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**Compliance Report on Particulate  
Matter, Carbon Monoxide, and Visible  
Emissions from Hot Mix Asphalt Unit**

Rieth-Riley  
Benton Harbor, MI

Wilcox Project # 180.15

August 28, 2015

**Prepared For:**

Rieth-Riley Construction Co.  
1589 Townline Road  
Benton Harbor, MI 49022

## EXECUTIVE SUMMARY

Wilcox Environmental Engineering, Inc. – Air Analysis Services (Wilcox) was contracted by Rieth-Riley Construction Company, Inc. (Rieth-Riley) to sample air emissions at the Benton Harbor, MI plant on August 6<sup>th</sup>, 2015. The hot mix asphalt unit was tested to evaluate particulate matter (PM), opacity of visible emissions (VE), and carbon monoxide (CO). The testing program was performed consistent with US EPA Methods 1, 2, 3A, 4, 5, 9, and 10. The test results are summarized below in Table ES-1.

**Table ES-1. Emissions Results Summary**

Date	Test Parameter	Result	Permit Limit
8/6/2015	Particulate Matter	0.000931 gr/dscf	0.04 gr/dscf
		0.000658 lbs/ton	0.04 lbs/ton
	Opacity/VE	0.200%	20%
	Carbon Monoxide	0.0545 lbs/ton	0.1980 lbs/ton

## 1.0 INTRODUCTION

Wilcox conducted source emissions testing on August 6<sup>th</sup>, 2015 at Rieth-Riley in Benton Harbor, MI in fulfillment of the submitted test plan for their hot mix asphalt (HMA) unit to demonstrate compliance with their Michigan Department of Environmental Quality (MDEQ) Permit No. 110-87E.

Table 1-1 below presents the emission unit(s) and parameters that were tested. The test was conducted in accordance with approved Environmental Protection Agency (EPA) Registered Test Methods and the submitted test protocol report is included in the Appendix of this document.

**Table 1-1. Emissions Sampling Summary**

TEST LOCATION	PARAMETER	TEST METHOD	# OF TEST RUNS	SAMPLE DURATION (MIN)	ANALYTICAL APPROACH
HMA UNIT	EXHAUST FLOW	USEPA METHOD 1,2	3	60	PITOT TUBE
	EXHAUST TEMP	USEPA METHOD 1,2	3	60	THERMOCOUPLE
	O <sub>2</sub> /CO <sub>2</sub>	USEPA METHOD 3A	3	60	PARAMAGNETIC/NDIR
	MOISTURE	USEPA METHOD 4	3	60	GRAVIMETRIC
	PM	USEPA METHOD 5	3	60	GRAVIMETRIC
	OPACITY OF VE	USEPA METHOD 9	3	60	VE READER
	CO	USEPA METHOD 10	3	60	NDIR/GFC

**Table 1-2. Project Personnel**

Firm	Contact	Title	Phone No.
Wilcox	Aaron Schavey	Senior Project Manager	317.472.0999
Wilcox	Taz Ziegler	Senior Technician	317.472.0999
Rieth-Riley	John Berscheid	Technical Services Manager	574.875.5183
MDEQ	Tom Gaslioli	Environmental Scientist	517.284.6778

## 2.0 FACILITY DESCRIPTION AND SOURCE INFORMATION

Rieth-Riley Construction Co. is a paving contractor located at 1589 Townline Road, Benton Harbor, MI 49022. They operate Hot Mix Asphalt equipment, including a 300 TPH counter-flow unified drying/mixing drum using a baghouse for control which is exhausted through a rectangular stack.

### 3.0 SUMMARY OF EVENTS AND RESULTS

#### 3.1 Site Test Plan

Wilcox conducted emissions sampling on August 6<sup>th</sup>, 2015 at Rieth-Riley in Benton Harbor, MI in strict accordance with the aforementioned USEPA Methods. The source operated at normal load conditions on the day of testing. Plant personnel kept track of production rates, which are included in the appendix of this report.

#### 3.2 Summary of Results – HMA Unit

Wilcox tested emissions from the HMA unit from 9:10 a.m. to 12:59 p.m. Table 3-1 displays detailed results of the sampling event.

**Table 3-1. Results - Particulate Matter**

Stack Gas Characteristics	Run 1 9:10 – 10:21	Run 2 10:30 – 11:35	Run 3 11:55 – 12:59	Average
Filterable PM(gr/dscf)	0.00111	0.000845	0.000839	0.000931
Filterable PM (lbs/hr)	0.223	0.172	0.172	0.189
Filterable PM (lbs/ton)	0.000781	0.000596	0.000597	0.000658
CO (ppmvd, uncorrected)	134	154	166	151
CO (lbs/hr)	13.7	15.9	17.3	15.6
CO (lbs/ton)	0.0482	0.0551	0.0601	0.0545
Process Weight Rate (tons/hr)	285	288	287	287
Oxygen %	13.3	13.5	14.1	13.6
Carbon Dioxide %	4.77	4.07	3.43	4.09
Actual Cubic Feet / Minute	41,526	41,403	41,480	41,470
Dry Standard Cubic Feet / Minute	23,429	23,708	23,863	23,667
Avg. Stack Temp. (deg. F)	243	243	244	243
Stack Gas Velocity (feet/sec)	34.1	34.0	34.0	34.0
Avg. Sq. Rt. Delta p	0.502	0.499	0.500	0.500
%Isokinetics (Vn/Vs)	106	98.2	98.3	101
% Moisture of Stack Gas	25.4	23.2	22.8	23.8
Sample Volume (cubic feet)	39.5	38.3	38.6	38.8

#### 4.0 METHODOLOGY

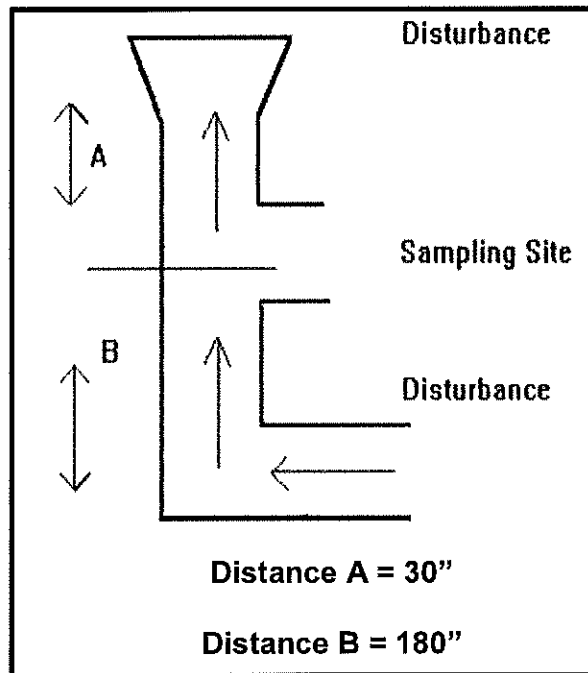
The sampling procedures used by Wilcox were performed according to Title 40 CFR Part 60 Appendix A and are as follows:

**Table 4-1. Sampling Procedures**

Method	Description
US EPA Method 1	Determination of Velocity Traverses for Stationary Sources
US EPA Method 2	Determination of Stack Gas Velocity and Volumetric Flow Rate
US EPA Method 3A	Gas Analysis for the Determination of Molecular Weight
US EPA Method 4	Determination of Moisture Content in Stack Gas
US EPA Method 5	Determination of Particulate Matter Emissions
US EPA Method 9	Determination of Visible Emissions
US EPA Method 10	Determination of Carbon Monoxide Emissions from Stationary Sources

#### 4.1 Sample Point Determination-EPA Method 1

Sampling point locations were determined according to EPA Reference Method 1. A diagram demonstrating distance from port location to nearest disturbances is presented below in Figure 4-1. Sampling point dimensions are further described in Table 4-2.



**Figure 4-1. Sampling Site Diagram**

**Table 4-2. Sampling Points**

<b>Locations</b>	<b>Dimensions</b>	<b>Ports</b>	<b>Points Per Port</b>	<b>Total Points</b>
Stack 1 Particulate Traverse	50 X 58.5"	5	5	25

#### **4.2 Velocity and Volumetric Flow Rate – EPA Method 2**

EPA Method 2 was used to determine the gas velocity and flow rate at the stack. Each set of velocity determinations included the measurement of gas velocity pressure and gas temperature at each of the Method 1 determined traverse points. The velocity pressures were measured with a Type S pitot tube. Gas temperature measurements were made with a Type K thermocouple and digital pyrometer.

#### **4.3 Gas Composition and Molecular Weight – EPA Method 3A**

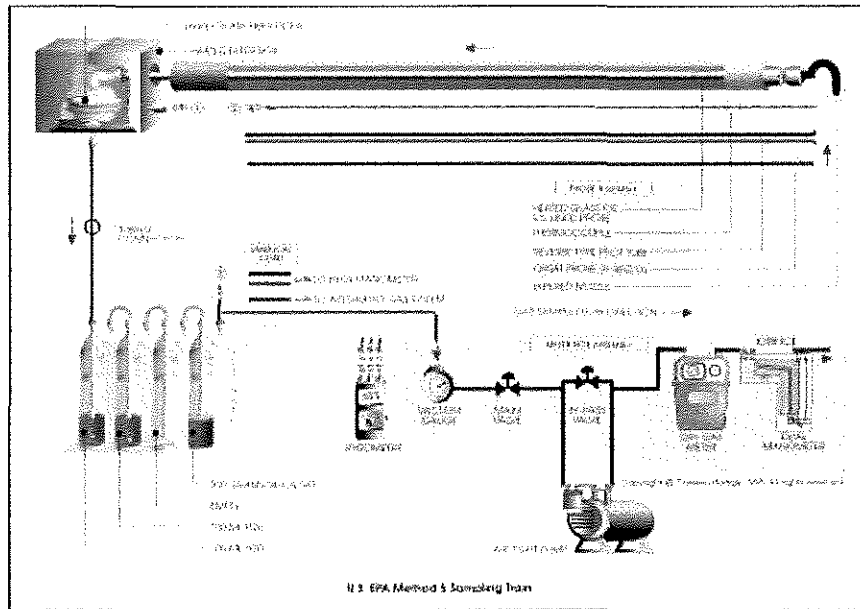
The oxygen and carbon dioxide concentrations were determined in accordance with EPA Method 3A using a paramagnetic and infrared detection analyzer. The remaining stack gas constituent was assumed to be nitrogen for the stack gas molecular weight determination.

#### **4.4 Moisture Content – EPA Method 4**

The flue gas moisture content at the testing locations was determined in accordance with EPA Method 4. The gas moisture was determined by quantitatively measuring condensed moisture in the chilled impingers and silica absorption. The amount of moisture condensed was determined gravimetrically. A dry gas meter was used to measure the volume of gas sampled. Moisture content is used to determine stack gas velocity.

#### 4.5 Determination of Filterable PM– EPA Method 5

Particulate matter (PM) was withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature of  $120 \pm 14^{\circ}\text{C}$  ( $248 \pm 25^{\circ}\text{F}$ ) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. The PM mass, which includes any material that condenses at or above the filtration temperature, was determined gravimetrically after the removal of uncombined water. A diagram of the Method 5 train is shown below in Figure 4-1.



**Figure 4-1. Method 5 Sampling Train**

#### 4.6 Visible Emissions – EPA Method 9

Stack opacity readings are taken for 60 minutes at 15 second intervals for NSPS and 30 minutes at 15 second intervals for state permitted, non-federal sources, by a certified visible emissions reader. The visible emissions reading are conducted during each of the particulate test runs. The results are reported as an average opacity reading for the testing period. A copy of the visible reader's current certification is included in the Appendix.

#### 4.7 CO Determination – EPA Method 10

Stack gas is withdrawn from the stack and conditioned (moisture is removed) before being analyzed by infra-red detection. Specific wavelengths of infrared light are absorbed by CO molecules. Molecular absorption is directly proportional to the concentration of CO. Quality assurance of the analyzer is first determined by direct injection of known EPA protocol 1 gas concentrations. A system check of the probe, connection lines, and conditioner is also performed prior to and after each sample period to determine drift bias.



## **5.0 WILCOX QUALITY ASSURANCE AND QUALITY CONTROL**

### **5.1 Sampling Protocol**

Wilcox Environmental Engineering (Wilcox) is organized to facilitate sample management, analytical performance management, and data management. Personnel are assigned specific tasks to ensure implementation of the quality assurance/quality control (QA/QC) program. The Senior Project Manager in charge of air emission measurement projects reports directly to the Director of Air Analysis Services and are the QA officers responsible for program effectiveness and compliance.

The analysts perform the data reduction, analyses, and initial data review. Each analyst must check and initial their work, making certain that it is complete, determining that any instrumentation utilized has been properly calibrated, and ensuring that the analysis has been performed within the QA/QC limits.

The Senior Project Manager evaluates and verifies the data submitted by the analysts and verify that the data and documentation are complete, that all analyses has been performed within QA criteria specific to each method, checks calculations, assembles and signs the data package, and prepares the final report.

### **5.2 Equipment Maintenance and Calibration**

The Field Supervisor and Field Technicians are in charge of routine maintenance and calibration of all source-testing equipment. Relevant calibration information is included in the Appendices of this report.

#### **5.2.1 Equipment Maintenance**

All major pieces of equipment have maintenance logs where all maintenance activities are recorded and documented. Table 5-1 shows routine maintenance that is performed on Wilcox source testing equipment.

**Table 5-1. Test Equipment - Routine Maintenance Schedule**

<b>Equipment</b>	<b>Acceptance Limits</b>	<b>Frequency of Service</b>	<b>Methods of Service</b>
Pumps	<ul style="list-style-type: none"> <li>• Absence of leaks</li> <li>• Ability to draw vacuum within equipment specifications</li> </ul>	Every 500 hours of operation or 6-months, whichever is less	<ul style="list-style-type: none"> <li>• Visual inspection</li> <li>• Lubrication</li> </ul>
Flow Meters	<ul style="list-style-type: none"> <li>• Free mechanical movement</li> <li>• Absence of malfunction</li> <li>• Calibration within tolerance</li> </ul>	Every 500 hours of operation or 6-months whichever is less	<ul style="list-style-type: none"> <li>• Visual inspection</li> <li>• Clean</li> <li>• Calibrate</li> </ul>
Electronic Instrumentation	<ul style="list-style-type: none"> <li>• Absence of malfunction</li> <li>• Proper response to calibration gases and signals</li> </ul>	As recommended by manufacturer or when required due to unacceptable limits	<ul style="list-style-type: none"> <li>• Clean</li> <li>• Replace parts as necessary</li> <li>• Other recommended manufacturer service</li> </ul>
Mobile Laboratory Sampling System	<ul style="list-style-type: none"> <li>• Absence of leaks.</li> <li>• Sample lines clean and free of debris</li> <li>• Proper input flow rates to analyzers</li> </ul>	At least once per month or sooner depending on nature of use.	<ul style="list-style-type: none"> <li>• Change filters</li> <li>• Change gas dryer</li> <li>• Leak check</li> <li>• Check for contamination</li> </ul>
Sample Lines	<ul style="list-style-type: none"> <li>• Absence of soot and particulate buildup</li> <li>• Adequate sample flow</li> </ul>	At least once per month or sooner depending on nature of use.	<ul style="list-style-type: none"> <li>• Flush with solvents and water</li> <li>• Heat and purge line with nitrogen</li> </ul>

## 5.2.2 Equipment Calibration

Current calibration information on equipment used during testing is included in the Appendices of this report.

The S-Type pitot tubes are calibrated initially upon purchase and then semiannually. Visual measurements are taken prior to each use to insure accidental damage has not occurred. Measurements are performed using a micrometer and protractor.

Each temperature sensor is marked and identified. This is done by marking each thermocouple end connector with a number. The sensor is calibrated as a unit with the control box potentiometer and associated lead wire as an identified unit. Calibrations are performed initially and annually at three set-points over the range of expected temperatures for that particular thermocouple. A reference output-voltage/thermocouple calibrator is used as a temperature reference source for the multi-point calibrations.

The field barometer is adjusted initially and semiannually to within 0.1” Hg of the actual atmospheric pressure at the Wilcox laboratory facility in Indianapolis, Indiana. All dry gas field meters are calibrated before initial use. Once the meter is placed in operation, its calibration is checked after each test series or bimonthly, whichever is less. Dry gas meters are calibrated against a NIST reference meter or orifice.

The dry gas meter orifice is calibrated before its initial use and then annually. This calibration is performed during the calibration of the dry gas test meter. The unit is checked in the field after every series of tests using a field gas-meter check procedure.

Analytical balances are internally calibrated prior to use following the manufacturer’s instructions. The balances are further checked using Class S-1 analytical weights prior to daily usage. Field top loading balances are checked with a field analytical weight prior to usage.

## **6.0 WILCOX DATA REDUCTION VALIDATION AND REPORTING**

The data presented in final reports are reviewed three times. First, the analyst reviews and certifies that the raw data complies with technical controls, documentation requirements, and standard group procedures. Second, the Senior Project Manager reviews and certifies that data packages comply to specifications for sample holding conditions, chain of custody, data documentation, and the final report is free of transcription errors. Third, a QA review is performed by additional senior personnel. This review thoroughly examines the entire completed data report. Once the review process is completed, the report is approved by Wilcox senior personnel and issued. All raw laboratory data and final reports are stored for a minimum of 5 years.

## 7.0 LIMITATIONS AND SIGNATURES

Wilcox Environmental Engineering, Inc.'s (Wilcox's) services, data, opinions, and recommendations described in this report are for Client's sole and exclusive use, and the unauthorized use of or reliance on the data, opinions, or recommendations expressed herein by parties other than Wilcox's Client is prohibited without Wilcox's express written consent. The services described herein are limited to the specific project, property, and dates of Wilcox's work. No part of Wilcox's report shall be relied upon by any party to represent conditions at other times or properties. Wilcox will accept no responsibility for damages suffered by third parties as a result of reliance upon the data, opinions, or recommendations in this report.

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Sincerely,  
**Wilcox Environmental Engineering, Inc.**



Ernest Brummett  
Project Manager – Air Analysis



Dave Williams  
Director – Air Analysis