AIR EMISSION TEST REPORT FOR THE VERIFICATION OF AIR POLLUTANT EMISSIONS FROM A HOT MIX ASPHALT MANUFACTURING PROCESS

Prepared for:

Cadillac Asphalt, LLC
Rawsonville Asphalt Plant
SRN B4280

ICT Project No.: 2400126
June 25, 2024

IMPACT
COMPLIANCE & TESTING

Report Certification

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FOR THE
VERIFICATION OF AIR POLLUTANT EMISSIONS
FROM A
HOT MIX ASPHALT MANUFACTURING PROCESS

Cadillac Asphalt, LLC
Rawsonville Asphalt Plant
Belleville, MI

The material and data in this document were prepared and reviewed under the supervision of the undersigned.

Report Prepared By:
Andrew Eisenberg Project Manager Impact Compliance & Testing, Inc.

Responsible Official Certification

This Test Report has been reviewed by Cadillac Asphalt, LLC representatives and is approved for submittal to EGLE-AQD.

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this Test Report are true, accurate and complete.

Susanne Hanf Environmental Engineer Michigan Paving & Materials, Inc.

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1.0 Introduction

Cadillac Asphalt, LLC has been issued Permit to Install (PTI) No. 216-06 by the State of Michigan Department of Environment, Great Lakes, and Energy-Air Quality Division (EGLE-AQD), for the operation of its hot mix asphalt (HMA) manufacturing process located in Belleville, Wayne County, Michigan (State Registration No. (SRN) B4280).

The testing and sampling of EUHMAPLANT was completed to ensure compliance with the permitted PM and VE emission limits after new equipment was installed.

Compliance with PM and Visible Emissions (VEs) emission limits were demonstrated during the test event. Air emission testing was performed June 11, 2024, by Impact Compliance & Testing, Inc. (ICT) personnel Blake Beddow, Andrew Eisenberg, and Max Fierro. EGLE-AQD representatives Mr. Jonathan Lamb and Andrew Riley (along with others) were on-site to observe portions of the compliance test event.

A Stack Test Protocol was submitted to EGLE-AQD prior to the testing project, and a Test Plan Approval Letter was issued by EGLE-AQD.

Attachment 1 provides a copy of the EGLE-AQD Test Plan Approval Letter.

Questions concerning this emission report should be directed to:

Testing Procedures	Andrew Eisenberg Project Manager Impact Compliance & Testing, Inc. 37660 Hills Tech Drive Farmington Hills, MI 48331 Andrew.Eisenberg@ImpactCandT.com (734) 357-8383
Site Operations	Ms. Susanne Hanf, P.E. Environmental Engineer Michigan Paving & Materials 7555 Whiteford Road Ottawa Lake, MI 49267 (734) 854-2265 SHanf@mipmc.com

2.0 Summary of Test Results

The exhaust gases from the HMA baghouse stack (emission unit EUHMAPLANT) were sampled and analyzed to determine the concentration of particulate matter (PM) content and emission rates using USEPA Method 5. Exhaust gas opacity observations were performed on the emission unit exhaust (EUHMAPLANT) using USEPA Method 9.

The air pollutant emission test data were converted to units necessary for comparison to the allowable emission limits specified in PTI No. 216-06.

Table 2.1 presents a summary of measured air pollutant emission rates and visual emission opacity readings for the process.

Test results for each one-hour sampling period are presented at the end of this Test Report in Section 6.0 and Tables 6.1 and 6.2.

Table 2.1 Summary of measured air pollutant emission rates and exhaust plume opacity for EUHMAPLANT

	PM (filterable)		6-Min. Avg. Opacity
Emission Unit	**(gr/dscf)**	**(lb/ton)**	**(%)**
EUHMAPLANT	0.002	0.001	0
Permit Limit	*0.04*	*0.04*	*20*

3.0 Source Description

3.1 General process description and type of raw and finished materials

The process produces HMA material by combining aggregate and liquid asphalt cement in a horizontal, rotating counter-flow drum. Aggregate is introduced into the drum at the burner end and moves towards the opposite end of the drum in parallel with the hot gases of combustion. Liquid asphalt cement is introduced into the mixing zone of the drum (located behind the burner flame zone) and the finished HMA material is discharged from the drum and conveyed to storage/loadout silos. The exhaust gases exit the drum and are directed to the baghouse particulate control system.

The HMA process combines aggregate with a liquid asphalt cement mixture using a counter-flow, direct-fired rotary drum. The drum is permitted to be fired by various fuels including natural gas, propane, distillate oil, residual oil, blended fuel oil, and recycled used oil. During compliance testing, the drum was fired by natural gas for three (3) one-hour tests.

The counter-flow dryer/mixer has a maximum design production rating of 650 tons per hour (tph). The typical operation of the plant ranges from 300-600 tph, with an average day running approximately 480 tph.

3.2 Emission control system description

Exhaust gas from the dryer/mixer is directed to a particulate matter emission control system consisting of a primary collector and baghouse. The baghouse filter media is periodically cleaned using reverse air pulses. The filtered process air from the baghouse is exhausted through a vertical stack to the atmosphere (SVHMAPLANT).

3.3 Operating variables

A Test Plan Approval Letter dated May 31, 2024, requested that Cadillac, Asphalt, LLC monitor and record the following process operational data during each test period:

- Hot mix asphalt (HMA) production rate (tph)
- Baghouse pressure drop
- Type of fuel being used

Attachment 2 provides process and control device operating records for the test periods.

3.4 Sampling location

Filtered exhaust gas is discharged to the ambient air through a 68 in. diameter exhaust stack (EUHMAPLANT). Two (2) sample ports were installed that were 254 in. downstream and 480 in. upstream from the nearest flow disturbance. Exhaust gas was sampled from 12 points across each port for a total of 24 sampling points.

Attachment 3 provides a drawing of the exhaust stack sampling location.

4.0 Sampling and Analytical Procedures

This section provides a summary of the sampling and analytical procedures that were used during the testing periods.

4.1 Summary of sampling methods

The exhaust gases from the exhaust stack were sampled and analyzed to determine the concentration of PM. The following USEPA Reference Test Methods were used.

Parameter/Analyte	Sampling Methodology	Analytical Method
Velocity traverses Volumetric flowrate	USEPA Method 1 USEPA Method 2	Selection of sample and velocity traverse locations by physical stack measurements. Type S Pitot tube and inclined manometer.
Molecular weight	USEPA Method 3A	Exhaust gas O_2 and CO_2 content was determined using paramagnetic and infrared instrumental analyzers, respectively.
Moisture	USEPA Method 4	Exhaust gas moisture determined using the chilled impinger method (as part of the particulate sampling train).
Particulate matter filterable	USEPA Method 5	Isokinetic sample train for filterable particulate matter
Visible emissions	USEPA Method 9	Exhaust gas opacity during each sampling period was determined by a certified observer of visible emissions.

In addition to the sampling and analytical methods presented in the preceding text, USEPA Method 205; *Verification of Dilution Systems for Field Instrument Calibrations,* was used to verify linearity of the calibration gas dilution system.

4.2 Velocity traverse locations & stack gas velocity measurements (USEPA Methods 1&2)

The representative sample locations were determined in accordance with USEPA Method 1 based on the measured distance to upstream and downstream disturbances. The absence of significant cyclonic flow was determined at the sampling location.

Exhaust gas velocity was measured using USEPA Method 2 throughout each test period as part of the isokinetic sampling procedures. Velocity pressure measurements were performed at each stack traverse point using an S-type Pitot tube and red-oil manometer. Temperature measurements were performed at each traverse point using a K-type thermocouple and a calibrated digital pyrometer.

Prior to performing the initial velocity traverse, the S-type Pitot tube and manometer lines were leak-checked at the test site. These checks were made by blowing into the impact opening of the Pitot tube until 3 or more inches of water were recorded on the manometer, then capping the impact opening and holding it closed for 15 seconds to ensure that it was leak free. The static pressure side of the Pitot tube was leak-checked using the same procedure.

4.3 Measurement of carbon dioxide and oxygen content (USEPA Method 3A)

CO_2 and O_2 content in the exhaust gas stream was measured continuously throughout each test period in accordance with USEPA Method 3A. The exhaust gas CO_2 content was monitored using a M&C GenTWO infrared gas analyzer. The exhaust gas O_2 content was monitored using a paramagnetic sensor within the M&C GenTWO gas analyzer.

During each sampling period, a continuous sample of the exhaust gas stream was extracted from the stack using a stainless-steel probe connected to a Teflon® heated sample line. The sampled gas was conditioned by removing moisture prior to being introduced to the analyzers; therefore, measurement of O_2 and CO_2 concentrations correspond to standard dry gas conditions. Instrument response data were recorded using an ESC Model 8864 data acquisition system that monitored the analog output of the instrumental analyzers continuously and logged data as one-minute averages.

Prior to, and at the conclusion of each test, the instruments were calibrated using upscale calibration and zero gas to determine analyzer calibration error and system bias (described in Section 5.9 of this document). Sampling times were recorded on field data sheets.

4.4 Determination of moisture content via isokinetic sampling (USEPA Method 4)

Moisture content was measured concurrently with the particulate matter sampling trains and determined in accordance with USEPA Method 4. Moisture from the gas sample was removed by the chilled impingers of the isokinetic sampling train. The net moisture gain from the gas sample was determined by either volumetric or gravimetric analytical techniques in the field. Percent moisture was calculated based on the measured net gain from the impingers and the metered gas sample volume of dry air.

4.5 Determination of PM (USEPA Method 5)

Filterable Particulate Matter Sample Train (USEPA Method 5)

Filterable PM was determined using USEPA Method 5. Exhaust gas was withdrawn from each exhaust stack at an isokinetic sampling rate using an appropriately sized stainless steel sample nozzle and heated probe. The collected exhaust gas was passed through a pre-tared glass fiber filter that was housed in a heated filter box. The back half of the filter housing was connected to the condensable PM impinger train.

Sample Recovery and Analysis (USEPA Method 5)

At the conclusion of each one-hour test period, the sample train was leak-checked and disassembled. The sample nozzle, probe liner, and filter holder were brushed and rinsed with acetone. The recovered particulate filter and acetone rinses were stored in sealed containers and transferred to Impact Compliance & Testing's Holt office for gravimetric measurements.

Attachment 4 provides sampling train diagrams.

Attachment 5 provides a copy of the laboratory analytical report.

Attachment 7 provides printouts of the PM calculations and scans of the field data sheets for each test run.

4.6 Visual determination of opacity (USEPA Method 9)

USEPA Method 9 procedures were used to evaluate the opacity of the exhaust gas during each 60-minute test period. In accordance with USEPA Method 9, the qualified observer stood at a distance sufficient to provide a clear view of the emissions with the sun oriented in the 140° sector to his back. As much as possible, the line of vision was approximately perpendicular to the plume direction.

Opacity observations were made at the point of greatest opacity in the portion of the plume where condensed water vapor was not present. Observations were made at 15-second intervals for the duration of the 60-minute testing period.

All visible emissions determinations were performed by a qualified observer in accordance with USEPA Method 9, Section 3.

Attachment 8 provides opacity reading field data sheets and the VE reader certification.

5.0 QA/QC Activities

5.1 Flow measurement equipment

Prior to arriving onsite (or onsite prior to beginning compliance testing), the instruments used during the source test to measure exhaust gas properties and velocity (pyrometer, Pitot tube, and scale) were calibrated to specifications in the sampling methods.

The absence of cyclonic flow for each sampling location was verified using an S-type Pitot tube and oil manometer. The Pitot tube was positioned at each of the velocity traverse points with the planes of the face openings of the Pitot tube perpendicular to the stack cross-sectional plane. The Pitot tube was then rotated to determine the null angle (rotational angle as measured from the perpendicular, or reference, position at which the differential pressure is equal to zero).

5.2 Isokinetic sampling and meter box calibrations

The dry gas meter sampling console used for moisture testing was calibrated prior to and after the testing program. This calibration uses the critical orifice calibration technique presented in USEPA Method 5. The metering console calibration exhibited no data outside the acceptable ranges presented in USEPA Method 5.

The digital pyrometer in the metering console was calibrated using a NIST traceable Omega® Model CL 940A temperature calibrator.

The sampling rate for all test periods was within the allowable isokinetic variation (i.e. within 10% of the calculated isokinetic sampling rate required by USEPA Method 5).

Attachment 6 presents test equipment quality assurance data, meter box calibration records, and field equipment calibration records.

5.3 Particulate matter recovery and analysis

All recovered particulate matter samples were stored and shipped in certified trace clean amber glass sample bottles with Teflon® lined caps. The liquid level on each bottle was marked with a permanent marker prior to pick-up and the caps were secured closed with tape. Samples of the reagents used in the test event (approximately 200 milliliters of acetone) were submitted with the samples for analysis to verify that the reagents used to recover the samples have low particulate matter residues.

5.4 Laboratory QA/AC procedures

The particulate matter analyses was conducted by ICT according to the appropriate QA/QC procedures specified in the USEPA Methods 5. Laboratory data sheets and PM catch weights are presented in the laboratory report in Attachment 5.

5.5 Sampling system response time determination

The response time of the sampling system was determined prior to the commencement of the performance tests by introducing upscale gas and zero gas, in series, into the sampling system using a tee connection at the base of the sample probe. The elapsed time for the analyzer to display a reading of 95% of the expected concentration was determined using a stopwatch. Each test period began once the instrument sampling probe has been in place for at least twice the greatest system response time.

5.6 Gas divider certification (USEPA Method 205)

A STEC Model SGD-710C 10-step gas divider was used to obtain appropriate calibration span gases. The ten-step STEC gas divider was NIST certified (within the last 12 months) with a primary flow standard in accordance with Method 205. When cut with an appropriate zero gas, the ten-step STEC gas divider delivers calibration gas values ranging from 0% to 100% (in 10% step increments) of the USEPA Protocol 1 calibration gas introduced into the system. The field evaluation procedures presented in Section 3.2 of Method 205 were followed prior to use of gas divider. The field evaluation yielded no errors greater than 2% of the triplicate measured average and no errors greater than 2% from the expected values.

5.7 Instrumental analyzer interference check

The instrumental analyzers used to measure O_2 and CO_2 have had an interference response test performed prior to their use in the field, pursuant to the interference response test procedures specified in USEPA Method 7E. The appropriate interference test gases (i.e., gases that would be encountered in the exhaust gas stream) were introduced into each analyzer, separately and as a mixture with the analyte that each analyzer is designed to measure. All the analyzers exhibited a composite deviation of less than 2.5% of the span for all measured interferent gases. No major analytical components of the analyzers have been replaced since performing the original interference tests.

5.8 Instrument calibration and system bias checks

At the beginning of each day of the testing program, initial three-point instrument calibrations were performed for the O_2 and CO_2 analyzers by injecting calibration gas directly into the inlet sample port for each instrument. System bias checks were performed prior to and at the conclusion of each sampling period by introducing an appropriate upscale calibration gas and zero gas into the sampling system (at the base of the stainless-steel sampling probe prior to the particulate filter and Teflon® heated sample line) and verifying the instrument response against the initial instrument calibration readings.

The instruments were calibrated with USEPA Protocol 1 certified concentrations of O_2 and CO_2 in nitrogen and zeroed using nitrogen. A STEC Model SGD-710C 10-step gas divider was used to obtain intermediate calibration gas concentrations as needed.

Attachment 6 provides sampling equipment quality assurance and calibration data.

6.0 Test Results and Discussion

6.1 Air pollutant emission test results and allowable emission limits

HMA operating data and PM emission measurement results for each one-hour test period are presented in Tables 6.1.

Table 6.2 presents the opacity (VE) reading test results for the three (3) sampling periods.

The measured PM concentrations and emission rates are not greater than the allowable limits specified in PTI No. 216-06.

6.2 Operating conditions during compliance tests

Testing was performed while the process operated at maximum routine operating conditions. MI Paving representatives provided production data at 15-minute intervals for each test period. The average recorded Asphalt production rate was 483 tons per hour (TPH) for the three (3) test periods.

Additionally, MI Paving operators recorded total HMA produced (TPH), fuel type, and baghouse pressure drop (in. H_2O).

Attachment 2 provides operating data collected during the compliance tests.

6.3 Variations from normal sampling procedures or operating conditions

The testing was performed as described in the approved Stack Test Protocol and reference test methods. During the test periods, the process was operated at normal routine operating conditions, at or near maximum achievable capacity, and satisfied the parameters specified in the Test Plan Approval Letter. The test event was witnessed by Mr. Johnathan Lamb, Andrew Riley and others of the EGLE-AQD. Each one-hour test was paused for a few minutes to move the probe/sampling train from one sampling port to the next.

Table 6.1 Measured air pollutant emission rates for the EUHMAPLANT exhaust

Analyzer and Isokinetic Test No. Test Date: Test Times:	1 6/20/2023 1025-1144	2 6/20/2023 1255-1400	3 6/20/2023 11450-1556	Three Run Average
Exhaust Gas Properties				
Exhaust Gas Flow (dscfm)	45,109	46,652	47,941	46,567
Temperature (°F)	201	200	207	203
Moisture (%)	27.5	28.8	28.5	28.3
Oxygen (%)	12.9	12.6	12.3	12.6
Carbon Dioxide (%)	5.47	5.77	5.90	5.72
HMA Process Data				
HMA Production Rate (ton/hr)	425	500	425	483
PM Emissions				
Sample Volume (dscf)	35.2	37.1	38.1	36.8
Filterable PM Catch (mg)	4.00	3.20	4.90	4.03
Filterable PM Catch (g)	0.004	0.003	0.005	0.004
Filterable PM Catch (gr)	0.06	0.05	0.08	0.06
PM Emission Rate (lb/hr)	0.679	0.532	0.815	0.675
PM Emission Factor (lb/ton)	0.002	0.001	0.002	0.001
PM Permit Limit (lb/ton)	-	-	-	*0.04*
PM Emission rate (gr/dscf)	0.002	0.001	0.002	0.002
PM Permit Limit (gr/dscf)	-	-	-	*0.04*
Visible Emissions				
VE 6-Minute Average (%)	0	0	0	0
VE Permit Limit (%)	-	-	-	*20*