf	0.0027	0.0024	0.0028	0.0026
C_{sm}	PM Concentration, mg/dscm	6.07	5.57	6.33	5.99
C_{AW}	PM Emission Rate, lbs/hr	0.20	0.18	0.21	0.20
Condensable Particulate Matter (CPM) Concentration and Emission Rates					
m_{cpm}	CPM Catch, mg	3.6	3.1	2.1	2.9
C_{sc}	CPM Concentration, gr/dscf	0.00073	0.00060	0.00040	0.00058
C_{sm}	CPM Concentration, mg/dscm	1.68	1.37	0.91	1.32
C_{AWc}	CPM Emission Rate, lbs/hr	0.055	0.045	0.031	0.043
Total Particulate Matter (TPM) Concentration and Emission Rates					
C_{sT}	TPM Concentration, gr/dscf	0.0034	0.0030	0.0032	0.0032
C_{sm}	TPM Concentration, mg/dscm	7.75	6.94	7.24	7.31
C_{AWT}	TPM Emission Rate, lbs/hr	0.25	0.23	0.24	0.24

Summary of Results
EPA Methods 5 and 202
Determination of Total Particulate Matter Concentrations and Emission Rates

Example Calculations Run 1

Stack Pressure, Absolute, in. Hg
$P_S = P_{bar} + (P_g / 13.6) =$ 29.585

Volume Sampled at Stand. Cond., cu. ft.
$Vm(std) = (Vm * Y *(Pbar + \Delta H / 13.6) * Tstd) / (Pstd * (Tm + 460) =$ 75.874

Method 4 Calculations:
Volume of Water Vapor at Std. Cond., SCF
$V_{WC(std)} = 0.04706 * V_C =$ 0.00

Vol. of Water Vapor in Silica Gel at Std. Cond., SCF
$V_{wsg(std)} = 0.04715 * W_C =$ 0.71

Moisture Content of Gas Stream
$B_{WS1} = (V_{WC(std)} + V_{wsg(std)}) / (V_{m(std)} + V_{WC(std)} + V_{wsg(std)}) =$ 0.009

Percent Moisture in Stack
$P_{MV1} = 100 * (V_{WC(std)} + V_{wsg(std)}) / (V_{m(std)} + V_{WC(std)} + V_{wsg(std)}) =$ 0.9

Saturated Stack Moisture using Stack Temperature (°F): Note if $\%S_{VP} > 100\% = 100\%$
$P_{MV1S} = \%S_{VP} = (100/Ps) * 10^{(6.6921-(3144/(T+390.86)))}$ 5.2

Reported Stack Moisture according to Method 4 Section 12.1.7
In saturated or moisture laden gas streams, the lower Bws (PMV1 or PMV1S) is considered correct 0.9

Mole Fraction of Dry Gas
$M_{FD1} = (100 - P_{MV}) / 100 =$ 0.991

Mole. Wt. Stack Gas, Dry Basis, lb/lb mole
Md is assigned a value per EPA Method 2, Section 8.6 = 29.0

Mole. Wt. Stack Gas, Wet Basis, lb/lb mole
$M_S = M_d * (1 - B_{ws}) + 18.0 * B_{ws} =$ 28.898

Avg. Stack Velocity, ft/sec
$Vs = Kp * Cp * (\Delta Pavg)1/2 * ((Ts +460)/(Ps * Ms))1/2$ 34.10

Gas Volume Flow, Dry Std. Cond. CFM
$Q_{SD} = (60 \text{ sec/min} * (1-B_{ws}) * V_s * A * ((T_{std} * P_s) / (T_{s(abs)} * P_{std}))$ 8,691

Actual Gas Volume Flow, CFM
$Q_A = V_S * A * 60 \text{ sec/min} =$ 9,280

Gas Volume Flow, Wet Std. Cond., CFM
$Q_{SW} = Q_{SD} * [1/(1-B_{WS})] =$ 8,772

Area of Nozzle, ft^2

Summary of Results
EPA Methods 5 and 202
Determination of Total Particulate Matter Concentrations and Emission Rates

Example Calculations Run 1

$A_n = ((D_n / 2)^{\wedge 2} * 3.14159)/144 =$ 0.00032

Percent Isokinetic
$I = (0.0945 * (TS + 460) * Vm\ (STD)) / (\theta * VS * PS * (1 - Bws) * An) =$ 99.2

Alternative Method 5 Posttest Calibration (ALT-009) Criteria: (Y± 0.05)
$Yqa = (\theta/Vm) * ((0.319*T_m)/(\Delta H_{@}*(Pb+(\Delta H_{avg}/13.6)))*(29/M_d))\wedge^{1/2} * (\Delta H_{avg})\wedge^{1/2} =$ 1.023

Filterable Particulate Matter (PM) Concentration and Emission Rates

Filterable Particulate Concentration, gr/dscf (At Standard Conditions)
$C_S = 0.015432358$ grain/ I mg $* m_n / V_{STD} =$ 0.0027

Filterable Particulate Matter Concentration, mg/dscm
Csm = mass (mg) / (Vmstd (dscf) * 0.028316847) 6.07

Filterable Particulate Emission Rate, lbs/hr (At Standard Conditions)
$C_{AW} = 60$ min/hr / 7000 grain/lb $* C_s * Q_{Sd} =$ 0.20

Condensable Particulate Matter (CPM) Concentration and Emission Rates

CPM Concentration, gr/dscf
$C_S = 0.015432358$ grain/ I mg $* m_n / V_{STD} =$ 0.00073

CPM Concentration, mg/dscm
Csm = mass (mg) / (Vmstd (dscf) * 0.028316847) 1.68

CPM Emission Rate, lbs/hr
$C_{AW} = 60$ min/hr / 7000 grain/lb $* C_s * Q_{Sd} =$ 0.055

Standard Conditions 68 Deg. F, 29.92 in. Hg
Pstd = 29.92 in. Hg
Tstd = 528 °R

APPENDIX B
FIELD DATA SHEETS

EPA Method 1
Determination of Sampling Ports and Points

Client The Goodyear Tire & Rubber Co.
City/State Danville, VA
Sampling Location Dust Collector BBC5
Date 10 / 22 /18

Sampling Location Dimensions, in inches:
From Far Wall to Outside of Port 25 1/8''
Nipple Length 0
Depth of Duct 25.125''
Width (Rectangular Duct) 26.0''

Equivalent Diameter Calculation (DE):

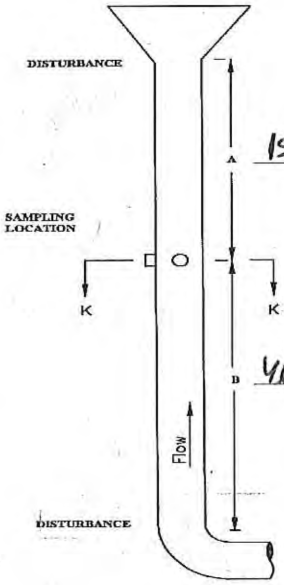
$$DE = \frac{2 \times Length \times Width}{Length + Width} = \frac{2(25\frac{1}{8})(26.0)}{(25\frac{1}{8} + 26.0)} = \overset{BU}{\cancel{26}}\ 25.555$$

Distance to Ports From Nearest Flow Disturbance:

	Upstream - A	Downstream - B
Dimensions in Inches	15.5''	BU ~~41.0''~~ 53''
Duct Diameters	0.61	BU ~~1.60~~ 2.07 ✓

Stack Area, in Square Feet 4.536 ✓
Calculations By BU

Schematic of Sampling Location



15.5''

BY ~~40.5''~~ BY ~~41.0''~~

53'' with stack extension added

Location of Traverse Points in Circular Stacks					
	4	6	8	10	12
1	6.7	4.4	3.2	2.6	2.1
2	25.0	14.6	10.5	8.2	6.7
3	75.0	29.6	19.4	14.6	11.8
4	93.3	70.4	32.3	22.6	17.7
5		85.4	67.7	34.2	25.0
6		95.6	80.6	65.8	35.6
7			89.5	77.4	64.4
8			96.8	85.4	75.0
9				91.8	82.3
10				97.4	88.2
11					93.3
12					97.9

Location of Traverse Points in Rectangular Stacks							
	2	3	4	5	6	7	8
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8
3		83.3	62.5	50.0	41.7	35.7	31.3
4			87.5	70.0	58.3	50.0	43.8
5				90.0	75.0	64.3	56.3
6					91.7	78.6	68.8
7						92.9	81.3
8							93.8
9							
10							
11							
12							

Point	% of Stack ID	Stack ID, in.	Distance From Inside Wall, in.	Nipple Length, in.	Distance From Outside of Port, in.
1	10.0	25 1/8	2.51	0.0	2.51
2	30.0		7.54		7.54
3	50.0		12.56		12.56
4	70.0		17.59		17.59
5	90.0		22.61		22.61 ✓

Stack Diameter = 12 - 24 inches Relocate to 0.50 inches from stack wall
Stack Diameter > 24 inches Relocate to 1.00 inches from stack wall

Audited by: WOB **(Personnel)** **Date:** 10 /24/ 18 **Completeness** ✓ **Legibility** ✓ **Accuracy** ✓
Audited by: **(Team Leader)** **Date:** 4 / 8 / 18 **Specifications** ✓ **Reasonableness** ✓

EPA Method 2

Determination of Stack Gas Velocity, Volumetric Flow Rate and Cyclonic Flow

Client The Goodyear Tire & Rubber Co.
Sampling Location Dust Collector BBC5
Run Date 10 / 22 /18
Barometric Pressure, in. Hg 29.65
Static Pressure, in. H_2O + 0.46
Pitot Tube Coefficient 0.84

City, State Danville, VA
Operators BLS, EWC
Time 1725
Pitot Tube I.D. No. 200.708
Date Calibrated 9/5/18
Leak Check, in. H_2O <0.1 @ +0.43 / -0.40 Magnehelic - cyclonic flow 6.0/7.5

Field Data

Traverse Point Number	Velocity Head Δp Inches H_2O		Stack Temperature °F		Cyclonic Flow Determination			
					Δp, at 0° Reference		Angle Which Yields a Null Δp	
	A	B	A	B				
A1	0.84	8	87		0.08		3	
2	0.86		88		.18		5	
3	0.83		88		.16		6	
4	0.84		88		.064	[illegible]	3	
5	0.86		88		.06		7	
B1	0.76		88		.12		10	
2	0.75				.14		11	
3	0.66				.14		13	
4	0.67				.12		8	
5	0.75				.10		8	
C1	0.62		88		.22		12	
2	0.41				.16		9	
3	0.36				.12		11	
4	0.36				.08		12	
5	0.50				.10		8	
D1	0.34		88		0.14		11	
2	0.25				0.10		10	
3	0.12				0.04		9	
4	0.11				0.04		19	
5	0.14				0.08		20	
E1	0.11		87		0.0		0	
2	0.10				0.0		0	
3	0.04				0.02		16	
4	0.02				0.01		5	
5	0.01				0.00		0	
Averages	0.453 ✓		87.76 ✓					8.64° ✓

Stack Temperature, Dry, °F (A) —
Stack Temperature, Wet °F (B) —
Difference (A - B) —
Preliminary Percent Moisture 2-3% ambient

Comments

Audited by: (Personnel) **Date:** 10/24/18 **Completeness** ✓ **Legibility** ✓ **Accuracy** ✓
Audited by: (Team Leader) **Date:** 11/8/18 **Specifications** ✓ **Reasonableness** ✓

CEC
Civil & Environmental Consultants, Inc.

Isokinetic Field Data Sheet - EPA Method 5/202

Client The Goodyear Tire & Rubber Co.
City/State Danville, VA
Sampling Location Dust Collector BBC5

Run Number 1
Date 10 / 23 /18
Operators BLS, EWC

Bar. Press., In. Hg 29.55
Static Press., In. H_2O +0.48
Meter Box No. 300. 045 F
Sample Box No. M-Trm A
Probe/Pitot No. 200. 064
Probe Temp. Setting 250
Sample ID No. 182545-01
Filter No. Q-242

NOMOGRAPH SET-UP: K Factor 3.337
ΔH @ 1.732 Y = 0.9756
Meter Temp. 83
Stack Temp. 88
Pitot Coeff. 0.84
% Moisture 3
C Factor —
Start Time 1318

Avg. Δ P 0.453
Ref. Δ P —
Desired Nozzle 0.248
Nozzle No. 300.240
Nozzle Calibration 0.242, 0.242, 0.242
Nozzle Diameter 0.242
End Time 1537

LEAK CHECKS
Pre-Test 0.004 @ 15.0 In. Hg.
Post-Test 0.002 @ 6.0 In. Hg.
Pre-Test Pitot <0.1 @ +5.6/-6.1 In. H_2O
Post-Test Pitot <0.1 @ +4.5/-4.9 In. H_2O
Observer James Pickett
Agency VADEQ

Sample Point	Clock Time	Dry Gas Meter Cubic Feet	Pitot Reading Δ P In. H_2O	Orifice Setting ΔH Inches H_2O Ideal	Actual	Dry Gas Meter Temp. °F	Pump Vacuum Inches Hg	Stack Temp °F	Probe Temp °F	Filter Box °F	CPM Filter Exhaust °F	Imp. Temp °F
ISO✓ 99% → A1	0	593.500	0.65	2.17	2.15	73	3.0	90	238	254	71	63
2	5	597.74	0.62	2.07	2.05	73	3.0	90	257	256	69	54
3	10	601.92	0.67	2.24	2.25	74	3.0	91	255	249	66	53
4	15	606.33	0.69	2.30	2.30	75	3.5	91	256	253	65	56
5	20	610.75	0.68	2.27	2.25	75	3.0	91	256	254	65	57
ISO✓ 99% → B1	25	615.132	0.62	2.07	2.05	77	3.0	91	259	251	67	60
2	30	619.30	0.55	1.835	1.85	77	3.0	91	259	247	66	56
3	35	623.30	0.50	1.67	1.65	78	2.5	91	258	252	67	55
4	40	627.03	0.49	1.64	1.65	79	2.5	92	257	254	68	55
5	45	630.81	0.61	2.04	2.05	79	3.0	92	260	253	69	55
C1	50	634.997	0.50	1.67	1.65	80	2.5	92	259	254	71	58
ISO✓ 102% → 2	55	638.77	0.40	1.34	1.35	80	2.5	92	258	249	70	53
3	60	642.25	0.32	1.07	1.05	81	2.0	92	261	253	70	52
4	65	645.36	0.30	1.00	1.00	81	2.0	92	259	249	70	53
5	70	648.36	0.39	1.30	1.30	81	2.5	93	257	250	71	53
ISO✓ 100% → D1	75	651.728	0.36	1.20	1.20	81	2.5	93	261	248	71	58
2	80	654.97	0.26	0.87	0.87	81	2.0	92	260	254	71	52
3	85	657.79	0.17	0.57	0.57	80	1.5	92	258	259	71	53
4	90	660.12	0.15	0.50	0.50	80	1.5	93	259	255	72	54
5	95	662.27	0.20	0.67	0.67	80	1.5	94	260	251	72	54
E1	100	664.748	0.18	0.60	0.60	81	1.5	94	259	253	74	61
2	105	667.09	0.14	0.47	0.47	81	1.0	94	257	257	72	56
3	110	669.22	0.08	0.27	0.27	81	1.0	95	255	254	73	57
4	115	670.85	0.05	0.17	0.17	81	1.0	95	260	256	73	58
5	120	672.19	0.06	0.20	0.20	81	1.0	95	261	254	73	60
	125	673.600										
		80.100	0.386		1.285	78.86		92.32				

Comments:

Isokinetic Check:
Audited by: [illegible] **(Personnel)** **Date:** 10/24/18 **Completeness** ✓ **Legibility** ✓ **Accuracy** ✓
Audited by: PM **(Team Leader)** **Date:** 11/8/18 **Specifications** ✓ **Reasonableness** ✓

Civil & Environmental Consultants, Inc.

Isokinetic Field Data Sheet - EPA Method 5/202

Client The Goodyear Tire & Rubber Co.
Run Number 2
City/State Danville, VA
Date 10 / 23 /18
Sampling Location Dust Collector BBC5
Operators BLS, EWC

Bar. Press., In. Hg 29.55
NOMOGRAPH SET-UP: K Factor 3.505
LEAK CHECKS

Static Press., In. H_2O +0.48
ΔH @ 1.732 Y = 0.9756
Avg. Δ P 0.39
Pre-Test 0.003 @ 15.0 In. Hg.

Meter Box No. 300. 045 F
Meter Temp. 78
Ref. Δ P —
Post-Test 0.001 @ 7.0 In. Hg.

Sample Box No. M-Tmm B
Stack Temp. 92
Desired Nozzle 0.259
Pre-Test Pitot <0.1 @ +5.9/-5.3 In. H_2O

Probe/Pitot No. 200. 063
Pitot Coeff. 0.84
Nozzle No. 300.290
Post-Test Pitot <0.1 @ +6.3/-4.8 In. H_2O

Probe Temp. Setting 250
% Moisture 3
Nozzle Calibration 0.246, 0.246, 0.246

Sample ID No. 182545- 02
C Factor —
Nozzle Diameter 0.246
Observer

Filter No. Q- 243
Start Time 1616
End Time 1842
Agency VADEQ

Sample Point	Clock Time	Dry Gas Meter Cubic Feet	Pitot Reading Δ P In. H_2O	Orifice Setting ΔH Inches H_2O Ideal	Orifice Setting ΔH Inches H_2O Actual	Dry Gas Meter Temp. °F	Pump Vacuum Inches Hg	Stack Temp °F	Probe Temp °F	Filter Box °F	CPM Filter Exhaust °F	Imp. Temp °F
ISO✓ → A1	0	673.850	0.59	2.07	2.05	79	3.0	96	261	251	85	66
99% 2	5	678.05	0.36	1.26	1.25	79	2.5	96	257	252	74	60
3	10	681.40	0.62	2.17	2.15	79	3.0	96	257	253	70	58
4	15	685.75	0.70	2.45	2.45	79	3.5	96	257	250	68	59
5	20	690.38	0.69	2.42	2.40	79	3.5	96	256	254	69	59
ISO✓ → B1	25	694.858	0.65	2.28	2.30	78	3.5	96	261	252	71	63
101% 2	30	699.32	0.60	2.10	2.10	79	3.5	96	255	251	70	58
3	35	703.56	0.56	1.96	1.95	78	3.0	95	256	251	71	59
4	40	707.65	0.54	1.89	1.90	78	3.0	96	255	253	72	59
5 $\bigstar_1$	45	711.72	0.68	2.46	2.45	78	3.5	95	258	251	73	60
C1	50	716.257	0.55	1.99	2.00	78	3.0	95	262	252	73	63 ← ice added
ISO✓ → 2	55	720.36	0.46	1.67	1.65	78	3.0	95	257	251	74	61
101% 3	60	724.21	0.34	1.23	1.25	77	2.5	95	258	250	72	58
4	65	727.48	0.32	1.16	1.15	77	2.5	95	259	250	70	55
5 $\bigstar_2$	70	730.68	0.42	1.52	1.50	77	3.0	94	258	251	69	54
ISO✓ → D1	75	734.318	0.32	1.16	1.15	76	2.5	95	260	254	68	57
100% 2	80	737.49	0.27	0.98	0.98	76	2.0	95	257	249	68	49
3	85	740.47	0.18	0.65	0.65	76	1.5	94	258	251	67	48
4	90	742.90	0.17	0.62	0.62	75	1.5	94	260	252	67	50
5	95	745.29	0.21	0.76	0.76	76	2.0	94	259	252	66	51
ISO✓ → E1	100	747.922	0.19	0.69	0.69	75	2.0	93	262	253	66	56
103% 2	105	750.43	0.18	0.65	0.65	75	1.5	93	258	251	66	52
3	110	752.85	0.11	0.40	0.40	74	1.5	92	259	250	66	50
4	115	754.81	0.09	0.33	0.33	74	1.5	92	258	250	65	51
5	120	756.57	0.07	0.25	0.25	72	~~1.0~~ BY 1.5	91	261	252	65	52
	125	758.143 ✓	✓		✓	✓		✓				
		84.293	0.395		1.401	76.88		94.60				

Comments: $\bigstar_1$ changed stack moisture from 3% to 1% from Run 1 collection data - New K Factor 3.623
$\bigstar_2$ Paused @ 1735 due to fan turning off - no flow (Run 2 was 1:12:29 into the run) - restarted @ 1743 when airflow resumed

Isokinetic Check:
Audited by: BLS (Personnel) Date: 10/23/18 Completeness ✓ Legibility ✓ Accuracy ✓
Audited by: WBB (Team Leader) Date: 10/24/18 Specifications ✓ Reasonableness ✓

Civil & Environmental
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Isokinetic Field Data Sheet - EPA Method 5/202

Client The Goodyear Tire & Rubber Co.
Run Number 3
City/State Danville, VA
Date 10 /24 /18
Sampling Location Dust Collector BBC5
Operators BLS, EWC

Bar. Press., In. Hg 29.62
Static Press., In. H₂O +0.63
Meter Box No. 300. 045 F
Sample Box No. M-Train C
Probe/Pitot No. 200. 064
Probe Temp. Setting 250
Sample ID No. 182545- 03
Filter No. Q- 244

***NOMOGRAPH SET-UP:* K Factor** 3.514
ΔH @ 1.732 Y = 0.9756
Meter Temp. ~~57~~ 55 BU
Stack Temp. ~~90~~ 85 BU
Pitot Coeff. 0.84
% Moisture 1
C Factor —
Start Time 0803
Avg. Δ P 0.40
Ref. Δ P —
Desired Nozzle 0.260
Nozzle No. 300.290
Nozzle Calibration 0.246, 0.246, 0.246
Nozzle Diameter 0.246
End Time 1048

LEAK CHECKS
Pre-Test 0.003 @ 14.0 In. Hg.
Post-Test 0.003 @ 8.0 In. Hg.
Pre-Test Pitot <0.1 @ +5.8/-6.3 In. H₂O
Post-Test Pitot <0.1 @ +5.4/-5.6 In. H₂O
Observer
Agency VADEQ

	Sample Point	Clock Time	Dry Gas Meter Cubic Feet	Pitot Reading Δ P In. H₂O	Orifice Setting ΔH Inches H₂O Ideal	Orifice Setting ΔH Inches H₂O Actual	Dry Gas Meter Temp. °F	Pump Vacuum Inches Hg	Stack Temp °F	Probe Temp °F	Filter Box °F	CPM Filter Exhaust °F	Imp. Temp °F
ISO✓ 100% →	A1	0	758.400	0.68	2.39	2.40	46	3.0	76	258	248	65	51
	2	5	762.81	0.67	2.35	2.35	47	3.0	76	255	248	65	50
	3	10	767.16	0.71	2.49	2.50	47	3.0	76	257	249	65	50
ISO✓ 101% →	4	15	771.69	0.75	2.64	2.65	49	3.5	77	256	248	66	52
	5	20	776.40	0.77	2.71	2.70	50	3.5	77	256	249	66	~~50~~ 53 BU
	B1 ★₁	25	781.083	0.65	2.28	2.30	52	3.0	77	259	250	66	55
ISO✓ 100% →	2	30	785.46	0.58	2.04	2.05	56	3.0	78	256	246	65	47
	3	35	789.61	0.54	1.90	1.90	57	2.5	79	256	252	65	46
	4	40	793.64	0.50	1.76	1.75	59	2.5	79	258	256	66	48
	5	45	797.47	0.64	2.25	2.25	60	3.0	80	255	248	67	50
ISO✓ 99% →	C1	50	801.833	0.45	1.58	1.60	62	2.5	80	260	253	66	54
	2	55	805.50	0.41	1.44	1.45	63	2.5	81	256	251	68	53
	3	60	809.08	0.32	1.12	1.10	64	2.0	81	257	250	69	52
	4	65	812.21	0.29	1.02	1.00	65	2.0	81	258	253	70	53
	5	70	815.19	0.42	1.48	1.50	66	2.5	81	256	248	72	53
	D1	75	818.76	0.31	1.09	1.10	68	2.0	82	258	249	71	57
	2 ★₂	80	821.84	0.28	1.00	1.00	68	2.0	82	257	250	73	55
	3	85	824.81	0.16	0.57	0.57	69	1.5	83	257	251	73	55
	4	90	827.09	0.15	0.54	0.54	70	1.5	83	258	251	73	56
	5	95	829.34	0.21	0.75	0.75	70	1.5	83	257	254	74	57
	E1	100	831.946	0.18	0.64	0.64	70	1.5	83	259	252	76	60
	2	105	834.34	0.15	0.54	0.54	70	1.5	83	260	253	76	59
	3	110	836.57	0.08	0.29	0.29	70	1.0	83	258	252	77	59
	4	115	838.26	0.06	0.21	0.21	70	1.0	83	259	252	78	60
	5	120	839.74	0.05	0.18	0.18	70	1.0	83	258	248	80	61
		125	841.114 ✓	✓		✓	✓		✓				
			82.714	0.400		1.413	61.52		80.28				

Comments: ★₁ Paused @ 0833 (26:33 into Run 3) due to production shutdown - restarted @ 0858
★₂ Revised meter temp average to 65°F - New K Factor 3.582

Isokinetic Check:
Audited by: BK (Personnel) Date: 11/8/18 Completeness ✓ Legibility ✓ Accuracy ✓
Audited by: ______ (Team Leader) Date: / / Specifications ✓ Reasonableness ✓

Civil & Environmental Consultants, Inc.

Methods 5 & 202 and Sample Recovery – Data Analysis

Client Name The Goodyear Tire & Water Co.
City/State Danville, VA
Sampling Location Dust Collector BBC5
Clean-Up Box Number 1
Chain of Custody: Date Received 10 /23-24 /18

Project Number 182-545
Sample Date 10 /23-24 /18
Samples Recovered 10 /23-24 /18 WDS
Recovery Date 10 /23- /18
Received By ____ Locked? ____

Equipment Documentation

Run Number	1	2	3	
Sample ID Number	182545-01	182545-02	182545-03	
Sample Box Number	A	B	C	
Probe Number	200. 064	200. 063	200. 064	
Nozzle Number	300. 240	300. 290	300, 290	

Sample Recovery – Fraction 1

Filter Container #	182545-01	182545-02	182545-03	
Particulate Description	black	black	black	
Filter Container Sealed?	✓	✓	✓	

Sample Recovery – Fraction 2

Probe Rinse Container #	182545-01	182545-02	182545-03	
Rinsing Solution	Acetone	Acetone	Acetone	Acetone
Sample Container Sealed?	✓	✓	✓	
Liquid Level Marked?	✓	✓	✓	

Analysis of Moisture and Sample Recovery – Fraction 3

Reagent Recovery Container	182545-01	182545-02	182545-03	
Imp. Absorbing Solution	DI H_2O	DI H_2O	DI H_2O	DI H_2O
Description of Reagent	Clear NA	clear NA	NA	
Reagent Level Marked?	✓	✓	✓	
Final Volume, ml	— See page 2 →			
Initial Volume, ml	— " →			
Net Condensed Volume, ml	0	2.9	(-0.1)	
N_2 Purge	✓		✓	
Rinse twice with DI H_2O	✓	✓	✓	
Rinse twice with Acetone	✓	✓	✓	
Rinse twice with hexane	✓	✓	✓	

Analysis of Moisture and Sample Recovery – Silica Gel

Silica Gel Recovery Container #	-01	-02	-03	
Percent Silica Gel Spent	10%	15%	15%	
Final Weight, g	— See page 2 →			
Initial Weight, g	— " →			
Net Absorbed Water, g	15.1	17.2	16.86 WDS	
Total Moisture Collected, g	15.1	20.1	16.5 ✓	

Reagent Blanks

Absorbing Reagent Blank (500mL)	DI H_2O	Absorbing Blank ID#	182545-04
Rinsing Reagent Blank (200 mL)	Acetone	Rinsing Blank ID #	182545-04
Rinsing Reagent Blank (200 mL)	Hexane	Rinsing Blank ID #	182545-04
Analyst Initials		Reviewer Initials	

Balance ID	Wt.(200 mg)	Wt. (500 mg)	Wt. (1,000 mg)	
600.057	200.0	500.0	1000.0	
600.057	200.0	500.0	1000.0	

Audited by: PN **(Personnel)** **Date:** 11 / 8 / 18 **Completeness** ✓ **Legibility** ✓ **Accuracy** ✓

Audited by: ____ **(Team Leader)** **Date:** / / **Specifications** ✓ **Reasonableness** ✓

Civil & Environmental Consultants, Inc.

Method 5 & 202 – Moisture Determination and Sample Recovery

Client Name The Goodyear Tire and Rubber Co.
City/State Danville, VA
Sampling Location [illegible] No. 5
Project Number: 182-545
Sample Date: 10/23-24/18
Samples Recovered by: BVS
Recovery Date 10/23-24/18

Moisture Recovery by weight

Run No.:1	grams	grams		
Impinger Bottle Weight	Initial wt. (~~mg~~) BV	Final Wt (~~mg~~) BV	Difference (gain) wt.	
1st Imp. Bottle	479.9	479.9	0.0	
2nd Imp. Bottle	596.5	596.5	0.0	
3rd Imp. Bottle	713.4	713.4	0.0 ✓	
4th Imp. Bottle 10%	914.1	929.2	15.1 ✓	70°F purge
5th Imp. Bottle				
6th Imp. Bottle			TC = 15.1	grams

Run No.:2	grams	grams		
Impinger Bottle Weight	Initial wt. (~~mg~~) BV	Final Wt (~~mg~~) BV	Difference (gain) wt.	
1st Imp. Bottle	481.6	481.7	0.1	BV
2nd Imp. Bottle	604.7	604.5	-0.2	~~69°F~~
3rd Imp. Bottle	708.0	711.0	3.0	
4th Imp. Bottle 15%	879.2	896.4	17.2 ✓	
5th Imp. Bottle				
6th Imp. Bottle			TC = 20.1	grams

Run No.:3	BV grams	BV grams		
Impinger Bottle Weight	Initial wt. (~~mg~~)	Final Wt (~~mg~~)	Difference (gain) wt.	
1st Imp. Bottle	484.2	484.3	0.1	
2nd Imp. Bottle	636.5	636.5 was	0	
3rd Imp. Bottle	698.1	697.9 was	(0.2)	
4th Imp. Bottle 15%	907.7	924.3	16.6	
5th Imp. Bottle				
6th Imp. Bottle				

Run No.:	BV grams	BV grams		
Impinger Bottle Weight	Initial wt. (~~mg~~)	Final Wt (~~mg~~)	Difference (gain) wt.	
1st Imp. Bottle				train blank
2nd Imp. Bottle				
3rd Imp. Bottle				69°F Purge
4th Imp. Bottle				
5th Imp. Bottle				
6th Imp. Bottle				

Audited by: PK **(Personnel)** **Date:** 11/9/18 **Completeness** ✓ **Legibility** ✓ **Accuracy** ✓
Audited by: ______ **(Team Leader)** **Date:** __/__/__ **Specifications** ✓ **Reasonableness** ✓

Civil & Environmental Consultants, Inc.

APPENDIX C
LABORATORY DATA

EPA Method 5 - Particulate Determination - Data Analysis

Client: The Goodyear Tire And Rubber Compai
City/State: Danville, Virginia
Sampling Location: Banbury Mixer No. 5
Parameter: EPA Method 5
Chain of Custody: Date Received: 10/24/2018
Analytical Balance ID: Sartorius Serial No. 39120051

Project No.: 182-545
Samples Collected On: 10/23/18
Samples Recovered By: WQB
Sample Recovery Date: 10/23/18
Received By: WQB Locked?: Yes
Class S Weight Set ID: Troemner 4563

Analysis of Particulate Recovery

Run Number	1	2	3				
Sample ID Number	182545-01	182545-02	182545-03				

Filter Number	Q-242	Q-243	Q-244				
Final Weight, g	0.3512	0.3639	0.3574				
Reweigh 2, Final, g	0.3508	0.3635	0.3571				
Reweigh 3, Final, g							
Initial Weight, g	0.3466	0.3559	0.3475				
Reweigh, Initial, g	0.3466	0.3560	0.3478				
Average Final, g	0.3510	0.3637	0.3573				
Average Initial, g	0.3466	0.3560	0.3477				
Net Filter Catch, g	0.0044	0.0078	0.0096				

Beaker Number	142	143	144				
Acetone Level Marked	Yes	Yes	Yes				
Acetone Wash Volume	150	150	150				
Final Weight, g	112.9392	115.4857	110.8888				
Reweigh 2, Final, g	112.9395	115.4860	110.8892				
Reweigh 3, Final, g							
Initial Weight, g	112.9303	115.4808	110.8838				
Reweigh, Initial, g	112.9303	115.4803	110.8835				
Average Final, g	112.9394	115.4859	110.8890				
Average Initial, g	112.9303	115.4806	110.8837				
Acetone Blank, g	0.0004	0.0004	0.0004				
Net Front Rinse, g	0.0086	0.0049	0.0050				

Total Particulate, g	0.0130	0.0127	0.0146				

Gravimetric Documentation

	Initial	Reweigh	Final	Reweigh 2	Reweigh 3	Reweigh 4
Date of Analysis	09/05/18	09/06/18	10/26/18	10/26/18		
Time of Analysis	1030	0745	0740	1550		
Analyst	EWC	EWC	WQB	EWC		
Desic. Rel. Humidity, %	12	16	15	18		
Lab. Temperature, °F	75	74	71	72		
Bar. Press., In. Hg	29.53	29.52	29.25	29.01		
Lab. Rel. Humidity, %	43	39	42	44		

Blank Acetone Analysis

Sample ID Number	182545-06		Final Weight, g	115.7631	
Blank Beaker Number	145		Reweigh, Final, g	115.7634	
Beaker Volume, ml	150		Initial Weight, g	115.7629	
Acetone Conc., mg/g *	0.00338		Reweigh, Initial, g	115.7628	
Maximum Residue, g	0.0012		Average Final, g	115.7633	
Analyst Initials	EWC		Average Initial, g	115.7629	
Auditor Initials	WQB		Acetone Residue, g	0.0004	

* Blank values ≤ 0.01 mg/g of the weight of acetone (≤ maximum residue, mg) were subtracted from sample weight.

Civil & Environmental Consultants, Inc.
1900 Center Park Drive, Suite A, Charlotte, North Carolina 28217
Toll-Free: 855-859-9932 Direct: 980-237-0373

CHAIN OF CUSTODY

Company: The Goodyear Tire & Rubber Co.	**Laboratory:** CEC	**Number of Containers**	**Sampling Methods**
City, State: Danville, VA	**Project No.:** 182-545	7	5
Contact: Bryan Starnes	**Purchase Order:** NA		

Sample Description	Sample ID	Date	Sample Disposition and Remarks
Dust Collector BBC5 Run 1	182545-01	10/23/2018	Acetone Rinse, Quartz filter
Run 2	182545-02	10/23/2018	Acetone Rinse, Quartz filter
Run 3	182545-03	10/24/2018	Acetone Rinse, Quartz filter
Reagent Blank	182545-06	10/23/2018	Acetone

Relinquished By:	Date/Time 10/24/18 1630	Received By:	Date/Time 10/24/18 1630	*Special Instructions:*
Relinquished By:	Date/Time	Received By:	Date/Time	
Received for Laboratory By:	Date/Time	*Analyze for the following Compounds:* Condensible Particulate		

Civil & Environmental Consultants, Inc. – Charlotte

1900 Center Park Drive, Suite A
Charlotte, NC 28217

The Goodyear Tire & Rubber Co.
Danville, VA

Project # 182-545

Analytical Report
(1018-174)

EPA Method 202

Condensable Particulate Matter

Enthalpy Analytical, LLC

Phone: (919) 850 - 4392 / Fax: (919) 850 - 9012 / www.enthalpy.com
800-1 Capitola Drive Durham, NC 27713-4385

I certify that to the best of my knowledge all analytical data presented in this report:

- Have been checked for completeness
- Are accurate, error-free, and legible
- Have been conducted in accordance with approved protocol, and that all deviations and analytical problems are summarized in the appropriate narrative(s)

This analytical report was prepared in Portable Document Format (.PDF) and contains 14 pages.

Quentisha L. Forrester

QA Review Performed by – Quentisha L. Forrester

Report Issued: 11/12/2018

Summary of Results

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Enthalpy Analytical

Company: Civil & Environmental Consultants - Charlotte
Job No.: 1018-174 EPA Method 202 Analysis
Project No.: 182-545 The Goodyear Tire & Rubber Co.- Danville, VA

Summary Report

	Run 1	Run 2	Run 3	Field Blank
Net Organic Catch (mg)	3.20	2.89	2.49	1.74
Corrected Inorganic (mg)	2.39	2.24	1.65	1.24
CPM (mg)	5.6	5.1	4.1	3.0
TB Corrected CPM (mg)	3.6	3.1	2.1	

Results

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Enthalpy Analytical

Company: Civil & Environmental Consultants - Charlotte

Job No.: 1018-174 EPA Method 202 Analysis

Project No.: 182-545 The Goodyear Tire & Rubber Co.- Danville, VA

Results

	Run 1		Run 2		Run 3		Field Blank	
Beaker Number	17486		17487		17488		17489	
Initial Solvent Volume (mL)	300		310		285		166	
Org Final Weight 1 (g)	2.521575	11/07/18 6:34	2.531275	11/07/18 6:34	2.519530	11/07/18 6:35	2.530967	11/07/18 6:35
Org Final Weight 2 (g)	2.521638	11/08/18 7:23	2.531249	11/08/18 7:24	2.519491	11/08/18 7:24	2.530931	11/08/18 7:24
Tare (g)	2.518439	10/25/18 10:02	2.528364	10/25/18 10:03	2.516998	10/25/18 10:03	2.529191	10/25/18 10:04
Organic Catch (mg)	3.20		2.89		2.49		1.74	
Inorganic								
Beaker Number	17480		17481		17482		17483	
Weight 1 (g)	2.545280	11/07/18 6:27	2.509400	11/07/18 6:28	2.528445	11/07/18 6:28	2.522086	11/07/18 6:29
Weight 2 (g)	2.545270	11/08/18 7:19	2.509396	11/08/18 7:20	2.528443	11/08/18 7:21	2.522077	11/08/18 7:21
Tare (g)	2.542881	10/25/18 10:00	2.507153	10/25/18 10:00	2.526792	10/25/18 10:01	2.520841	10/25/18 10:01
Initial Water Vol (mL)	350		275		245		260	
Water Added by Lab (mL)	75		75		75		75	
Resuspend Vol (mL)	100		100		100		100	
Net Inorganic Catch (mg)	2.39		2.24		1.65		1.24	
Titrant Normality	0.10		0.10		0.10		0.10	
Titrant Vol (mL)	0.05		0.05		0.08		0.03	
Titrant Blank Vol (mL)	0.05		0.05		0.05		0.05	
Ammonium Corr (mg)	0.0		0.0		0.0		0.0	
Corrected Inorganic (mg)	2.39		2.24		1.65		1.24	
Condensible Particulate (mg)	5.59		5.13		4.14		2.98	
TB Corrected CPM (mg)	3.59		3.13		2.14			

Enthalpy Analytical

Company: Civil & Environmental Consultants - Charlotte

Job No.: 1018-174 EPA Method 202 Analysis

Project No.: 182-545 The Goodyear Tire & Rubber Co.- Danville, VA

Reagent Blanks

		Water		Acetone		Hexane	
In House	Beaker	17485		17492		17493	
	Weight 1 (g)	2.535784	11/07/18 6:33	2.518250	11/07/18 6:42	2.508971	11/07/18 6:43
	Weight 2 (g)	2.535902	11/08/18 7:22	2.518112	11/08/18 7:41	2.509076	11/08/18 7:45
	Tare (g)	2.535757	10/25/18 10:02	2.518036	10/25/18 10:06	2.508920	10/25/18 10:06
	Residue (g)	0.00015		0.00008		0.00016	
	Vol (mL)	250		200		225	
	Max Residue (g)	0.0003		0.0002		0.0001	
		Water		**Acetone**		**Hexane**	
Client's Reagent Blank	Beaker	17484		17490		17491	
	Weight 1 (g)	2.519670	11/07/18 6:31	2.535562	11/07/18 6:40	2.539401	11/07/18 6:41
	Weight 2 (g)	2.519715	11/08/18 7:22	2.535582	11/08/18 7:30	2.539474	11/08/18 7:39
	Tare (g)	2.519552	10/25/18 10:02	2.535345	10/25/18 10:04	2.539190	10/25/18 10:05
	Residue (g)	0.00016		0.00024		0.00028	
	Vol (mL)	204		202		204	
	Max Residue (g)	0.0002		0.0002		0.0001	

Narrative Summary

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Enthalpy Analytical Narrative Summary

Company:	Civil & Environmental Consultants, Inc. – Charlotte
Client No.:	182-545
Job No.:	1018-174
Parameters	EPA Method 202

Custody

David Myers received the samples on 10/29/18 after being relinquished by Civil & Environmental Consultants, Inc. – Charlotte. The samples were received at ambient temperature and in good condition.

Prior to, during, and after analysis, the samples were kept under lock with access only to authorized personnel by Enthalpy Analytical, LLC.

Analysis

The samples were analyzed for Condensable Particulate Matter using the analytical procedures in EPA Method 202, Determination of Condensible Particulate Emissions from Stationary Sources (40 CFR Part 51, Appendix M).

All samples were weighed on Balance 8 (Sartorius Model ME5-OCE, Serial # 23104965), certified by Mettler Toledo through July 31, 2019.

QC Notes

A field train blank was received with these samples. The method specifies that blank corrections are accomplished by subtracting the particulate mass determined for the 'Field Train Blank' or 2 mg (whichever is less) from the sample weight.

Acetone, hexane, and water reagent blanks (RBs) were received with these samples and analyzed.

Laboratory reagent blanks (acetone, water, and hexane) were analyzed with the samples and are included in the report, though their results are not used to adjust any of the sample results.

The inorganic results for the samples were corrected for the ammonium ions used to precipitate the sulfate, per the formula in the Method (Section 12.2.1).

Reporting Notes

These gravimetric analyses are considered to be accurate to ±0.5 mg.

The results presented in this report are representative of the samples as provided to the laboratory.

These analyses met the requirements of the TNI Standard. Any deviations from the requirements of the reference method or TNI Standard have been stated above.

General Reporting Notes

The following are general reporting notes that are applicable to all Enthalpy Analytical, LLC data reports, unless specifically noted otherwise.

- Any analysis which refers to the method as ***"Type"*** represents a planned deviation from the reference method. For instance a Hydrogen Sulfide assay from a Tedlar bag would be labeled as "EPA Method 16-Type" because Tedlar bags are not mentioned as one of the collection options in EPA Method 16.

- The acronym ***MDL*** represents the Minimum Detection Limit. Below this value the laboratory cannot determine the presence of the analyte of interest reliably.

- The acronym ***LOQ*** represents the Limit of Quantification. Below this value the laboratory cannot quantitate the analyte of interest within the criteria of the method.

- The acronym ***ND*** following a value indicates a non-detect or analytical result below the MDL.

- The letter ***J*** in the Qualifier or Flag column in the results indicates that the value is between the MDL and the LOQ. The laboratory can positively identify the analyte of interest as present, but the value should be considered an estimate.

- The letter ***E*** in the Qualifier or Flag column indicates an analytical result exceeding 100% of the highest calibration point. The associated value should be considered as an estimate.

- Sample results are presented 'as measured' for single injection methodologies, or an average value if multiple injections are made. If all injections are below the MDL, the sample is considered non-detect and the ND value is presented. If one, but not all, are below the MDL, the MDL value is used for any injections that are below the MDL. For example, if the MDL is 0.500 and LOQ is 1.00, and the instrument measures 0.355, 0.620, and 0.442 - the result reported is the average of 0.500, 0.620, and 0.500 - - - i.e. 0.540 with a J flag.

- When a spike recovery (Bag Spike, Collocated Spike Train, or liquid matrix spike) is being calculated, the native (unspiked) sample result is used in the calculations, as long as the value is above the MDL. If a sample is ND, then 0 is used as the native amount (not the MDL value).

- The acronym ***DF*** represents Dilution Factor. This number represents dilution of the sample during the preparation and/or analysis process. The analytical result taken from a laboratory instrument is multiplied by the DF to determine the final undiluted sample results.

- The addition of ***MS*** to the Sample ID represents a Matrix Spike. An aliquot of an actual sample is spiked with a known amount of analyte so that a percent recovery value can be determined. The MS analysis indicates what effect the sample matrix may have on the target analyte, i.e. whether or not anything in the sample matrix interferes with the analysis of the analyte(s).

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General Reporting Notes

(continued)

- The addition of ***MSD*** to the Sample ID represents a Matrix Spike Duplicate. Prepared in the same manner as a MS, the use of duplicate matrix spikes allows further confirmation of laboratory quality by showing the consistency of results gained by performing the same steps multiple times.

- The addition of ***LD*** to the Sample ID represents a Laboratory Duplicate. The analyst prepares an additional aliquot of sample for testing and the results of the duplicate analysis are compared to the initial result. The result should have a difference value of within 10% of the initial result (if the results of the original analysis are greater than the LOQ).

- The addition of ***AD*** to the Sample ID represents an Alternate Dilution. The analyst prepares an additional aliquot at a different dilution factor (usually double the initial factor). This analysis helps confirm that no additional compound is present and coeluting or sharing absorbance with the analyte of interest, as they would have a different response/absorbance than the analyte of interest.

- The Sample ID ***LCS*** represents a Laboratory Control Sample. Clean matrix, similar to the client sample matrix, prepared and analyzed by the laboratory using the same reagents, spiking standards and procedures used for the client samples. The LCS is used to assess the control of the laboratory's analytical system. Whenever spikes are prepared for our client projects, two spikes are retained as LCSs. The LCSs are labeled with the associated project number and kept in-house at the appropriate temperature conditions. When the project samples are received for analysis, the LCSs are analyzed to confirm that the analyte could be recovered from the media, separate from the samples which were used on the project and which may have been affected by source matrix, sample collection, and/or sample transport.

- **Significant Figures**: Where the reported value is much greater than unity (1.00) in the units expressed, the number is rounded to a whole number of units, rather than to 3 significant figures. For example, a value of 10,456.45 ug catch is rounded to 10,456 ug. There are five significant digits displayed, but no confidence should be placed on more than two significant digits. In the case of small numbers, generally 3 significant figures are presented, but still only 2 should be used with confidence. Many neat materials are only certified to 3 digits, and as the mathematically correct final result is always 1 digit less than all its pre-cursors - 2 significant figures are what are most defensible.

- **Manual Integration**: The data systems used for processing will flag manually integrated peaks with an "M". There are several reasons a peak may be manually integrated. These reasons will be identified by the following two letter designations on sample chromatograms, if provided in the report. The peak was ***not integrated*** by the software **"NI"**, the peak was ***integrated incorrectly*** by the software **"II"** or the ***wrong peak*** was integrated by the software **"WP"**. These codes will accompany the analyst's manual integration stamp placed next to the compound name on the chromatogram.

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Sample Custody

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Civil & Environmental Consultants, Inc.
1900 Center Park Drive, Suite A, Charlotte, North Carolina 28217
Toll-Free: 855-859-9932 Direct: 980-237-0373

CHAIN OF CUSTODY

Company: The Goodyear Tire & Rubber Co.	**Laboratory:** Enthalpy	**Number of Containers**	**Sampling Methods**
City, State: Danville, VA	**Project No.:** 182-545	15	202
Contact: Bryan Starnes	**Purchase Order:**		

Sample Description		Sample ID	Date	Sample Disposition and Remarks
Dust Collector BBC5	Run 1	182545-01	10/23/2018	Imp. Contents with DI H2O Rinse, Acetone and Hexane Rinse, and CPM Filter
	Run 2	182545-02	10/23/2018	Imp. Contents with DI H2O Rinse, Acetone and Hexane Rinse, and CPM Filter
	Run 3	182545-03	10/24/2018	Imp. Contents with DI H2O Rinse, Acetone and Hexane Rinse, and CPM Filter
	Reagent Blank	182545-04	10/23/2018	200ml each of Acetone, Hexane, and DI H2O
	Field Blank	182545-05	10/23/2018	Imp. Contents with DI H2O Rinse, Acetone and Hexane Rinse, and CPM Filter

Relinquished By:	Date/Time	Received By:	Date/Time	*Special Instructions:*
	10/26/18 1425		10/29/18 9:10	
Relinquished By:	Date/Time	Received By:	Date/Time	

Received for Laboratory By:	Date/Time	*Analyze for the following Compounds:*
		Condensible Particulate

Good Condition DSM 10/29/18
Ambient Temp.

This Is The Last Page Of This Report.

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APPENDIX D
2018 EQUIPMENT CALIBRATIONS

QUALITY ASSURANCE AND EQUIPMENT CALIBRATION PROCEDURES

General. Field or laboratory test equipment purchased or fabricated by Civil and Environmental Consultants, Inc. (CEC) is assigned a unique, permanent identification number. New items for which calibration is required are calibrated before initial field use. Equipment whose calibration status may change with use or with time is inspected in the field before testing begins, and again upon return from field use. When an item of equipment is found to be out of calibration, it is adjusted and recalibrated or retired from service. CEC's equipment is periodically recalibrated, regardless of the outcome of these regular inspections.

Calibrations are conducted in accordance with United States Environmental Protection Agency (US EPA) specifications. CEC follows the calibration procedures outlined in EPA Reference Methods found in the Code of Federal Regulations (Volume 40, Part 60) and those recommended in the Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III (EPA/600/R-94/038c). When the Reference Methods do not detail procedures, CEC uses methods such as those prescribed by the American Society for Testing and Materials (ASTM).

Data obtained during calibrations are recorded on standardized forms, which are verified for completeness and accuracy by the Quality Assurance Manager. Data reduction and subsequent calculations are performed using CEC's Air Quality Data System. Calibration calculations are performed by an environmental scientist, independently audited by the Project Manager, and reviewed by the Quality Assurance Manger for verification of data. Copies of calibration data are included in the test or project report.

Inspection and Maintenance. An effective preventative program is necessary to ensure equipment performance quality prior to, during, and following the source test. Equipment returning from the field is inspected before it is returned to storage. During the course of these inspections, items are cleaned, repaired, reconditioned, and recalibrated when necessary.

Equipment that is transported to the field for a test project is inspected again prior to being packed. CEC performs these quality assurance checks prior to departure for the project site to detect equipment problems, which may occur during periods of storage. CEC transports adequate back-up equipment to the project site so as to minimize delays in the test schedule.

Calibration. Source sampling equipment that requires calibration includes nozzles, pitot tubes, thermometers, flow meters, dry gas meters, and barometers. The following sections briefly describe the calibration procedures followed by CEC.

Nozzles. Probe nozzles are uniquely and permanently identified at the time of purchase or fabrication; with the exception for glass nozzles. (Glass nozzles are not uniquely identified due to their fragile status.) Nozzles are calibrated before initial field use and prior to the source test. The inside diameter of the nozzle is measured to the nearest 0.001 inch precision micrometer. Three measurements are made using different diameters. If the difference between the high and the low measurements do not exceed 0.004 inch, the average of the three measurements is used. If the difference exceeds this amount, or when the nozzle becomes nicked, dented, or corroded, the nozzle is reshaped, sharpened, and recalibrated. Regardless of usage, nozzles are inspected on a yearly basis.

Pitot Tubes. CEC Type S Pitot tubes have been constructed and calibrated using those recommendations in accordance with EPA Reference Method 2, Section 10.1. CEC Type S Pitot tubes C_p coefficients have been determined according to Method 2, Section 10.1. CEC standard Pitot tubes have been assigned a C_p coefficient of 0.99 according to Calibration Procedure 2. Pitot tubes are visually inspected prior to field use. If the inspection indicates damage, the calibration is rechecked. Regardless of usage, CEC Pitot tubes are inspected and recalibrated on a yearly basis.

Dry Gas Meter and Orifice. Console metering systems receive a full calibration at the time of purchase and annually, thereafter. Post-test calibrations are performed after the source test. Approved Alternative Method 5 Post-Test Calibration (ALT-009) may be used to determine a post-test calibration on the console metering systems instead of reference post-test method. If the calibration factor, γ (gamma), deviates by more than five percent per the reference post-test method, the meter is recalibrated and the meter coefficient (initial or recalibrated) that yields the lowest sample volume for the test runs is used. Standard practice at CEC is to recalibrate the dry gas meter when the γ is found to be outside the range of γ ± 3%.

Barometer. Field barometers are compared to a reference mercury barometer and are deemed acceptable when they agree to within ± 0.1 inches Hg. This barometric pressure is corrected for pressure and temperature. Prior to and following the sampling program, the field barometer is verified against the referenced barometer.

Thermometers. New thermometers, pyrometers and thermocouples purchased or fabricated by CEC are calibrated using the procedures described by US EPA Test Protocol. Calibration tolerance limits are as follow:

Impinger Temperature Gauge	± 1°C or 2°F
Dry Gas Meter Temperature Gauge	± 3°C or 5.4°F
Stack Thermocouples	± 1.5% of absolute temperature

Thermometers and thermocouples are inspected and calibrated prior to and following the field test. Regardless of usage, CEC thermometers and thermocouples are inspected and recalibrated on a yearly basis.

Laboratory Equipment. CEC, Inc. has a written quality assurance document that covers calibration and maintenance of laboratory equipment. This includes calibration of the analytical balance against Class S weights. Calibration of thermometers, barometers, and wet test meters are traceable to NIST. A copy of our quality assurance document may be obtained by written request.

PRE-TEST / POST-TEST CALIBRATION DATA FORM

Client Goodyear Tires
Pre-test Date 10/16-19/18 Calibrator BLS
Reference Thermometer Lollipop SN 170553260

City/State Danville, VA
Post-test Date 10/26/18 Calibrator BLS
Reference Barometer 100.044

		Pre-test			Post-test		
		Temp., ° F	Ref. Temp., ° F	Inspection	Temp., ° F	Ref. Temp., ° F	Inspection
10/16	Omega [✓ DB]/WB # 100.042	73.9	73.0	▨	62.1	61.3	▨
	Omega DB/[✓ WB] # 100.044	79.5	79.1	▨	63.0	61.3	▨
	Omega [✓ DB]/WB # 100.045	71.7	73.0	▨	62.5	61.3	▨
	Omega DB/[✓ WB] # 100.059	72.1	73.0	100.061 62.8	62.8	61.3	▨
	DB 100.060, WB 100.061	73.3/71.5	73.0	Positive Leak Check	62.8	61.3	Poistive Leak Check
	Dry Gas Meter #300.392 [A]			☐ Yes ☐ No @			☐ Yes ☐ No @
	Dry Gas Meter #300.321 [B]			☐ Yes ☐ No @			☐ Yes ☐ No @
	Dry Gas Meter #300.035 [C]			☐ Yes ☐ No @			☐ Yes ☐ No @
	Dry Gas Meter #300.388 [D]			☐ Yes ☐ No @			☐ Yes ☐ No @
	Dry Gas Meter #300.310 [E]			☐ Yes ☐ No @			☐ Yes ☐ No @
10/16	Dry Gas Meter #300.045 [F] ✓	72	74.0	☒ Yes ☐ No @ 6.7	61	61.1	☒ Yes ☐ No @ 6.4
	Dry Gas Meter #300-390 [G]			☐ Yes ☐ No @			☐ Yes ☐ No @
10/16	Dry Gas Meter #300.241 [H] ✓	73	74.0	☒ Yes ☐ No @ 5.7	62	61.1	☒ Yes ☐ No @ 5.4
	Dry Gas Meter #300.214 [I]			☐ Yes ☐ No @			☐ Yes ☐ No @
	Dry Gas Meter #300.067 [J]			☐ Yes ☐ No @			☐ Yes ☐ No @
	Dry Gas Meter #300.200 [K]			☐ Yes ☐ No @			☐ Yes ☐ No @
10/16	Umbilical Adaptor # K #300.	73.5	73.2		62.6	61.2	
10/16	Umbilical Adaptor # M #300.	73.1	73.2		62.7	61.2	
	Umbilical Adaptor # #300.						
	Umbilical Adaptor # #300.						
	Umbilical Adaptor # #300.						
	Umbilical Adaptor # #300.						
				Visual Inspection			Visual Inspection
10/19	Probe #200. 063	65.0	65.6	☒ Yes ☐ No @	70.0	69.8	☒ Yes ☐ No @ lab
	Probe #200. 064	65.2	65.6	☒ Yes ☐ No @	70.1	69.8	☒ Yes ☐ No @ lab
	Probe #200. 076	65.0	65.6	☒ Yes ☐ No @	62.6	61.3	☒ Yes ☐ No @
	Probe #200. 077	64.8	65.6	☒ Yes ☐ No @	62.8	61.4	☒ Yes ☐ No @
	Probe #200. 300	65.1	65.6	☒ Yes ☐ No @	62.4	61.2	☒ Yes ☐ No @
	Probe #200. 301	64.9	65.6	☒ Yes ☐ No @	62.5	61.2	☒ Yes ☐ No @
	Probe #200. 105	64.8	65.6	☒ Yes ☐ No @	62.4	61.2	☒ Yes ☐ No @
	Probe #200. 121	65.1	65.6	☒ Yes ☐ No @	70.2	69.8	☒ Yes ☐ No @ lab
	Pitot #200.		BU	☒ Yes ☐ No @			☐ Yes ☐ No @
	Pitot #200. 711	65.4	65.6	☒ Yes ☐ No @	62.4	61.2	☒ Yes ☐ No @
10/19	Pitot #200. 708	65.6	65.7	☒ Yes ☐ No @	62.7	61.2	☒ Yes ☐ No @
10/16	Hotboxes						
	H1	73.7	73.7		62.5	61.3	
	H2 BU	73.9	73.7		Not	used	
	~~H11~~ H13	73.1	73.7		62.8	61.3	
	CPM Exit thermocouples				BU		
	100.104	64.8	64.4	70.5	~~69.~~	69.8	lab
	100.119	64.8	64.4		70.4	69.7	lab
	100.120	64.9	64.4		70.5	69.7	lab
	▨	Field Baro., in. Hg		Ref. Baro., in Hg	Field Baro., in. Hg		Ref. Baro., in. Hg
	Barometer # 600.042	29.62		29.64	29.09		29.13
	Barometer #						
	Barometer #						

Were safety checks performed during the pre-site reviews? ☒ Yes ☐ No
Were post-test calibrations withi the EPA Quality Assurance criteria? ☒ Yes ☐ No

CEC
Civil & Environmental Consultants, Inc.

METHOD 5 CRITICAL ORIFICE CALIBRATION

Quality - Service - Reliability

ENVIRONMENTAL SUPPLY COMPANY

CRITICAL ORIFICE SET S/N: 1374

DATE: 7/25/2000
GAS METER P/N: S-200

REFERENCE DRY GAS METER
SERIAL NUMBER: 6834449

LEAK CHECK: Passed

ORIFICE#	RUN #	CRITICAL VACUUM (In Hg)	TESTED VACUUM (In Hg)	Barometric Pressure per Orifice AVG (P_{bar})	DGM READINGS (FT³)			TEMPERATURES °F						ELAPSED TIME (MIN) Θ	DGM ΔH (In H₂O)	K' FACTOR	K' FACTOR VARIATION (%)	AVG VOLUME FLOWRATE (FT³/MIN)	AVG VOLUME FLOWRATE (LITERS/MIN)
					INITIAL	FINAL	NET (V_m)	AMBIENT	DGM INLET INITIAL	DGM INLET FINAL	DGM OUTLET INITIAL	DGM OUTLET FINAL	DGM AVG						
#48 SS	1	14	18		553.448	559.783	6.335	69.0	68.7	69.3	68.7	68.8	68.88	6.00	3.71	0.8150	0.19	1.05	29.80
	2	14	18		559.783	566.105	6.322	68.6	69.2	70.5	68.8	69.0	69.38	6.00	3.71	0.8125	-0.15		
	3	14	18	29.79	566.105	572.441	6.336	69.0	70.1	72.5	69.0	69.3	70.23	6.00	3.71	0.8134	-0.05		
															AVG K' FACTOR =	0.8138			
#51 SS	1	14	18.5		572.441	578.562	6.121	69.0	70.4	73.0	69.3	69.7	70.60	7.00	2.48	0.6710	0.10	0.87	24.71
	2	14	18.5		578.562	584.687	6.125	69.1	72.1	74.0	69.7	70.2	71.50	7.00	2.48	0.6704	0.00		
	3	14	18.5	29.79	584.687	590.814	6.127	69.1	73.1	74.9	70.2	70.7	72.23	7.00	2.48	0.6697	-0.10		
															AVG K' FACTOR =	0.6704			
#52 SS	1	16	19		590.814	597.174	6.360	69.1	73.0	75.1	70.7	71.2	72.50	8.00	2.16	0.6075	0.10	0.79	22.45
	2	16	19		597.174	603.531	6.357	69.1	74.4	75.6	71.2	71.6	73.20	8.00	2.16	0.6064	-0.08		
	3	16	19	29.79	603.531	609.897	6.366	69.1	74.8	76.1	71.6	72.1	73.66	8.00	2.16	0.6067	-0.02		
															AVG K' FACTOR =	0.6069			
#54 SS	1	15	21		609.897	615.457	5.560	67.6	68.1	68.5	68.1	68.1	68.20	10.00	0.96	0.4264	-0.10	0.56	15.73
	2	15	21		615.457	621.036	5.579	67.6	68.3	68.9	68.1	68.3	68.40	10.00	0.96	0.4277	0.21		
	3	15	21	29.83	621.036	626.602	5.566	67.6	68.9	69.5	68.3	68.6	68.83	10.00	0.96	0.4264	-0.11		
															AVG K' FACTOR =	0.4269			
#56 SS	1	16	22		626.602	631.128	4.526	67.2	69.4	69.8	69.3	69.4	69.48	12.00	0.42	0.2881	-0.02	0.38	10.68
	2	16	22		631.128	635.654	4.526	68.0	69.6	70.1	69.4	69.6	69.68	12.00	0.42	0.2882	0.01		
	3	16	22	29.83	635.654	640.179	4.525	68.9	70.0	70.5	69.6	70.0	70.03	12.00	0.42	0.2882	0.01		
															AVG K' FACTOR =	0.2882			

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:
Calculate the standard volumes of air passed through the DGM and the critical orifices, and calculate the DGM calibration factor, Y, using the equations in US EPA Method 5, Section 7.2.3.3 (these equations are programmed on the spreadsheet included with each orifice set).

* Critical Orifice Coefficient = $K' = \frac{K_1 V_m Y (P_{bar} + \Delta H/13.6) \sqrt{T_{amb}}}{P_{bar} T_m \Theta}$

Critical Orifice Set number 1374 was calibrated in accordance with the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 5, Section 7.2

Signature

7/25/00
Date

K_1 = 17.64 °R/in. Hg (English)
= 0.3858 °K/mm Hg (Metric)
T_{amb} = Absolute ambient temperature, °R (English), °K (Metric)
T_m = Absolute DGM avg. temperature, °R (English), °K (Metric)

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES

1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
2) Record barometric pressure before and after calibration procedure.
3) Run at tested vacuum (from Orifice Calibration Report), for a period of time necessary to achieve a minimum total volume of 5 cubic feet.
4) Record readings in outlined boxes below, other columns are automatically calculated.

CEC
Civil & Environmental Consultants, Inc.

DATE: 7/24/2018
METER PART #: 300.045 F
METER SERIAL #: 12454596
CRITICAL ORIFICE SET SERIAL #: 1374
BAROMETRIC PRESSURE (in Hg): INITIAL 29.27 FINAL 29.25 AVG (P_{bar}) 29.26

IF Y VARIATION EXCEEDS 2.00%,
ORIFICE SHOULD BE RECALIBRATED

ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT^3) INITIAL	FINAL	9 NET (V_m)	TEMPERATURES °F AMBIENT	DGM INLET INITIAL	DGM INLET FINAL	DGM OUTLET INITIAL	DGM OUTLET FINAL	DGM AVG	ELAPSED TIME (MIN) θ	DGM ΔH (in H_2O)	(1) V_m (STD)	(2) V_{cr} (STD)	(3) Y	Y VARIATION (%)	$\Delta H_@$
# 48	1	0.8138	16.0	177.463	188.535	11.072	84	88	90	88	90	89.0	10.00	3.60	10.5095	10.2121	0.9717		1.8431
SS	2	0.8138	16.0	188.535	199.590	11.055	86	90	92	90	92	91.0	10.00	3.60	10.45528	10.1934	0.9750		1.8432
	3	0.8138	16.0	199.590	210.656	11.066	86	92	93	92	93	92.5	10.00	3.60	10.43725	10.1934	0.9766		1.8382
																AVG =	0.9744	-0.12	
# 51	1	0.6704	16.0	150.166	159.225	9.059	85	88	90	88	90	89.0	10.00	2.03	8.5652	8.4049	0.9813		1.5283
SS	2	0.6704	16.0	159.225	168.334	9.109	84	90	91	90	91	90.5	10.00	2.30	8.5948	8.4126	0.9788		1.7248
	3	0.6704	16.0	168.334	177.463	9.129	85	91	92	91	92	91.5	10.00	2.30	8.5980	8.4049	0.9775		1.7249
																AVG =	0.9792	0.37	
# 52	1	0.6069	17.0	125.493	133.707	8.214	83	82	85	82	85	83.5	10.00	1.90	7.8423	7.6228	0.9720		1.7560
SS	2	0.6069	17.0	133.707	141.930	8.223	84	85	87	85	87	86.0	10.00	1.90	7.8149	7.6158	0.9745		1.7512
	3	0.6069	17.0	141.930	150.166	8.236	84	87	89	87	89	88.0	10.00	1.90	7.7987	7.6158	0.9765		1.7448
																AVG =	0.9744	-0.13	
# 54	1	0.4269	19.0	108.284	114.018	5.734	81	79	81	79	81	80.0	10.00	0.91	5.4964	5.3719	0.9773		1.7003
SS	2	0.4269	19.0	114.018	119.752	5.734	82	80	81	80	81	80.5	10.00	0.91	5.4913	5.3669	0.9773		1.7019
	3	0.4269	19.0	119.752	125.493	5.741	82	81	83	81	83	82.0	10.00	0.91	5.4828	5.3669	0.9789		1.6972
																AVG =	0.9779	0.23	
# 56	1	0.2882	20.0	210.656	214.598	3.942	86	90	90	90	90	90.0	10.00	0.42	3.7054	3.6099	0.9742		1.7041
SS	2	0.2882	20.0	214.598	218.568	3.970	87	90	90	90	90	90.0	10.00	0.42	3.7317	3.6066	0.9665		1.7072
	3	0.2882	20.0	218.568	222.496	3.928	87	90	89	90	89	89.5	10.00	0.42	3.6956	3.6066	0.9759		1.7088
																AVG =	0.9722	-0.35	

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:
The following equations are used to calculate the standard volumes of air passed through the DGM, V_m (std), and the critical orifice, V_{cr} (std), and the DGM calibration factor, Y. These equations are automatically calculated in the spreadsheet above.

AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = 0.9756

AVERAGE $\Delta H_@$ = 1.732

(1) $V_m\text{ (std)} = K_1\ V_m\ \dfrac{P_{bar} + (\Delta H/13.6)}{T_m}$ = Net volume of gas sample passed through DGM, corrected to standard conditions

K_1 = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)

T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)

$$\Delta H_@ = \left(\frac{0.75\ \theta}{V_{cr}(\text{std})}\right)^2 \Delta H \left(\frac{V_m(\text{std})}{V_m}\right)$$

(2) $V_{cr}\text{ (std)} = K' \sqrt{\dfrac{P_{bar}\ \theta}{T_{amb}}}$ = Volume of gas sample passed through the critical orifice, corrected to standard conditions

T_{amb} = Absolute ambient temperature (°R - English, °K - Metric)

K' = Average K' factor from Critical Orifice Calibration

(3) $Y = \dfrac{V_{cr}\text{ (std)}}{V_m\text{ (std)}}$ = DGM calibration factor

	300.045 F- 08/23/2018			Barometric Pressure 29.41				Stack	Probe	Filter	Exit	Aux	DGM In	DGM Out
Temperature	Stack	Probe	Filter	Exit	Aux	DGM In	DGM Out	% Error	% Error	% Error	% Error	% Error	% Error	% Error
0	0	0	0	0	0	2	2	0.00%	0.00%	0.00%	0.00%	0.00%	0.43%	0.43%
50	49	49	49	49	49	50	50	-0.20%	-0.20%	-0.20%	-0.20%	-0.20%	0.00%	0.00%
75	74	74	74	74	74	75	74	-0.19%	-0.19%	-0.19%	-0.19%	-0.19%	0.00%	-0.19%
100	100	100	100	100	99	99	99	0.00%	0.00%	0.00%	0.00%	-0.18%	-0.18%	-0.18%
200	202	202	203		202	202	202	0.30%	0.30%	0.45%		0.30%	0.30%	0.30%
500	502	502	502		502			0.21%	0.21%	0.21%		0.21%		
1000	1012							0.82%						
1500	1512							0.61%						
1900	1909							0.38%						

Criteria
± 1.5 °R (460+Ts)

Negative Leak Check @ 25 inches vacuum	0.000 cubic feet/min
Positve Leak Check @ 6.4 inches water	No movement- good

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES

1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
2) Record barometric pressure before and after calibration procedure.
3) Run at tested vacuum (from Orifice Calibration Report), for a period of time necessary to achieve a minimum total volume of 5 cubic feet.
4) Record readings in outlined boxes below, other columns are automatically calculated.

Civil & Environmental Consultants, Inc.

DATE: 7/30/2018
METER PART #: 300.241 H
METER SERIAL #: 7811505
CRITICAL ORIFICE SET SERIAL #: 1374

	INITIAL	FINAL	AVG (P_{bar})
BAROMETRIC PRESSURE (in Hg):	29.34	29.34	29.34

IF Y VARIATION EXCEEDS 2.00%, ORIFICE SHOULD BE RECALIBRATED

ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT³) INITIAL	FINAL	9 NET (V_m)	TEMPERATURES °F AMBIENT	DGM INLET INITIAL	DGM INLET FINAL	DGM OUTLET INITIAL	DGM OUTLET FINAL	DGM AVG	ELAPSED TIME (MIN) θ	DGM ΔH (in H_2O)	(1) V_m (STD)	(2) V_{cr} (STD)	(3) Y	Y VARIATION (%)	$\Delta H_@$
# 48	1	0.8138	17.5	614.8590	625.594	10.735	81	87	88	87	88	87.5	10.00	3.50	10.2427	10.2684	1.0025		1.7815
SS	2	0.8138	17.5	625.594	643.901	18.307	80	87	90	87	90	88.5	17.00	3.50	17.4356	17.4725	1.0021		1.7750
	3	0.8138	17.5	643.901	663.286	19.385	82	90	89	90	89	89.5	18.00	3.50	18.4287	18.4661	1.0020		1.7783
																AVG =	1.0022	0.09	
# 51	1	0.6704	19.0	584.681	597.136	12.455	81	86	86	86	86	86.0	14.00	2.30	11.8810	11.8426	0.9968		1.7247
SS	2	0.6704	19.0	597.136	606.002	8.866	81	86	87	86	87	86.5	10.00	2.30	8.4497	8.4590	1.0011		1.7231
	3	0.6704	19.0	606.002	614.859	8.857	81	87	87	87	87	87.0	10.00	2.30	8.4334	8.4590	1.0030		1.7216
																AVG =	1.0003	-0.10	
# 52	1	0.6069	20.0	557.284	565.329	8.045	80	85	85	85	85	85.0	10.00	2.00	7.6826	7.6649	0.9977		1.8286
SS	2	0.6069	20.0	565.329	576.626	11.297	81	85	86	85	86	85.5	14.00	2.00	10.7782	10.7209	0.9947		1.8303
	3	0.6069	20.0	576.626	584.681	8.055	80	86	87	86	87	86.5	10.00	2.00	7.6710	7.6649	0.9992		1.8236
																AVG =	0.9972	-0.41	
# 54	1	0.4269	21.5	540.305	545.985	5.680	80	83	84	83	84	83.5	10.00	0.97	5.4251	5.3916	0.9938		1.7928
SS	2	0.4269	21.5	545.985	551.643	5.658	81	84	84	84	84	84.0	10.00	0.97	5.3991	5.3866	0.9977		1.7945
	3	0.4269	21.5	551.643	557.284	5.641	80	84	84	84	84	84.0	10.00	0.97	5.3829	5.3916	1.0016		1.7911
																AVG =	0.9977	-0.36	
# 56	1	0.2882	23.0	663.286	667.506	4.220	81	89	88	89	88	88.5	11.00	0.44	3.9886	4.0001	1.0029		1.7690
SS	2	0.2882	23.0	667.506	673.586	6.080	81	88	88	88	88	88.0	16.00	0.44	5.7518	5.8184	1.0116		1.7706
	3	0.2882	23.0	673.586	679.664	6.078	81	88	89	88	89	88.5	16.00	0.44	5.7447	5.8184	1.0128		1.7690
																AVG =	1.0091	0.78	

AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = 1.0013

AVERAGE $\Delta H_@$ = 1.778

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:
The following equations are used to calculate the standard volumes of air passed through the DGM, V_m (std), and the critical orifice, V_{cr} (std), and the DGM calibration factor, Y. These equations are automatically calculated in the spreadsheet above.

(1) $V_m\ (std) = K_1\ V_m\ \frac{P_{bar} + (\Delta H/13.6)}{T_m}$ = Net volume of gas sample passed through DGM, corrected to standard conditions

K_1 = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)
T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)

(2) $V_{cr}\ (std) = K'\ \sqrt{\frac{P_{bar}\ \theta}{T_{amb}}}$ = Volume of gas sample passed through the critical orifice, corrected to standard conditions

T_{amb} = Absolute ambient temperature (°R - English, °K - Metric)
K' = Average K' factor from Critical Orifice Calibration

(3) $Y = \frac{V_{cr}\ (std)}{V_m\ (std)}$ = DGM calibration factor

$$\Delta H_@ = \left(\frac{0.75\ \theta}{V_{cr}(std)}\right)^2\ \Delta H \left(\frac{V_m(std)}{V_m}\right)$$

Meterbox Temp Cal. 300.241 H- 08/24/2018			Barometric Pressure 29.5			
Temperature	Stack	Probe	Filter	Exit	Aux	DGM outlet
0	1	1	1	1	1	1
50	50	50	50	50	50	50
75	75	75	75	74	75	75
100	100	100	100	99	100	100
200	203	203	202		202	202
500	503	503	503		503	
1000	1010					
1500	1510					
1900	1908					

Stack % Error	Probe % Error	Filter % Error	Exit % Error	Aux % Error	DGM Out % Error
0.22%	0.22%	0.22%	0.22%	0.22%	0.22%
0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
0.00%	0.00%	0.00%	-0.19%	0.00%	0.00%
0.00%	0.00%	0.00%	-0.18%	0.00%	0.00%
0.45%	0.45%	0.30%		0.30%	0.30%
0.31%	0.31%	0.31%		0.31%	
0.68%					
0.51%					
0.34%					

Criteria
± 1.5 °R (460+Ts)

Negative Leak Check @ 23 inches vacuum 0.000 cubic feet/min
Positve Leak Check @ 5.9 inches water No movement- good

TYPE "S" PITOT TUBE CALIBRATION FORM

Dates: 09/04-05/2018 and
larger probes 8'+ 01/30/18.
Calibrator: BLS

Specifications:
A.) Pitot tube assembly must be level.
B.) If pitot tube is damaged explain under comments section.
C.) Z = A Sin g (<0.125) and W = A Sin q (<0.03125)
D.) a <10° and b <5°

BP-29.45	09/04/18
BP-29.52	09/05/18
BP-29.55	01/30/18

Pitot Tubes Attached to Probes

I.D. Length	a1°	a2°	b1°	b2°	y°	O°	A, in.	Z, in.	W, in.	PA, in.	PB, in.	Dt, in.	Pass/Fail	Cal. Date
200.021 2'	1.0	1.0	1.0	1.0	1.0	1.0	0.949	0.017	0.01656	0.475	0.475	0.379	Pass	09/04/18
200.063 2'	-1.0	0.0	-1.0	-1.0	1.0	-1.0	0.924	0.016	-0.01613	0.462	0.462	0.382	Pass	09/04/18
200.064 2'	0.0	1.0	-1.0	0.0	1.0	1.0	0.933	0.016	0.01628	0.467	0.467	0.381	Pass	09/04/18
200.076 3'	-1.0	1.0	1.0	0.0	1.0	1.0	0.931	0.016	0.01625	0.466	0.466	0.392	Pass	09/04/18
200.077 3'	0.0	1.0	1.0	1.0	1.0	1.0	0.925	0.016	0.01614	0.463	0.463	0.379	Pass	09/04/18
200.080 3'	0.0	1.0	-1.0	1.0	1.0	1.0	0.979	0.017	0.01709	0.490	0.490	0.374	Pass	09/04/18
200.300 3'	-1.0	1.0	-1.0	0.0	0.0	1.0	0.936	0.000	0.01634	0.468	0.468	0.379	Pass	09/04/18
200.301 3'	0.0	1.0	-1.0	0.0	0.0	1.0	0.903	0.000	0.01576	0.452	0.452	0.382	Pass	09/04/18
200.302 3'	-1.0	0.0	-1.0	1.0	0.0	1.0	0.946	0.000	0.01651	0.473	0.473	0.380	Pass	09/04/18
200.303 3'	0.0	1.0	0.0	2.0	1.0	1.0	0.873	0.015	0.01524	0.437	0.437	0.379	Pass	09/04/18
200.105 5'	-1.0	-1.0	0.0	1.0	-1.0	0.0	0.933	-0.016	0.00000	0.467	0.467	0.383	Pass	09/05/18
200.118 5'	-1.0	-1.0	1.0	1.0	-1.0	1.0	0.947	-0.017	0.01653	0.474	0.474	0.379	Pass	09/05/18
200.119 5'	0.0	-1.0	0.0	1.0	-1.0	-1.0	1.005	-0.018	-0.01754	0.503	0.503	0.378	Pass	09/05/18
200.120 5'	0.0	1.0	1.0	2.0	-1.0	0.0	0.935	-0.016	0.00000	0.468	0.468	0.395	Pass	09/05/18
200.121 5'	-1.0	0.0	0.0	2.0	1.0	1.0	0.934	0.016	0.01630	0.467	0.467	0.374	Pass	09/05/18
T13 7'	-1.0	-2.0	0.0	-1.0	-1.0	0.0	1.012	-0.018	0.00000	0.506	0.506	0.377	Pass	01/30/18
200.093 7'	-1.0	-1.0	-1.0	1.0	0.0	1.0	0.932	0.000	0.01627	0.466	0.466	0.386	Pass	09/05/18
200.094 7'	0.0	0.0	-1.0	0.0	0.0	1.0	0.933	0.000	0.01628	0.467	0.467	0.386	Pass	09/05/18
200.112 7'	-1.0	0.0	0.0	0.0	0.0	1.0	0.940	0.000	0.01641	0.470	0.470	0.389	Pass	09/05/18
200.310 7'	-1.0	0.0	-1.0	0.0	1.0	-1.0	0.920	0.016	-0.01606	0.460	0.460	0.383	Pass	09/05/18
200.045 8'	0.0	0.0	-1.0	2.0	0.0	1.0	1.006	0.000	0.01756	0.503	0.503	0.375	Pass	09/05/18
200.108 8'	0.0	0.0	-1.0	-1.0	0.0	0.0	1.005	0.000	0.00000	0.503	0.503	0.373	Pass	01/30/18
200.109 8'	1.0	0.0	-1.0	-1.0	0.0	-1.0	0.927	0.000	-0.01618	0.464	0.464	0.379	Pass	01/30/18
200.705 8'	1.0	-1.0	0.0	-1.0	-1.0	0.0	0.868	-0.015	0.00000	0.434	0.434	0.381	Pass	01/30/18
200.709 8'	1.0	0.0	-1.0	-1.0	1.0	-2.0	0.963	0.017	-0.03361	0.482	0.482	0.377	Pass	01/30/18
200.014 10'	1.0	1.0	1.0	0.0	-1.0	-1.0	0.934	-0.016	-0.01630	0.467	0.467	0.384	Pass	01/30/18
200.050 11'	1.0	1.0	-2.0	-3.0	-1.0	1.0	0.928	-0.016	0.01620	0.464	0.464	0.382	Pass	01/30/18
200.051 11'	1.0	1.0	-1.0	0.0	-1.0	-2.0	0.941	-0.016	-0.03284	0.471	0.471	0.381	Pass	01/30/18
200.052 11'	2.0	2.0	1.0	-2.0	0.0	-1.0	0.941	0.000	-0.01642	0.471	0.471	0.383	Pass	01/30/18
200.053 11'	0.0	1.0	1.0	-2.0	1.0	-1.0	0.962	0.017	-0.01679	0.481	0.481	0.376	Pass	01/30/18

Comments: Pitot Tubes Required Only Minor Maintenance & Reconditioning

TYPE "S" PITOT TUBE CALIBRATION FORM

Date: 09/04/18
Calibrator: BLS

Specifications:
A.) Pitot tube assembly must be level.
B.) If pitot tube is damaged explain under comments section.
C.) Z = A Sin g (<0.125) and W = A Sin q (<0.03125)
D.) a <10° and b <5°

Individual Pitot Tubes

I.D. Length	**a1°**	**a2°**	**b1°**	**b2°**	**y°**	**o°**	**A, in.**	**Z, in.**	**W, in.**	**PA, in.**	**PB, in.**	**Dt, in.**	**Pass/Fail**	**Cal. Date**
200.304 3'	-1.0	-1.0	0.0	-1.0	1.0	1.0	0.937	0.016	0.01635	0.469	0.469	0.381	Pass	09/04/18
200.305 3'	-1.0	0.0	0.0	0.0	-1.0	0.0	0.935	-0.016	0.00000	0.468	0.468	0.383	Pass	09/04/18
200.706 3'	-1.0	1.0	-2.0	-1.0	-1.0	-1.0	0.831	-0.015	-0.01450	0.416	0.416	0.382	Pass	09/04/18
200.708 3'	0.0	0.0	-1.0	0.0	2.0	1.0	0.841	0.029	0.01468	0.421	0.421	0.384	Pass	09/04/18
200.701 5'	0.0	1.0	0.0	1.0	2.0	1.0	0.958	0.033	0.01672	0.479	0.479	0.381	Pass	09/04/18
200.711 5'	-1.0	1.0	-1.0	0.0	1.0	1.0	0.935	0.016	0.01632	0.468	0.468	0.380	Pass	09/04/18
200.704 7'	-1.0	0.0	-3.0	1.0	1.0	-1.0	0.834	0.015	-0.01456	0.417	0.417	0.373	Pass	09/04/18
CLT-T-7-1/ p-825	-1.0	0.0	-1.0	0.0	-1.0	1.0	0.956	-0.017	0.01668	0.478	0.478	0.388	Pass	09/04/18
200.769 (s/n/p)	-1.0	1.0	1.0	0.0	1.0	0.0	0.933	0.016	0.00000	0.467	0.467	0.391	Pass	09/04/18
200.255i 7'	1.0	1.0	1.0	0.0	1.0	-1.0	0.867	0.015	-0.01513	0.434	0.434	0.383	Pass	09/04/18
200.712 8'	-1.0	-1.0	-1.0	0.0	1.0	1.0	0.936	0.016	0.01634	0.468	0.468	0.394	Pass	09/04/18
CLT.T.10.1	1.0	-1.0	-2.0	0.0	1.0	1.0	0.864	0.015	0.01508	0.432	0.432	0.390	Pass	09/04/18
CLT.T.10.2	1.0	0.0	-1.0	-1.0	0.0	1.0	0.854	0.000	0.01490	0.427	0.427	0.385	Pass	09/04/18
CLT.T.10.3 Inconel	0.0	1.0	-1.0	3.0	0.0	1.0	0.943	0.000	0.01646	0.472	0.472	0.388	Pass	09/04/18
200.997	-1.0	-1.0	-2.0	1.0	0.0	1.0	0.935	0.000	0.01632	0.468	0.468	0.383	Pass	09/04/18
200.998	1.0	0.0	1.0	0.0	1.0	1.0	0.927	0.016	0.01618	0.464	0.464	0.382	Pass	09/04/18
200.801 Micro Type S	1.0	-1.0	1.0	1.0	1.0	1.0	0.475	0.008	0.00829	0.238	0.238	0.188	Pass	09/04/18

☐Black &

Date:	08/30/18
Barometric Pressure, In. Hg:	29.43

Reference Thermometer:	170553260
Omega NIST Calibrator Serial No.:	17000169

Reference Thermometer:	170553260
Omega NIST Calibrator Serial No.:	17000169

Reference Thermometer:	170553260
Omega NIST Calibrator Serial No.:	17000169

Asset Number		Cal. By	Temp. One	Reference Temp. One	Percent Difference	Passed	Temp. Two	Reference Temp. Two	Percent Difference	Passed	Temp. Three	Reference Temp. Three	Percent Difference	Passed
PROBES														
200.021	2	*BLS*	79.8	79.5	-0.1%	Yes	181.3	182.8	0.2%	Yes	379	382.4	0.4%	Yes
200.063	2	*BLS*	79.9	80.0	0.0%	Yes	183.9	184.6	0.1%	Yes	384	382.6	-0.2%	Yes
200.064	2	*BLS*	80.0	79.8	0.0%	Yes	185.7	185.3	-0.1%	Yes	384	385.8	0.2%	Yes
200.076	3	*BLS*	79.8	79.5	-0.1%	Yes	183.3	183.6	0.0%	Yes	385	386.5	0.2%	Yes
200.077	3	*BLS*	79.8	79.7	0.0%	Yes	184.6	184.1	-0.1%	Yes	382	383.3	0.2%	Yes
200.080	3	*BLS*	80.0	79.7	-0.1%	Yes	185.0	183.9	-0.2%	Yes	388	387.1	-0.1%	Yes
200.300	3	*BLS*	79.6	79.7	0.0%	Yes	184.1	184.2	0.0%	Yes	377	385.6	1.0%	Yes
200.301	3	*BLS*	79.7	79.7	0.0%	Yes	184.4	184.8	0.1%	Yes	382	385.6	0.4%	Yes
200.302	3	*BLS*	79.7	79.7	0.0%	Yes	185.6	185.1	-0.1%	Yes	376	382.1	0.7%	Yes
200.303	3	*BLS*	79.8	79.8	0.0%	Yes	185.2	185.3	0.0%	Yes	377	386.0	1.1%	Yes
200.105	5	*BLS*	80.9	80.7	0.0%	Yes	185.7	186.6	0.1%	Yes	375	384.8	1.2%	Yes
200.118	5	*BLS*	80.8	80.7	0.0%	Yes	187.1	186.9	0.0%	Yes	379	383.3	0.5%	Yes
200.119	5	*BLS*	80.8	80.8	0.0%	Yes	186.9	187.1	0.0%	Yes	374	384.6	1.3%	Yes
200.120	5	*BLS*	80.8	80.6	0.0%	Yes	186.9	187.0	0.0%	Yes	375	379.2	0.5%	Yes
200.121	5	*BLS*	80.7	80.6	0.0%	Yes	185.5	186.9	0.2%	Yes	389	392.0	0.4%	Yes
200.093 7'	7	*BLS*	80.7	80.6	0.0%	Yes	186.0	186.8	0.1%	Yes	379	383.1	0.5%	Yes
200.094 7'	7	*BLS*	80.6	80.6	0.0%	Yes	188.0	187.3	-0.1%	Yes	386	387.3	0.2%	Yes
200.112 7'	7	*BLS*	80.7	80.4	-0.1%	Yes	188.2	188.4	0.0%	Yes	383	383.5	0.1%	Yes
200.310 7'	7	*BLS*	80.9	80.6	-0.1%	Yes	188.6	187.3	-0.2%	Yes	378	383.8	0.7%	Yes
200.045 8'	8	*BLS*	80.7	80.4	-0.1%	Yes	187.7	188.0	0.0%	Yes	376	380.4	0.5%	Yes
Pitots														
200.304	3	*BLS*	81.3	81.1	0.0%	Yes	186.9	188.0	0.2%	Yes	385	385.7	0.1%	Yes
200.305	3	*BLS*	81.3	81.1	0.0%	Yes	186.9	186.9	0.0%	Yes	384	386.1	0.2%	Yes
200.706	3	*BLS*	81.1	81.1	0.0%	Yes	186.6	187.7	0.2%	Yes	380	381.1	0.1%	Yes
200.708	3	*BLS*	80.8	81.3	0.1%	Yes	188.0	187.1	-0.1%	Yes	377	381.0	0.5%	Yes
200.711	5	*BLS*	81.0	81.1	0.0%	Yes	187.1	187.8	0.1%	Yes	377	380.1	0.4%	Yes
200.704	7	*BLS*	81.4	81.3	0.0%	Yes	188.5	187.5	-0.2%	Yes	384	386.3	0.3%	Yes
CLT.T.7.1	7	*BLS*	81.2	81.3	0.0%	Yes	185.6	187.3	0.3%	Yes	378	381.9	0.5%	Yes
200.769 s/np	7	*BLS*	81.3	81.5	0.0%	Yes	186.8	188.0	0.2%	Yes	384	385.1	0.1%	Yes
200.255i	7	*BLS*	81.0	81.6	0.1%	Yes	190.1	190.4	0.0%	Yes	375	379.5	0.5%	Yes
CLT.T.10.1	10	*BLS*	81.2	81.5	0.1%	Yes	189.3	191.1	0.3%	Yes	374	375.2	0.1%	Yes
CLT.T.10.2	10	*BLS*	81.5	81.6	0.0%	Yes	190.3	191.6	0.2%	Yes	377	380.4	0.4%	Yes
CLT.T.10.3	10	*BLS*	81.3	81.6	0.1%	Yes	189.7	191.8	0.3%	Yes	371	380.8	1.2%	Yes
200.701	5	BLS	81.3	81.1	0.0%	Yes	192.6	191.6	-0.2%	Yes	381	382.6	0.2%	Yes
200.997	2	BLS	81.7	81.3	-0.1%	Yes	188.3	191.8	0.5%	Yes	377	383.9	0.8%	Yes

Ref. Temp. Deg. F + 460

☑Black &

Date: 01/29/18
Barometric Pressure, In. Hg: 29.30

Reference Thermometer: 170553260
Omega NIST Calibrator Serial No.: 17000169

Reference Thermometer: 170553260
Omega NIST Calibrator Serial No.: 17000169

Reference Thermometer: 170553260
Omega NIST Calibrator Serial No.: 17000169

Asset Number		Cal. By	Temp. One	Reference Temp. One	Percent Difference	Passed	Temp. Two	Reference Temp. Two	Percent Difference	Passed	Temp. Three	Reference Temp. Three	Percent Difference	Passed
PROBES														
T13 7'	7	BLS	56.4	54.6	-0.3%	Yes	165.2	165.1	0.0%	Yes	391	388.7	-0.3%	Yes
200.108 8'	8	BLS	63.3	61.4	-0.4%	Yes	160.2	159.6	-0.1%	Yes	381	383.1	0.2%	Yes
200.109 8'	8	BLS	62.9	61.4	-0.3%	Yes	175.2	173.8	-0.2%	Yes	388	389.6	0.2%	Yes
200.705 8'	8	BLS	63.0	61.4	-0.3%	Yes	179.6	180.3	0.1%	Yes	387	391.1	0.5%	Yes
200.709 8'	8	BLS	63.1	61.4	-0.3%	Yes	176.5	182.8	1.0%	Yes	361	371.4	1.3%	Yes
200.014 10'	10	BLS	62.5	61.5	-0.2%	Yes	189.6	186.8	-0.4%	Yes	379	386.0	0.8%	Yes
200.050 11'	11	BLS	62.7	61.5	-0.2%	Yes	187.8	185.3	-0.4%	Yes	381	385.3	0.5%	Yes
200.051 11'	11	BLS	62.5	61.5	-0.2%	Yes	188.0	186.6	-0.2%	Yes	383	388.5	0.6%	Yes
200.052 11'	11	BLS	62.5	61.5	-0.2%	Yes	190.3	188.4	-0.3%	Yes	382	388.0	0.7%	Yes
200.053 11'	11	BLS	62.4	61.5	-0.2%	Yes	190.2	187.1	-0.5%	Yes	386	388.5	0.3%	Yes

Ref. Temp. Deg. F + 460

Umbilical Adaptors Temperature Calibration

☐Black & white

Calibrated By: BLS

Date: 08/24/18

Reference Thermometer: 170553260

Omega NIST Calibrator Serial No.: 17000169
Model CL3512A

Barometric Pressure,In. Hg: 29.47

Asset Number	Id Letter	Ambient	Reference Ambient	Percent Difference	Passed	Ice Bath	Reference Ice Bath	Percent Difference	Passed	Heat Bath	Reference Heat Bath	Percent Difference	Passed
300.030	A	80.9	80.6	-0.1%	Yes	41.7	40.8	-0.2%	Yes	180.1	179.6	-0.1%	Yes
300.318	B	80.8	80.6	0.0%	Yes	39.7	39.9	0.0%	Yes	179.1	179.7	0.1%	Yes
300.355	C	80.9	80.6	-0.1%	Yes	42.3	41.0	-0.3%	Yes	180.0	179.7	0.0%	Yes
300.032	D	80.9	80.6	-0.1%	Yes	42.4	40.6	-0.4%	Yes	178.3	180.3	0.3%	Yes
300.043	E	80.9	80.6	-0.1%	Yes	41.4	39.9	-0.3%	Yes	182.0	183.7	0.3%	Yes
300.319	F	81.0	80.6	-0.1%	Yes	40.7	39.5	-0.2%	Yes	181.9	183.3	0.2%	Yes
300.317	G	81.0	80.6	-0.1%	Yes	40.4	39.2	-0.2%	Yes	182.7	183.3	0.1%	Yes
300.042	H	80.9	80.6	-0.1%	Yes	41.2	39.3	-0.4%	Yes	181.4	182.8	0.2%	Yes
300.345	I	81.0	80.6	-0.1%	Yes	39.8	38.6	-0.2%	Yes	182.2	182.6	0.1%	Yes
300.044	J	81.1	80.6	-0.1%	Yes	41.1	39.7	-0.3%	Yes	180.8	182.3	0.2%	Yes
300.031	K	81.0	80.6	-0.1%	Yes	39.2	38.3	-0.2%	Yes	182.0	182.1	0.0%	Yes
300.216	L	80.8	80.6	0.0%	Yes	40.7	39.5	-0.2%	Yes	179.2	179.7	0.1%	Yes
300.320	M	80.2	80.6	0.1%	Yes	39.8	39.0	-0.2%	Yes	177.5	179.0	0.2%	Yes
300.346	N	80.4	80.7	0.1%	Yes	40.2	38.8	-0.3%	Yes	178.9	179.2	0.0%	Yes
300.295	O	80.8	80.7	0.0%	Yes	40.4	38.6	-0.4%	Yes	180.0	180.3	0.0%	Yes

Temperature Difference Calculation:

$$\frac{(\text{Ref. Temp. Deg. F} + 460) - (\text{Test Temp. Deg. F} + 460)}{\text{Ref. Temp. Deg. F} + 460} \text{ X } 100 = <1.5\%$$

Date:	08/24/18
Barometric Pressure, In. Hg:	29.50

Reference Thermometer:	170553260	Reference Thermometer:	170553260	Reference Thermometer:	170553260
Omega NIST Calibrator Serial No.:	17000169	Omega NIST Calibrator Serial No.:	17000169	Omega NIST Calibrator Serial No.:	17000169

Asset Number	Cal. By	Temp. One	Reference Temp. One	Percent Difference	Passed	Temp. Two	Reference Temp. Two	Percent Difference	Passed	Temp. Three	Reference Temp. Three	Percent Difference	Passed
Wands													
CPM Exit													
100.108	BLS	38.9	38.4	-0.1%	Yes	73.3	73.5	0.0%	Yes	200.0	198.6	-0.2%	Yes
100.109	BLS	41.1	39.3	-0.4%	Yes	73.3	73.5	0.0%	Yes	191.7	191.3	-0.1%	Yes
100.110	BLS	39.7	39.9	0.0%	Yes	71.2	70.8	-0.1%	Yes	194.0	195.2	0.2%	Yes
100.112	BLS	40.0	39.5	-0.1%	Yes	69.2	70.3	0.2%	Yes	193.6	195.0	0.2%	Yes
100.119	BLS	40.0	38.4	-0.3%	Yes	72.0	72.3	0.1%	Yes	192.0	191.6	-0.1%	Yes
100.120	BLS	40.2	39.0	-0.2%	Yes	69.1	70.3	0.2%	Yes	192.1	193.1	0.2%	Yes
100.125	BLS	41.0	41.0	0.0%	Yes	71.7	71.4	-0.1%	Yes	194.0	194.7	0.1%	Yes
M5 Exit Glass													
100.089	BLS	40.6	40.2	-0.1%	Yes	72.1	70.3	-0.3%	Yes	187.9	187.3	-0.1%	Yes
G1	BLS	40.2	38.6	-0.3%	Yes	72.9	71.6	-0.2%	Yes	187.5	187.1	-0.1%	Yes
G2	BLS	39.5	39.2	-0.1%	Yes	72.6	71.7	-0.2%	Yes	187.5	185.5	-0.3%	Yes
G3	BLS	39.0	38.3	-0.1%	Yes	72.7	71.9	-0.2%	Yes	188.4	187.1	-0.2%	Yes
G5	BLS	39.4	39.2	0.0%	Yes	72.8	71.9	-0.2%	Yes	187.7	186.8	-0.1%	Yes
G6	BLS	39.3	38.4	-0.2%	Yes	72.9	72.1	-0.2%	Yes	188.8	187.1	-0.3%	Yes
G7	BLS	41.0	40.4	-0.1%	Yes	72.7	72.1	-0.1%	Yes	188.1	187.3	-0.1%	Yes
G13	BLS	42.5	40.0	-0.5%	Yes	73.9	72.5	-0.3%	Yes	184.5	186.6	0.3%	Yes
G14	BLS	40.8	40.1	-0.1%	Yes	70.9	69.2	-0.3%	Yes	188.4	186.8	-0.2%	Yes
G15	BLS	41.0	39.7	-0.3%	Yes	69.7	69.2	-0.1%	Yes	188.3	186.0	-0.4%	Yes
G18	BLS	42.8	40.5	-0.5%	Yes	72.2	70.7	-0.3%	Yes	187.9	187.3	-0.1%	Yes
M5 Exit SS													
S01	BLS	40.7	39.4	-0.3%	Yes	73.6	73.5	0.0%	Yes	193.5	193.1	-0.1%	Yes
S02	BLS	40.4	38.4	-0.4%	Yes	70.8	70.8	0.0%	Yes	194.2	193.2	-0.2%	Yes
S03	BLS	38.5	37.2	-0.3%	Yes	71.3	70.5	-0.2%	Yes	192.9	191.6	-0.2%	Yes
S04	BLS	40.2	37.9	-0.5%	Yes	70.6	71.0	0.1%	Yes	192.1	191.6	-0.1%	Yes
S05	BLS	39.5	38.1	-0.3%	Yes	73.8	73.5	-0.1%	Yes	200.0	199.2	-0.1%	Yes
S06	BLS	40.0	38.1	-0.4%	Yes	72.3	73.0	0.1%	Yes	195.0	193.4	-0.2%	Yes
S07	BLS	39.6	38.3	-0.3%	Yes	72.2	71.2	-0.2%	Yes	196.4	195.4	-0.2%	Yes
S08	BLS	41.0	39.5	-0.3%	Yes	73.5	73.5	0.0%	Yes	196.5	195.9	-0.1%	Yes
S09	BLS	40.1	38.1	-0.4%	Yes	70.7	71.0	0.1%	Yes	192.0	191.4	-0.1%	Yes
S10	BLS	40.0	38.8	-0.2%	Yes	74.8	73.5	-0.2%	Yes	191.4	191.8	0.1%	Yes
S11	BLS	39.2	39.2	0.0%	Yes	73.5	72.8	-0.1%	Yes	194.6	195.9	0.2%	Yes
100.066	BLS	42.8	40.8	-0.4%	Yes	73.7	72.8	-0.2%	Yes	191.5	192.3	0.1%	Yes

Ref. Temp. Deg. F + 460

Date: 06/24/18
Barometric Pressure, In. Hg: 29.50

Reference Thermometer: 170553260
Omega NIST Calibrator Serial No.: 17000169

Reference Thermometer: 170553260
Omega NIST Calibrator Serial No.: 17000169

Reference Thermometer: 170553260
Omega NIST Calibrator Serial No.: 17000169

Asset Number	Cal. By	Temp. One	Reference Temp. One	Percent Difference	Passed	Temp. Two	Reference Temp. Two	Percent Difference	Passed	Temp. Three	Reference Temp. Three	Percent Difference	Passed
Thermocouple Wands													
Wb/Db													
100.001	BLS	40.8	41.1	0.1%	Yes	74.3	73.0	-0.2%	Yes	184.7	185.5	0.1%	Yes
100.002	BLS	38.0	37.2	-0.2%	Yes	74.3	73.5	-0.1%	Yes	191.3	191.6	0.0%	Yes
100.042	BLS	40.8	39.2	-0.3%	Yes	72.9	73.4	0.1%	Yes	187.8	186.8	-0.2%	Yes
wb100.044	BLS	40.0	38.8	-0.2%	Yes	74.5	73.3	-0.2%	Yes	183.4	185.0	0.2%	Yes
100.045	BLS	39.3	40.0	0.1%	Yes	72.5	73.3	0.2%	Yes	187.5	186.0	-0.2%	Yes
100.046	BLS	77.4	77.3	0.0%	Yes	191.0	189.8	-0.2%	Yes	375.0	384.8	1.2%	Yes
100.047	BLS	78.5	77.5	-0.2%	Yes	190.0	189.8	0.0%	Yes	385.0	391.6	0.8%	Yes
100.060	BLS	39.8	38.8	-0.2%	Yes	72.6	73.3	0.1%	Yes	188.0	186.2	-0.3%	Yes
wb100.061	BLS	39.5	39.2	-0.1%	Yes	73.2	73.3	0.0%	Yes	188.2	189.3	0.2%	Yes
100.071	BLS	40.5	38.9	-0.3%	Yes	73.4	72.5	-0.2%	Yes	192.5	191.9	-0.1%	Yes
100.072	BLS	38.5	37.5	-0.2%	Yes	73.8	72.5	-0.2%	Yes	191.6	191.6	0.0%	Yes
100.073	BLS	40.0	39.7	-0.1%	Yes	74.3	72.7	-0.3%	Yes	193.2	192.2	-0.2%	Yes
wb 100.059	BLS	39.5	39.9	0.1%	Yes	74.6	73.4	-0.2%	Yes	190.7	189.8	-0.1%	Yes
100.075	BLS	40.9	39.9	-0.2%	Yes	73.3	72.6	-0.1%	Yes	192.0	191.4	-0.1%	Yes
100.076	BLS	40.2	40.4	0.0%	Yes	74.3	72.8	-0.3%	Yes	192.6	192.0	-0.1%	Yes
100.077	BLS	39.5	38.5	-0.2%	Yes	73.2	72.5	-0.1%	Yes	192.5	192.5	0.0%	Yes
100.079	BLS	39.7	39.3	-0.1%	Yes	73.7	72.8	-0.2%	Yes	192.3	191.6	-0.1%	Yes
100.080	BLS	40.0	40.2	0.0%	Yes	74.1	72.8	-0.2%	Yes	191.9	192.0	0.0%	Yes
100.074	BLS	40.4	39.3	-0.2%	Yes	80.0	78.6	-0.3%	Yes	185.3	185.5	0.0%	Yes
Lollipops													
150739815	BLS	44.8	44.0	-0.2%	Yes	72.1	71.2	-0.2%	Yes	182.2	182.6	0.1%	Yes
150655937	BLS	44.7	44.2	-0.1%	Yes	73.5	71.7	-0.3%	Yes	182.0	182.8	0.1%	Yes

Ref. Temp. Deg. F + 460

Date: 08/24/18
Barometric Pressure, In. Hg: 29.50

Reference Thermometer: 170553260
Omega NIST Calibrator Serial No.: 17000169

Reference Thermometer: 170553260
Omega NIST Calibrator Serial No.: 17000169

Reference Thermometer: 170553260
Omega NIST Calibrator Serial No.: 17000169

Asset Number	Cal. By	Temp. One	Reference Temp. One	Percent Difference	Passed	Temp. Two	Reference Temp. Two	Percent Difference	Passed	Temp. Three	Reference Temp. Three	Percent Difference	Passed
Thermocouple Wands													
CPM Exit													
100.104	BLS	43.2	42.8	-0.1%	Yes	73.7	72.8	-0.2%	Yes	178.9	177.6	-0.2%	Yes
100.106	BLS	40.8	40.5	-0.1%	Yes	73.6	72.8	-0.2%	Yes	179.6	179.9	0.0%	Yes
100.124	BLS	43.9	43.1	-0.2%	Yes	73.5	72.8	-0.1%	Yes	183.0	182.3	-0.1%	Yes

Ref. Temp. Deg. F + 460

08/23/2018 BP- 29.47				
Handheld Omega Readers	HH91	100.040	T-148841	T-269912
0	-0.4	1	2	1
50	49.4	50	50	49
75	74.5	75	75	74
100	99.6	100	100	**99**
200	199.5	202	200	201
500	499.3	502	495	500

% Error	% Error	% Error	% Error	Criteria
-0.09%	0.22%	0.43%	0.22%	± 1.5 °R (460+Ts)
-0.12%	0.00%	0.00%	-0.20%	
-0.09%	0.00%	0.00%	-0.19%	
-0.07%	0.00%	0.00%	-0.18%	
-0.08%	0.30%	0.00%	0.15%	
-0.07%	0.21%	-0.52%	0.00%	

Hotbox Thermocouple Temperature Calibration

☐Black & white

Calibrated By: BLS

Date: 01/24/18

Reference Thermometer: NIST 170553260
Traceable Lollipop

Omega NIST Calibrator Serial No.: 17000169
Model Number CL3512A

Barometric Pressure,In. Hg: # 29.45

Asset Number	Id Letter	Ambient	Reference Ambient	Percent Difference	Passed	MID. Temp.	Reference Temp.	Percent Difference	Passed	HIGH Temp.	Reference Temp.	Percent Difference	Passed
Hotbox	CLT.H.1	68.7	68.0	-0.1%	Yes	203	201.7	-0.2%	Yes	354	360.7	0.8%	Yes
Hotbox	CLT.H.4	68.6	68.0	-0.1%	Yes	208	206.7	-0.2%	Yes	347	345.7	-0.2%	Yes
Hotbox	CLT.H.5	68.8	68.0	-0.2%	Yes	209	204.8	-0.6%	Yes	352	351.6	0.0%	Yes
Hotbox	CLT.H.9	68.9	68.0	-0.2%	Yes	202	200.3	-0.3%	Yes	355	354.0	-0.1%	Yes

Temperature Difference Calculation:

$$\frac{(\text{Ref. Temp. Deg. F} + 460) - (\text{Test Temp. Deg. F} + 460)}{\text{Ref. Temp. Deg. F} + 460} \text{ X } 100 = <1.5\%$$

Hotbox Thermocouple Temperature Calibration

☐ Black & white

Calibrated By: BLS

Date: 08/29/18

Reference Thermometer: NIST 170553260
Traceable Lollipop

Omega NIST Calibrator Serial No.: 17000169
Model Number CL3512A

Barometric Pressure,In. Hg: # 29.47

Asset Number	Id Letter	Ambient	Reference Ambient	Percent Difference	Passed	MID. Temp.	Reference Temp.	Percent Difference	Passed	HIGH Temp.	Reference Temp.	Percent Difference	Passed
Hotbox	CLT.H.2	82.8	82.4	-0.1%	Yes	186.6	186.0	-0.1%	Yes	385	383.4	-0.2%	Yes
Hotbox	CLT.H.3	81.2	80.9	-0.1%	Yes	176.8	177.2	0.1%	Yes	373	381.0	1.0%	Yes
Hotbox	CLT.H.10	83.2	82.4	-0.1%	Yes	185.5	186.0	0.1%	Yes	378	383.0	0.6%	Yes

Temperature Difference Calculation:

$$\frac{(\text{Ref. Temp. Deg. F} + 460) - (\text{Test Temp. Deg. F} + 460)}{\text{Ref. Temp. Deg. F} + 460} \text{ X } 100 = <1.5\%$$

Hotbox Thermocouple Temperature Calibration

☐ Black &

Calibrated By: BLS

Date: 01/05/18

Reference Thermometer: NIST 170553260
Traceable Lollipop

Omega NIST Calibrator Serial No.: 17000169
Model Number CL3512A

Barometric Pressure,In. Hg: # 29.47

Asset Number	Id Letter	Ambient	Reference Ambient	Percent Difference	Passed	MID. Temp.	Reference Temp.	Percent Difference	Passed	HIGH Temp.	Reference Temp.	Percent Difference	Passed
Hotbox	CLT.H.11	69.7	68.4	-0.2%	Yes	214	211	-0.4%	Yes	331	336.0	0.6%	Yes
Hotbox	CLT.H.12	69.8	68.4	-0.3%	Yes	195	193.2	-0.3%	Yes	335	337.8	0.4%	Yes
Hotbox	CLT.H.13	70.3	68.4	-0.4%	Yes	203	201.1	-0.3%	Yes	331	328.4	-0.3%	Yes

Temperature Difference Calculation:

$$\frac{(\text{Ref. Temp. Deg. F} + 460) - (\text{Test Temp. Deg. F} + 460)}{\text{Ref. Temp. Deg. F} + 460} \text{ X } 100 = <1.5\%$$

Date: 08/21-24/18
Barometric Pressure, In. Hg: See each day

Reference Thermometer: 170553260
Omega NIST Calibrator Serial No.: 17000169

Reference Thermometer: 170553260
Omega NIST Calibrator Serial No.: 17000169

Reference Thermometer: 170553260
Omega NIST Calibrator Serial No.: 17000169

Asset Number	Cal. By	Temp. One	Reference Temp. One	Percent Difference	Passed	Temp. Two	Reference Temp. Two	Percent Difference	Passed	Temp. Three	Reference Temp. Three	Percent Difference	Passed
DGM Thermocouples													
Meter Box Consoles													
08/21/18 BP 29.31													
300.321 B average	BLS	46.0	46.2	0.0%	Yes	79.0	78.1	-0.2%	Yes	112	113.9	0.3%	Yes
300.035 C Inlet	BLS	48.0	48.6	0.1%	Yes	77.0	78.0	0.2%	Yes	112	114.0	0.3%	Yes
300.035 C Outlet	BLS	49.0	48.8	0.0%	Yes	77.0	78.1	0.2%	Yes	111	112.1	0.2%	Yes
08/22/18 BP 29.24													
300.388 D Outlet	BLS	44.0	44.6	0.1%	Yes	83.0	83.6	0.1%	Yes	118	119.0	0.2%	Yes
300.310 E Outlet	BLS	44.0	44.6	0.1%	Yes	83.0	83.6	0.1%	Yes	118	119.0	0.2%	Yes
08/23/18 BP 29.41													
300.045 F Inlet	BLS	46.0	45.1	-0.2%	Yes	73.0	73.9	0.2%	Yes	108	110.4	0.4%	Yes
300.045 F Outlet	BLS	46.0	45.1	-0.2%	Yes	73.0	73.7	0.1%	Yes	110	110.4	0.1%	Yes
300.390 G Outlet	BLS	43.0	42.6	-0.1%	Yes	73.0	73.7	0.1%	Yes	115	115.3	0.1%	Yes
08/24/18 BP 29.50													
300.241 H Outlet	BLS	45.0	44.4	-0.1%	Yes	75.0	75.3	0.1%	Yes	106	106.5	0.1%	Yes
300.214 I average	BLS	46.0	45.1	-0.2%	Yes	76.0	75.5	-0.1%	Yes	111.0	112.1	0.2%	Yes

Ref. Temp. Deg. F + 460

ilac-MRA

ACCREDITED

Calibration
Certificate No. 1750.01

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 6530-8662395

Traceable® Certificate of Calibration for Digital Barometer

Manufactured for and distributed by: Cole-Parmer Instrument Company, 625 East Bunker Court, Vernon Hills, IL 60061 U.S.A.

CEC #
600.044 in Lab

Instrument Identification:

Model: 68000-49 S/N: 170487238 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Digital Barometer	D4540001	9/27/17	1000398691
Chilled Mirror Hygrometer	44654/2H3737	9/27/18	14394
Digital Thermometer	140156092	7/19/17	4000-7810155
Climate Chamber	W613.0046		

Certificate Information:

Technician: 57 Procedure: CAL-31 Cal Date: 6/12/17 Due Date: 6/12/19
Test Conditions: 24.0°C 67.0 %RH 1014 mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
mb/hPa		N.A.		806.60	806	Y	803	811	0.70	>4:1
mb/hPa		N.A.		908.83	908	Y	905	913	0.70	>4:1
mb/hPa		N.A.		1,013.35	1,013	Y	1,009	1,017	0.70	>4:1
°C		N.A.		23.792	24.1	Y	23.4	24.2	0.069	>4:1
%RH		N.A.		50.90	49	Y	48	54	0.80	3.8:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min = As Left Nominal(Rounded) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Nicol Rodriguez
Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Digital Barometer should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Barometers change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Control Company is an ISO 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2008 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01805-2006-AQ-HOU-RvA.
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

Calibration
Certificate No. 1750.01

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 4378-8727331

Traceable® Certificate of Calibration for Lollipop Thermometer

Manufactured for and distributed by: Thomas Scientific, Box 99, 99 High Hill Road, Swedeboro, NJ 08085-0099 U.S.A.

Instrument Identification:

Model: 1235D30 S/N: 170553260 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Temperature Calibration Bath TC-191	A42238		
Thermistor Module	A27129	12/01/17	1000401760
Temperature Probe	5202	12/19/17	B6B30058-1
Temperature Calibration Bath TC-218	A73332		
Thermistor Probe	5356	1/10/18	B7104024
Readout, Digital Thermometer	B5C344	3/12/18	B7314035

Certificate Information:

Technician: 104 Procedure: CAL-03 Cal Date: 7/31/17 Due Date: 7/31/19
Test Conditions: 23.2°C 56.0 %RH 1015 mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
°C		N.A.		0.000	-0.3	Y	-0.4	0.4	0.059	>4:1
°C		N.A.		100.000	99.6	Y	99.6	100.4	0.059	>4:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerence; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min = As Left Nominal(Rounded) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Nicol Rodriguez
Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Maneger

Maintaining Accuracy:

In our opinion once calibrated your Lollipop Thermometer should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Lollipop Thermometers change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Control Company is an ISO 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
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International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

SUPERIOR SCALE, INC.
2118 CAROLINA PLACE DRIVE
FORT MILL, SC 29708
Phone: 803-548-3320 Fax: 803-548-2910
Email: info@superiorscales.com

WEIGHT SET VERIFICATION CERTIFICATE

CLIENT: CIVIL & ENVIRONMENTAL

DEPARTMENT: LAB

DESCRIPTION: STAINLESS STEEL

WEIGHT ID#: 22931

VERIFICATION DATA

Serial Number	Nominal Value	Reading on Balance
22931	200g	200.0g
	300g	300.0g
	500g	500.0g

VERIFICATION DATE: **JANUARY 9, 2018**

VERIFICATION DUE DATE: **JANUARY 2019**

TEST STANDARD(S) INFORMATION:

Standard(s) Used	ID	Expiration Date
CLASS 1 KIT	SSCL1-1	5/2018

COMMENTS:

READINGS OF WEIGHT(S) TAKEN ON BALANCE(S) LISTED AFTER BALANCE(S) WITH NIST TRACEABLE WEIGHT SET(S) NOTED.

TECHNICIAN:

CUSTOMER:

SUPERIOR SCALE, INC.
2118 CAROLINA PLACE DRIVE
FORT MILL, SC 29708
Phone: 803-548-3320 Fax: 803-548-2910
Email: info@superiorscales.com

WEIGHT SET VERIFICATION CERTIFICATE

CLIENT: CIVIL & ENVIRONMENTAL

DEPARTMENT: LAB

DESCRIPTION: STAINLESS STEEL

WEIGHT ID#: 22934

VERIFICATION DATA

Serial Number	Nominal Value	Reading on Balance
22934	200g	200.0g
	300g	300.0g
	500g	500.0g
	1000g	1000.0g

VERIFICATION DATE: **JANUARY 9, 2018**

VERIFICATION DUE DATE: **JANUARY 2019**

TEST STANDARD(S) INFORMATION:

Standard(s) Used	ID	Expiration Date
CLASS 1 KIT	SSCL1-1	5/2018

COMMENTS:

READINGS OF WEIGHT(S) TAKEN ON BALANCE(S) LISTED AFTER BALANCE(S) WITH NIST TRACEABLE WEIGHT SET(S) NOTED.

TECHNICIAN:

CUSTOMER:

SUPERIOR SCALE, INC.
2118 CAROLINA PLACE DRIVE
FORT MILL, SC 29708
Phone: 803-548-3320 Fax: 803-548-2910
Email: info@superiorscales.com

WEIGHT SET VERIFICATION CERTIFICATE

CLIENT: CIVIL & ENVIRONMENTAL

DEPARTMENT: LAB

DESCRIPTION: STAINLESS STEEL

WEIGHT ID#: 4563

VERIFICATION DATA

Serial Number	Nominal Value	Reading on Balance
4563	100g	100.0000g
	50g	50.0002g
	20g	30.0002g
	20g	20.0001g
	10g	10.0000g
	5g	5.0000g
	2g	2.0000g
	2g	1.9999g
	1g	1.0000g
	.5g	.5002g
	.1g	.1001g

VERIFICATION DATE: JANUARY 9, 2018

VERIFICATION DUE DATE: JANUARY 2019

TEST STANDARD(S) INFORMATION:

Standard(s) Used	ID	Expiration Date
CLASS 1 KIT	SSCL1-1	5/2018

COMMENTS:

READINGS OF WEIGHT(S) TAKEN ON BALANCE(S) LISTED AFTER BALANCE(S) WITH NIST TRACEABLE WEIGHT SET(S) NOTED.

TECHNICIAN:

CUSTOMER:

SUPERIOR SCALE, INC.
2118 CAROLINA PLACE DRIVE
FORT MILL, SC 29708
Phone: 803-548-3320 Fax: 803-548-2910
Email: info@superiorscales.com

WEIGHT SET VERIFICATION CERTIFICATE

CLIENT: CIVIL & ENVIRONMENTAL

DEPARTMENT: LAB

DESCRIPTION: STAINLESS STEEL

WEIGHT ID#: CA6640

VERIFICATION DATA

Serial Number	Nominal Value	Reading on Balance
CA6640	100g	100.0000g
	50g	50.0001g
	20g	30.0002g
	20g	20.0002g
	10g	10.0001g
	5g	5.0002g
	3g	3.0000g
	2g	1.9999g
	1g	1.0000g
	.5g	.4999g
	.2g	.2002g
	.2g	.2001g
	.1g	.0999g

VERIFICATION DATE: **JANUARY 9, 2018**

VERIFICATION DUE DATE: **JANUARY 2019**

TEST STANDARD(S) INFORMATION:

Standard(s) Used	ID	Expiration Date
CLASS 1 KIT	SSCL1-1	5/2018

COMMENTS:

READINGS OF WEIGHT(S) TAKEN ON BALANCE(S) LISTED AFTER BALANCE(S) WITH NIST TRACEABLE WEIGHT SET(S) NOTED.

TECHNICIAN:

CUSTOMER:

SUPERIOR SCALE, INC.
CERTIFICATION OF SCALE CALIBRATION
Issue/Revision: 10/08/10 Rev. 3

Customer Name: Civil + Environmental Consultants
Customer Address: 1900A Center Park Dr
City : Charlotte State: NC Zip: ______
Page 1 of 2
Today's Date: 1-9-2018
Next Due Date: 1-2019

Test Location: (✓) Onsite ( ) Superior Scale, Inc.

Mfg: Sartorius
Model: QUINTIX224-1S
Capacity: 220 x 0.0001 g
Service Technician: B. Vess
Customer ID#: ______
Serial Number: 0031650012

Routine Calibration: ☑ **New Equipment:** ☐ **Repair/Recalibration:** ☐

Instructions: Report all readings before and after corrections are made. Readings are to be taken at low, middle and high portions of the working range of the scale.
Record + or – deviation and adjusted reading below.

Standards used are traceable to NIST. Equipment tolerances are Handbook 44 Table 6, unless otherwise noted.

WEIGHT APPLIED	AS FOUND (Before Adjustment)	DEVIATION (+ OR -)	AS LEFT (After Adjustment)
5	5.0002	+ 0.0002	5.0000
20	20.0004	+ 0.0004	20.0000
50	50.0006	+ 0.0006	50.000
100	100.0008	+ 0.0008	100.0000
200	200.000	+ 0.0005	200.000

Comments: ______

NIST Traceability #'s/Serial Number SSCL#-3
Technician Signature: B. Ve **License #:** 1766

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SUPERIOR SCALE, INC.
CERTIFICATION OF SCALE CALIBRATION
Issue/Revision: 10/08/10 Rev. 3

Customer Name: Civil + Envirmental Consultants
Customer Address: 1900A Center Park
City : Charlotte State: NC Zip: ______

Page 2 of 3
Today's Date: 1-9-2018
Next Due Date: 1-2019

Test Location: (✓) Onsite ( ) Superior Scale, Inc.

Mfg: Satorius
Model: A41500
Capacity: 1500 x 0.1 g

Service Technician: B. Uss
Customer ID#: ______
Serial Number: 27154460

Routine Calibration: ☑ **New Equipment:** ☐ **Repair/Recalibration:** ☐

Instructions: Report all readings before and after corrections are made. Readings are to be taken at low, middle and high portions of the working range of the scale.
Record + or – deviation and adjusted reading below.

Standards used are traceable to NIST. Equipment tolerances are Handbook 44 Table 6, unless otherwise noted.

WEIGHT APPLIED	AS FOUND (Before Adjustment)	DEVIATION (+ OR -)	AS LEFT (After Adjustment)
200	200.0	0	200.0
500	500.0	0	500.0
1000	1000.0	0	1000.0
1500	1500.0	0	1500.0

Comments: ______

NIST Traceability #'s/Serial Number SSK63
Technician Signature: B. **License #:** 1766

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SUPERIOR SCALE, INC.
CERTIFICATION OF SCALE CALIBRATION
Issue/Revision: 10/08/10 Rev. 3

Customer Name: Civil + Environmental Consultants
Customer Address: 1900A Center Park Dr
City : Charlotte State: NC Zip:

Page 3 of 3
Today's Date: 1-9-2018
Next Due Date: 1-2019

Test Location: (✓) Onsite ( ) Superior Scale, Inc.

Mfg: AWS
Model: SC2K6A
Capacity: 2000 x 0.1 g

Service Technician: B. Vess
Customer ID#:
Serial Number: 01-24438

Routine Calibration: ☑ **New Equipment:** ☐ **Repair/Recalibration:** ☐

Instructions: Report all readings before and after corrections are made. Readings are to be taken at low, middle and high portions of the working range of the scale.
Record + or – deviation and adjusted reading below.

Standards used are traceable to NIST. Equipment tolerances are Handbook 44 Table 6, unless otherwise noted.

WEIGHT APPLIED	AS FOUND (Before Adjustment)	DEVIATION (+ OR -)	AS LEFT (After Adjustment)
200	200.0	0.0	200.0
500	500.1	+ 0.1	500.1
1000	1000.2	+0.2	1000.2
2000	2000.0	0.0	2000.0

Comments:

NIST Traceability #'s/Serial Number SSK6-3
Technician Signature: B. Vess **License #:** 1766

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2118 Carolina Place Dr. • Fort Mill, SC 29708 • Phone (803) 548-3320 • Fax (803) 548-2910

APPENDIX E
A2LA AND QSTI CERTIFICATIONS

STAC
STACK TESTING ACCREDITATION COUNCIL

A2LA

American Association for Laboratory Accreditation

Accredited Air Emission Testing Body

A2LA has accredited

CIVIL AND ENVIRONMENTAL CONSULTANTS, INC. (CEC)

In recognition of the successful completion of the joint A2LA and Stack Testing Accreditation Council (STAC) evaluation process, this laboratory is accredited to perform testing activities in compliance with ASTM D7036:2004 - Standard Practice for Competence of Air Emission Testing Bodies.

Presented this 20th day of December 2017.

President and CEO
For the Accreditation Council
Certificate Number 3913.01
Valid to November 30, 2019

This accreditation program is not included under the A2LA ILAC Mutual Recognition Arrangement.

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

WILLIAM QUENTIN BEST

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 22ND DAY OF SEPTEMBER 2014 AND EFFECTIVE UNTIL SEPTEMBER 21ST, 2019

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Theresa Lowe, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION
NO.
2007-090

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

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HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS

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Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION
NO.
2007-090

1995

SOURCE EVALUATION SOCIETY

Qualified Source Testing Observer

LET IT BE KNOWN THAT

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HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST OBSERVER REVIEW BOARD FOR

GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS

ISSUED THIS 21ST DAY OF MARCH 2015 AND EFFECTIVE UNTIL MARCH 20TH, 2020

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Theresa M. Lowe

Theresa Lowe, QSTI/QSTO Review Board

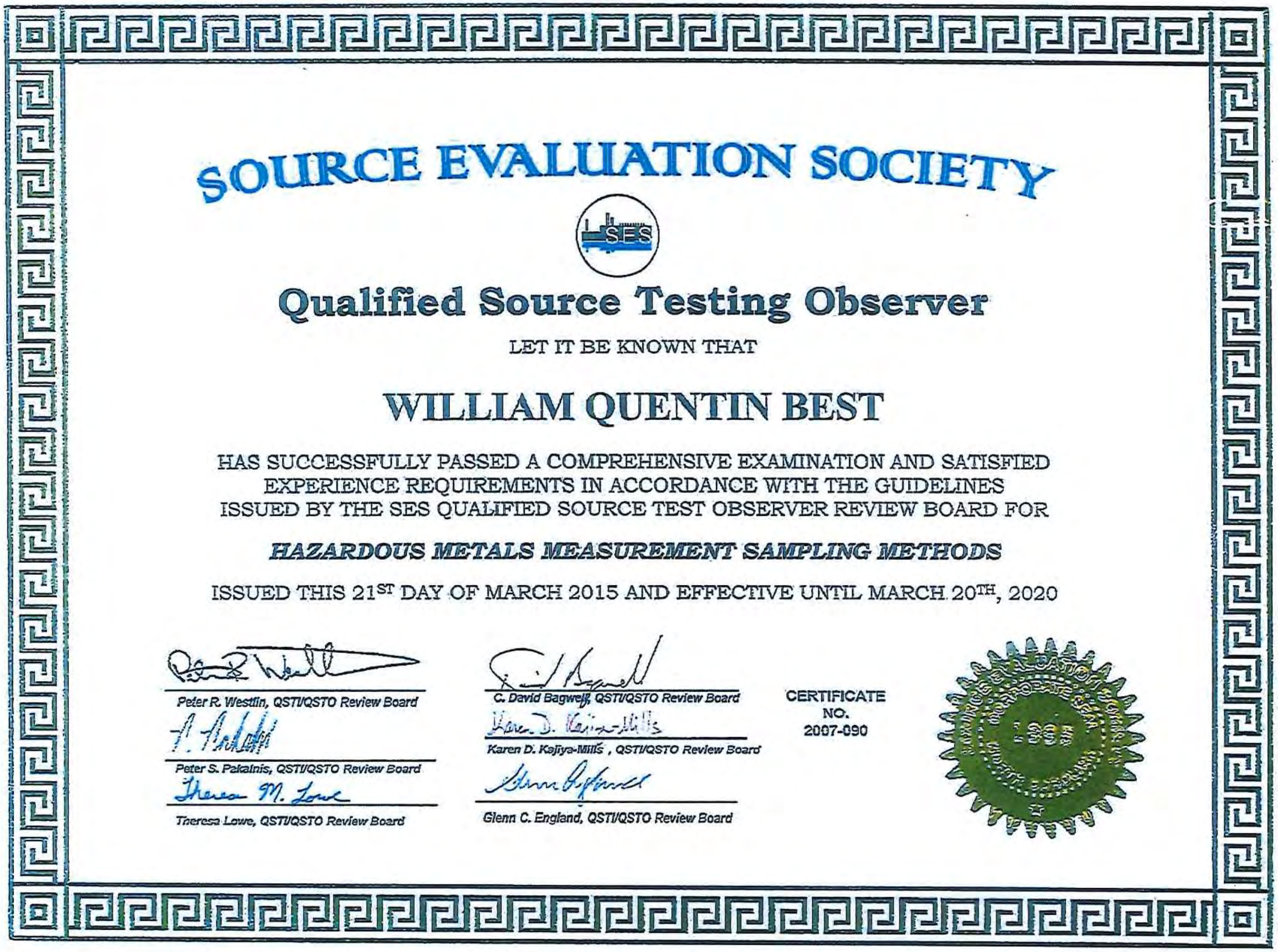
C. David Bagwell, QSTI/QSTO Review Board

Karen D. Kajiya-Mills

Karen D. Kajiya-Mills, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

CERTIFICATE
NO.
2007-090



SOURCE EVALUATION SOCIETY

Qualified Source Testing Observer

LET IT BE KNOWN THAT

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HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST OBSERVER REVIEW BOARD FOR

HAZARDOUS METALS MEASUREMENT SAMPLING METHODS

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Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

CERTIFICATE
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2007-090

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

BRYAN L. STARNES

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

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APPLICATION
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2007-089

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Karen D. Kajiya-Mills

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION
NO.
2007-089

APPENDIX F
PRODUCTION DATA DURING THE COMPLIANCE TEST

From: Matt Caton
Sent: Wednesday, October 31, 2018 6:53 AM
To: brian_l_smith@goodyear.com
Subject: Banbury 5 Stack Test
Importance: High

Brian,

Can you please send me the amount of material processed on Banbury 5 during our stack test for these 3 times.

Run 1
10/23/18
1:18 pm to 3:37 pm

39 batches – 38,490

Run 2
10/23/18
4:16 pm to 6:42 pm

41 batches – 39,574

Run 3
10/24/18
8:03 am to 10:48 am

43 batches – 41,949

Thanks,

Matt Caton
Environmental Manager
Goodyear-Danville VA
1901 Goodyear Boulevard
Danville, VA 24541-6664
434-791-9170
GTN 564-9170