FEDERALLY-ENFORCEABLE STATE ORIGIN PERMIT RENEWAL APPLICATION

Permit No. F-20-032 R1
AI: 2899

Independent Stave Company, LLC / Kentucky Cooperage
712 East Main St.
Lebanon, KY 40033

Prepared By:

TRINITY CONSULTANTS
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Covington, KY 41011
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November 2025

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1. APPLICATION SUMMARY

Independent Stave Company, LLC (ISC), headquartered in Lebanon, Missouri, owns and operates several cooperages throughout Kentucky that manufacture barrels for the wine and spirits industry. Kentucky Cooperage Holding Company, LLC, a division of ISC, operates the Kentucky Cooperage (KYC), located in Lebanon, Kentucky. This cooperage specializes in the production of wood barrels / staves for the Kentucky bourbon whiskey industry. KYC is currently regulated as a conditional major source under the Title V operating permit program based on potential emissions of non-fugitive carbon monoxide (CO) and non-fugitive particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}). KYC operates under the authority of the Federally-Enforceable State Origin Permit (FESOP) F-20-032 R1, originally issued by the Kentucky Division for Air Quality (KDAQ) on May 16, 2021, and most recently revised on March 14, 2025.

1.1 Purpose of Application

This document, along with its appendices, constitute the renewal application for KYC's FESOP, as required by Condition G.2.a. of the existing permit and 401 KAR 52:030, Section 12. This permit condition and the underlying regulation require that the renewal application be submitted at least six months prior to the expiration date of the permit. The expiration date of the current permit (F-20-032 R1) is May 16, 2026; as such, this renewal application is being submitted in advance of the November 16, 2025 deadline.

Pursuant to 401 KAR 52:030 Section 4, applications for permit renewals shall only provide information that is new or different from the most recent source-wide permit application. As part of this permit renewal application, KYC is seeking to further update the conditional major permit to reflect the existing configuration of the facility. In addition, this application summarizes all facility changes and permit revisions that have been requested since submittal of the most recent source-wide permit application, which resulted in the issuance of FESOP F-20-032. To facilitate the processing of this application, DEP7007AI, DEP7007B, and DEP7007N forms are included in **Appendix A**[1], supporting revised emission calculations are provided in **Appendix B**, relevant stack test documentation is presented in **Appendix C**, and suggested permit changes are documented by a red-lined strikeout (RLSO) version of the current permit in **Appendix D**.

Following this introduction, a brief description of the existing process operations located at KYC is provided in Section 2. This section also identifies each permit action undertaken by KYC since issuance of Permit No. F-20-032. Section 3 summarizes KYC's requested changes to the current FESOP, and Section 4 provides an overview of applicable regulatory requirements under state and federal air quality programs that have changed since this application.

[1] The current permit (F-20-032 R1) accurately identifies applicable regulatory requirements for the facility. As such, revised DEP7007V forms are not included.

2. EXISTING FACILITY AND OPERATIONS DESCRIPTION

2.1 Facility Location

The KYC facility is located at 712 East Main St., Lebanon, Kentucky (Marion County). The facility is approximately one mile north-east of the Lebanon downtown area. The Universal Transverse Mercator (UTM) coordinates of the center of the facility's property are (approximately) 4,160,178 meters (m) North and 656,252 m East (UTM Zone 16, NAD83).

2.2 Facility Operations Summary

The KYC facility produces charred wood barrels for the Kentucky bourbon industry. The facility specializes in the production of charred oak barrels, which are essential for bourbon aging and flavor development. The manufacturing process begins with the receipt of raw wooden staves and heads, which are further processed through a series of woodworking operations. These operations include sawing, planing, jointing, sanding, rounding, and molding. The facility utilizes multiple emission units for these processes. Dust generated from these operations is controlled using a combination of cyclones, baghouses, and dust collection systems.

Once shaped, staves and heads are charred to impart the desired properties onto the interior surface of the barrels. Charring is performed in dedicated emission units (EUs), EU-011 for head charring, and EU-012 for barrel charring. KYC also operates steam-heated kilns (EU-14, Insignificant Activity [IA] 1) and a natural-gas fired drying chamber (EU-05) to condition wood and achieve the desired moisture content prior to charring.

Steam for kiln operations and other process needs is generated by two wood-fired boilers (EU01 & EU02) and one natural-gas fired boiler (EU-016). The facility also employs various paved and unpaved haul roads to account for the transfer of materials and products in and out of the facility.

2.3 Conditional Major Permit History Summary

The most recent source-wide permit application for the KYC facility resulted in the issuance of FESOP F-20-032 on July 6, 2020. **Table 2-1** summarizes all permit actions that have been submitted since issuance of this permit.

Table 2-1. Summary of Permit Actions

APE# from ORR	Date	Type of Permit Action	Corresponding Permit Revision	Permit Action Summary
APE20200001	7/2020	FESOP Renewal	F-20-032	KYC submitted a renewal permit application to renew the initial conditional major permit (F-15-023); remove EU-03A-1 and EU-03A-2; and modify EU-13.
APE20230001	5/2023	Off-Permit Change	F-20-032 R1	KYC submitted a Section 502(b)(10) notification, which was processed by KDAQ as an off-permit change, to replace six existing kilns with five new kilns.
APE20240001	10/2024	Minor Permit Revision	F-20-032 R1	KYC submitted a minor permit revision application for the incremental replacement of various head woodworking units. Specifically, changes requested by this application included: • The replacement of existing Heading Jointers (EU-03C-1), and Heading Rounders (EU-03C-2) subject to 401 KAR 61:020 with new Heading Jointers (EU-03D-6) and Heading Rounders (EU-03D-7) subject to 401 KAR 59:010. • The replacement of Heading Planers (EU-03D-1) with "like-kind" equipment As a result of this permit action, language was added to the permit indicating that a "transitional stage" would be required to bring EU-03D-6 and EU-03D-7 online and that EU-03C-1 and EU-03C-2 shall be operated only during this "transitional stage".

3. REQUESTED CHANGES TO CONDITIONAL MAJOR PERMIT

In accordance with the provisions outlined in 401 KAR 52:030, Section 4(2)(c), Kentucky's regulations allow applicants to limit the content of a renewal application to encompass only information that is new or different from the most recent facility-wide permit application. Accordingly, KYC is seeking various updates to the permit as outlined below. To facilitate these updates, revised DEP7007B and DEP7007N forms are included in **Appendix A**, detailed emission calculations covering to the emission factor updates are provided in **Appendix B**, and relevant stack test documentation is provided in **Appendix C**. A summary of the requested changes and pertinent documentation for each change on a Process ID basis is presented in

Table 3-3.

3.1 Heading Char (EU-011) Updates

Pursuant to Section B.3.a within the Heading Char section of Permit F-20-032 R1, KYC was required to conduct a performance test for CO emissions to establish a site-specific CO emission factor for the head charring operations; however, Section B.3.b of this section also allows the test result for the stave charring process (EU-012) to be used to develop a representative CO and PM emission factor for the head charring process (EU-011).

In April-May 2024, Alliance Technical Group (Alliance) conducted a performance (stack) test (subsequently referred to as the 2024 Alliance Stack Test) to determine CO and PM emissions from both the head charring and stave charring processes. At the time of the 2024 Alliance Stack Test, KYC used wood as the auxiliary fuel for the head charring combustion reaction. On the other hand, KYC used natural gas as the auxiliary fuel for the stave charring process. In early 2025, KYC installed a natural gas combustion system to facilitate the combustion reaction in the head charring operations. Accordingly, to accurately characterize charring emissions using natural gas as the auxiliary fuel, KYC proposes to use the result of the 2024 Alliance Stack Test for the stave charring process to represent CO and PM emissions from the head charring process.

The associated stack test report presents the CO results on both a concentration (parts per million by volume [ppmv]) and mass emission rate (tons per year [tpy]) basis and the filterable, condensable, and total PM emissions on a mass emission rate (lbs/barrel produced) basis. The mass emission rates assume continuous annual operation at the operating rates recorded during the test runs – heads per hour for the head charring process and barrels per hour for the barrel charring process. To account for the fact that (1) the average weight of a head (9 pounds [lbs]) differs from the average weight of a barrel (90 lbs) and (2) the average charred fraction of a head (13.28% by weight) differs from the average charred fraction of a barrel (4.16% by weight), KYC adjusted these test results to a charred wood throughput basis. Using this procedure, KYC proposes a CO and PM emission factor for the head charring process (EU-012) based on the throughput of charred wood, which is equivalent to the proposed stave charring emission factor on a charred wood throughput basis. Both factors are calculated as follows using data from the 2024 Alliance Stack Test:

> CO EF_{EU-012} (lbs/ton wood charred) = (8.42 tons CO/yr) x (2,000 lbs CO/ton CO) x (1 yr/8,760 hrs) x (1 hr/214.86 barrels[2]) x (1 barrel/90 lbs wood) x (2,000 lbs wood/ton wood) x (1 ton wood/0.0416 tons charred wood[3]) = **4.78 lbs/ton wood charred**
>
> Total PM EF_{EU-012} (lbs/ton wood charred) = (0.003 lbs PM/barrel) x (1 barrel/90 lbs wood) x (2,000 lbs wood/ton wood) x (1 ton wood/0.0416 tons charred wood[3]) = **1.60 lbs/ton wood charred**

As mentioned earlier in this section, KYC has recently replaced the use of wood fuel for the head-charring process (EU-011-1) with natural gas-fired burners. This modified system includes five (5) 210,000 Btu/hr

[2] The operating rates during the 2024 Alliance Stack Test are presented in Appendix E of the test report, which is included as **Appendix C** of this renewal application. The operating rates for the stave charring process (EU-012) are adjusted to an hourly basis using the duration of each test run. Specifically, Run 2 lasted 63 minutes and charred 221 barrels, Run 3 lasted 63 minutes and charred 229 barrels, and Run 4 lasted 65 minutes and charred 234 barrels. Therefore, the average hourly operating rate of Runs 2 through 4 was 214.86 barrels per hour.

[3] This term is based on KYC's operating experience regarding the average charred fraction of a barrel – 4.16% by weight which corresponds to a conversion factor of 0.0416 tons of charred wood per ton of total wood throughput.

(1.05 MMBtu/hr total heat input) natural gas-fired burners. Accordingly, KYC requests the removal of Process ID EU-011-1 and the addition of Process ID EU-011-3 to represent natural gas fuel combustion for the head-charring process. Emissions for EU-011-3 were estimated for criteria pollutants using emission factors set forth in AP-42 Chapter 1.4 - *Natural Gas Combustion*. Potential emission calculations assume continuous annual operation at the rated capacity of each burner.

Although the burner system for the head charring process was modified, this modification did not cause an increase in potential hourly PM emissions given that (1) PM emissions from natural gas combustion are less than PM emissions from wood waste combustion on a lbs/MMBtu basis, and (2) the capacity of the new natural gas charring system is less than 25% of the capacity of the wood firing system that it replaced on a MMBtu/hr basis. Consequently, this modification did not trigger the applicability of the process rate rule and opacity requirements for new sources under 401 KAR 59:010. Instead, the existing source requirements established by 401 KAR 61:020 remain applicable as represented by the current permit conditions. Since potential PM emissions from this system decreased as a result of this change, KYC will continue to comply with the applicable PM and opacity limits based on the current compliance demonstration strategy.

The egress point evaluated during the 2024 Alliance Stack Test accounts for both fuel combustion emissions and CO / PM emissions generated during the charring of barrel heads. Therefore, the CO and PM emission factors for EU-011-3, the Process ID for natural gas combustion, are proposed to be **0.0 lbs/SCC** since the CO and PM emission factors for EU-011-2 already represent the total CO and PM emissions on a mass (head throughput) basis.

Although the replacement of the auxiliary wood combustion system with the natural gas-fired burners did not debottleneck or otherwise increase the potential operating rate of the head charring operations, based on operating experience gained by KYC since the initial permitting of this process, the current maximum short-term throughput rate is now estimated to be **500 heads per hour**[4]. A summary of the requested updates for operating rates and CO / PM emission factors proposed for the head charring processes is presented in **Table 3-1**. Emission factors and PTE estimates for other pollutants associated with the natural gas combustion system (EU-011-3) are presented in the DEP7007N.1 forms in **Appendix A** and the detailed emission calculations in **Appendix B**.

Table 3-1. Requested Head Char Emission Factor Updates

Emission Unit	Revised PM Emission Factor	Revised CO Emission Factor	Revised Maximum Process Throughput
EU-012-1 (**remove**)	N/A – remove from permit	N/A – remove from permit	N/A – remove from permit
EU-012-2	1.60 lbs/ton wood charred	4.78 lbs/ton wood charred	500 heads/hour (0.30 tons/hr charred wood)
EU-012-3 (**new**)	0.0 lbs/MMscf	0.0 lbs/MMscf	1.05 MMBtu/hr

3.2 Stave Char (EU-012) Updates

Pursuant to Section B.3.a and Section B.3.b within the Stave Char section of Permit F-20-032 R1, KYC was required to conduct performance testing for CO and PM emissions to establish site-specific emission factors

[4] This hourly rate represents the maximum short-term capacity of the head char process; however, the sustained monthly and annual operating rates will be less than this short-term throughput rate due to process bottlenecks.

for the stave-charring operations. These testing requirements were satisfied through the 2024 Alliance Stack Test.

Based on the 2024 Alliance Stack Test, KYC requests to revise the CO and PM emission factors for the following Process IDs:

- EU-012-2 – Natural Gas Combustion
- EU-012-3 – Stave Charring Operations

Additionally, upon review of the current permit, KYC determined that the process equipment associated with EU-012-1 (wood fuel combustion for barrel char) was never installed at the facility. Accordingly, this Process ID should be removed from the permit.

Similarly to the Head Char operations, the egress point evaluated during the 2024 Alliance Stack Test accounts for emissions from the combustion of auxiliary fuel (natural gas) and the charring of wood staves. Therefore, the CO and PM emission factors for EU-012-2 are proposed to be **0.0 lbs/SCC**, as the emission factor for EU-012-3 already represents total CO and PM emissions on a mass (barrel throughput) basis.

Based on additional operating experience gained since the initial permitting of this charring process, KYC requests to increase the current maximum short-term throughput rate to be **250 barrels per hour**[5]. A summary of the requested changes for the Stave Char processes is presented in **Table 3-2**.

Table 3-2. Requested Stave Char Emission Factor Updates

Emission Unit	Revised PM Emission Factor	Revised CO Emission Factor	Revised Maximum Process Throughput
EU-012-1 (**remove**)	N/A – remove from permit	N/A – remove from permit	N/A – remove from permit
EU-012-2	0.0 lbs/MMscf	0.0 lbs/MMscf	6.0 MMBtu/hr
EU-012-3	1.60 lbs/ton wood charred	4.78 lbs/ton wood charred	250 barrels/hr (0.47 tons/hr charred wood)

3.3 G5 Process (EU-013) Updates

Pursuant to Section B.3 within the G5 Process section of Permit F-20-032 R1, KYC was required to conduct PM performance testing to establish a site-specific PM emission factor for the G5 Process and to evaluate the control efficiency of the CAMCORP Baghouse.

The 2024 Alliance Stack Test was conducted to determine the PM emission rate from the exhaust of the G5 Process following control by the CAMCORP baghouse. Based on the test results, KYC requests the following updates to the G5 Process (EU-013):

- Update Condition 3 in the G5 Process section to remove the requirement to test for the control efficiency of the CAMCORP baghouse;
- Consolidate all existing Process IDs listed under the G5 Process into a single, comprehensive Process ID (EU-13-5) representing a total throughput of 240 barrels per hour (10.80 tons/hr); and

[5] This hourly rate represents the maximum short-term capacity of the barrel char process; however, the sustained monthly and annual operating rates will be less than this short-term throughput rate due to process bottlenecks.

- Update the PM, PM_{10}, and $PM_{2.5}$ emission factors to reflect the post-control emission factor of **0.267 lbs/ton**, as determined in the 2024 Alliance Stack Test.

KYC has opted to combine all G5 Process units under one Process ID since each process has comparable PM emissions potentials and is routed to the same CAMCORP baghouse for emissions control.

3.4 Transitional Stage Permit Updates

As discussed within **Table 2-1**, KYC submitted a minor permit revision in October 2024 to request the incremental replacement of various heading woodworking units. In response to this application, FESOP F-20-032 R1 was issued with additional language indicating that a "transitional stage" would be required to phase out existing Heading Jointers (EU-03C-1) and Heading Rounders (EU-03C-2) with the new Heading Jointers (EU-03D-6) and Heading Rounders (EU-03D07). This "transitional stage" allowed operations of existing woodworking units while new equipment was being installed piecewise.

KYC plans to have this "transitional stage" completed by early 2026, meaning that all existing Heading Jointers and Heading Rounders subject to 401 KAR 61:020 will have been replaced with the new Heading Jointers and Heading Rounders. As such, KYC requests that the existing units (EU-03C-1 & EU-03C-2) be removed from the renewed permit and any language discussing the "transitional stage" be removed from Sections B and D.

3.5 Source Emission Limitation Updates

To preclude the applicability of 401 KAR 52:020, Section D of Permit F-20-032 R1 established source-wide emission limits of 90 tpy CO and PM_{10}, based on potential-to-emit (PTE) calculations submitted in the initial facility permit application. In addition, the following unit-specific operating hour limits were imposed:

- **Drying Chamber (EU05)**: 6,000 hours during any twelve consecutive months
- **Head Char (EU-011)**: 6,000 hours during any twelve consecutive months
- **Stave Char – Wood Fuel Combustion (EU-012-1)**: 1,752 hours during any twelve consecutive months
- **Stave Char – Natural Gas Combustion (EU-012-2)**: 1,676 hours during any twelve consecutive months

As demonstrated in **Appendix B,** the revised facility-wide PTE based on the changes described in Sections 3.1 through 3.4 is **96.2 tpy** for CO and **52.0 tpy** for non-fugitive PM_{10}. CO and PM_{10} emissions are now below the 100 tpy major source threshold, and as such, KYC requests the removal of:

1. The facility-wide CO and PM_{10} emission limits;
2. The unit-specific operating hour restrictions; and
3. Any associated recordkeeping requirements related to 12-month rolling CO and PM_{10} emissions used to demonstrate compliance with the aforementioned limits.

Based on the revised PTE calculations, the facility's potential emissions of nitrogen oxides (NO_x) are approximately **99.6 tpy**. To conservatively preclude the applicability of 401 KAR 52:020, KYC requests the establishment of a 90 tpy source-wide NO_x emission limit in the renewal permit, along with the corresponding recordkeeping and monitoring conditions required.

Table 3-3. Summary of Requested Changes

Emission Unit	Emission Unit Description	Requested Change(s)	Pertinent Attachments
EU-011-1	Heading Char – Wood Fuel Combustion	Removal from renewal permit	Appendix A - DEP7007N Forms
EU-011-2	Heading Char – Barrel Head Char	1. Revise CO and PM emission factors based on 2024 Alliance Stack Test results 2. Revise maximum throughput 3. Update compliance demonstration for 401 KAR 61:020 PM limit to refer to natural gas combustion	Appendix A - DEP7007N Forms Appendix B.3 – Emission Calculations
EU-011-3 (**NEW)**	Heading Char – Natural Gas Fuel Combustion	Add Process ID to renewal permit	Appendix A - DEP7007N Forms Appendix B.2 – Emission Calculations
EU-012-1	Stave Char – Wood Fuel Combustion	Removal from renewal permit	Appendix A - DEP7007N Forms
EU-012-2	Stave Char – Natural Gas Fuel Combustion	Set PM and CO emission factors to 0.0 lbs/SCC based on 2024 Alliance Stack Test	Appendix A - DEP7007N Forms Appendix B.2 – Emission Calculations
EU-012-3	Stave Char – Barrel Stave Char	1. Revise PM and CO emission factors based on 2024 Alliance Stack Test results 2. Revise maximum throughput	Appendix A - DEP7007N Forms Appendix B.3 – Emission Calculations
EU-013 – 1	G5 Process – Equalizer (2)	1. Combine Process ID's into one Emission Unit (EU-013-5) 2. Update PM, PM_{10}, and $PM_{2.5}$ emission factors to incorporate "post-control" factors based on the 2024 Alliance Stack Test 3. Update Condition 3 in the G5 Process section to remove baghouse control efficiency test requirement	Appendix A - DEP7007N Forms Appendix B.4 – Emission Calculations
EU-013 – 2	G5 Process – Stave Planer (2)		
EU-013 – 3	G5 Process – Stave G5 (24)		
EU-013 – 4	G5 Process – Grinder (2)		
EU-03C-1	Existing Heading Jointers (15)	Requesting removal from the renewal permit as the "transitional stage" is complete	N/A
EU-03C-2	Existing Heading Rounders (3)	Requesting removal from the renewal permit as the "transitional stage" is complete	
Facility-Wide – CO 90 tpy emission limit		Removal from renewal permit	Appendix A - DEP7007V Forms Appendix B.1 – Facility-PTE Calculations
Facility-Wide – PM_{10} 90 tpy emission limit		Removal from renewal permit	
Various Emission Units – Hours of operation limits		Removal from renewal permit	
Facility-Wide – NO_x 90 tpy emission limit **NEW**		Add facility-wide NO_x limit and pertinent recordkeeping and monitoring requirements based on revised PTE calculations	

4. RULE REQUIREMENTS SUMMARY

This section provides general air quality regulatory information for the KYC facility, including the facility's status with respect to the Prevention of Significant Deterioration (PSD) and Title V permitting programs. No federal or state requirements have changed as a result of permit actions submitted since the issuance of the most recent site-wide permit in 2021. However, the subsequent sections provides relevant regulatory updates to state and federal air regulatory requirements that are addressed in this permit renewal application.

4.1 Source Classification

4.1.1 PSD Permitting Program

The KYC facility is located in Marion County, which has been designated by U.S. Environmental Protection Agency (EPA) as an unclassified/attainment area for all criteria pollutants.[6] Therefore, with respect to the federal New Source Review (NSR) permitting program, only PSD requirements could potentially apply to the source.

The PSD preconstruction permitting program in Kentucky has been approved by the EPA and incorporated into the Kentucky State Implementation Plan (SIP) under 401 KAR 51:017 to implement the federal requirements of 40 CFR 51.166 or 52.21. Requirements for a major source can be summarized as follows:

- One of the 28 listed stationary sources that emits, or has the potential to emit, 100 tons per year (tpy) or more of any regulated NSR pollutant, where fugitive emissions from the listed source category must be included in the total; or
- Any source not belonging to one of the listed source categories that emits, or has the potential to emit, 250 tpy or more of any regulated NSR pollutant, where fugitive emissions are not included in the total.

Based on KYC's Standard Industry Classification (SIC) code, it does not belong to one of the 28 listed source categories. As documented in KYC's permit applications, the facility's non-fugitive emissions have remained below the 250 tpy PSD major source threshold for each regulated criteria air pollutant. Therefore, KYC is an existing minor source with respect to the PSD permitting program.

4.2 Federal Regulatory Applicability Review

4.2.1 40 CFR 70 - Title V Permitting Program

40 CFR 70 establishes the regulations implementing the federal Title V operating permit program. Kentucky has adopted these provisions of this federal program in its Title V operating program established in 401 KAR 52:020. As specified in 401 KAR 52:001, Section 1(46), a major source with respect to the Title V regulations encompasses facilities with potential emissions of 100 tpy of any regulated pollutant, 10 tpy of any single hazardous air pollutant (HAP), and/or 25 tpy of any combination of HAPs.

[6] 401 KAR 51:010 Sections 4 through 9.

Historically, KYC limited potential emissions to below 90 tpy of CO and non-fugitive PM_{10} to preclude the applicability of 401 KAR 52:020. Based on revised PTE calculations, the facility now demonstrates that normal operations remain below the 100 tpy major source threshold for CO and PM_{10} without reliance on the former 90 tpy limits.

To continue precluding Title V applicability, KYC is requesting the establishment of a 90 tpy facility-wide NO_x limit, including appropriate monitoring and recordkeeping provisions. Accordingly, KYC remains a synthetic minor source with respect to the Title V permitting program and is subject to the FESOP requirements established by 401 KAR 52:030.

APPENDIX A. DEP7007 APPLICATION FORMS

DEP7007AI – Administrative Information
DEP7007B – Manufacturing or Processing Operations
DEP7007N – Source Emissions Profile
DEP7007V – Applicable Requirements
DEP7007DD – Insignificant Activities

Division for Air Quality

300 Sower Boulevard

Frankfort, KY 40601

(502) 564-3999

DEP7007AI

Administrative Information

___ Section AI.1: Source Information

___ Section AI.2: Applicant Information

___ Section AI.3: Owner Information

___ Section AI.4: Type of Application

___ Section AI.5: Other Required Information

___ Section AI.6: Signature Block

___ Section AI.7: Notes, Comments, and Explanations

Additional Documentation

None

___ Additional Documentation attached

Source Name: Kentucky Cooperage

KY EIS (AFS) #: 21- 155-00001

Permit #: F-20-032 R1

Agency Interest (AI) ID: 2899

Date: 11/14/2025

Section AI.1: Source Information

Physical Location Address:
Street: 712 EAST MAIN ST
City: LEBANON **County:** MARION **Zip Code:** 40033

Mailing Address:
Street or P.O. Box: 712 EAST MAIN ST
City: LEBANON **State:** KY **Zip Code:** 40033

Standard Coordinates for Source Physical Location

Longitude: -85.2305361 (decimal degrees) **Latitude:** 37.5754028 (decimal degrees)

Primary (NAICS) Category: Wood Container and Pallet Mfg **Primary NAICS #:** 321920

Classification (SIC) Category: Wood Containers **Primary SIC #:** 2449

Briefly discuss the type of business conducted at this site: Manufacture of White Oak Bourbon Barrels

Description of Area Surrounding Source: ☑ Rural Area ☐ Industrial Park ☑ Residential Area ☐ Urban Area ☑ Industrial Area ☑ Commercial Area

Is any part of the source located on federal land? ☐ Yes ☑ No

Number of Employees: 480

Approximate distance to nearest residence or commercial property: 800

Property Area: 13.5 acres

Is this source portable? ☐ Yes ☑ No

What other environmental permits or registrations does this source currently hold or need to obtain in Kentucky?

NPDES/KPDES:	☑ Currently Hold	☐ Need	☐ N/A
Solid Waste:	☐ Currently Hold	☐ Need	☑ N/A
RCRA:	☐ Currently Hold	☐ Need	☑ N/A
UST:	☐ Currently Hold	☐ Need	☑ N/A

Type of Regulated Waste Activity:

☐ Mixed Waste Generator ☐ Generator ☐ Recycler ☐ Other: _____

☐ U.S. Importer of Hazardous Waste ☐ Transporter ☐ Treatment/Storage/Disposal Facility ☑ N/A

Section AI.2: Applicant Information

Applicant Name: John Mealey

Title: (if individual) Kentucky Cooperage

Mailing Address:
Street or P.O. Box: 712 EAST MAIN ST
City: LEBANON **State:** KY **Zip Code:** 40033

Email: (if individual) john.mealey@kentuckycooperage.com

Phone: 270-692-4674

Technical Contact

Name: Same As Applicant

Title:

Mailing Address:
Street or P.O. Box:
City: **State:** **Zip Code:**

Email:

Phone:

Air Permit Contact for Source

Name: Same As Applicant

Title:

Mailing Address:
Street or P.O. Box:
City: **State:** **Zip Code:**

Email:

Phone:

Section AI.3: Owner Information

☐ **Owner same as applicant**

Name: Kentucky Cooperage Holding Company, LLC

Title:

Mailing Address: **Street or P.O. Box:** 712 East Main St

City: Lebanon **State:** KY **Zip Code:** 40033

Email:

Phone:

List names of owners and officers of the company who have an interest in the company of 5% or more.

Name	Position

Section AI.4: Type of Application

Current Status: ☐ Title V ☑ Conditional Major ☐ State-Origin ☐ General Permit ☐ Registration ☐ None

Requested Action: *(check all that apply)*

☐ Name Change	☐ Initial Registration	☐ Significant Revision	☐ Administrative Permit Amendment
☑ Renewal Permit	☐ Revised Registration	☐ Minor Revision	☐ Initial Source-wide Operating Permit
☐ 502(b)(10)Change	☐ Extension Request	☐ Addition of New Facility	☐ Portable Plant Relocation Notice
☐ Revision	☐ Off Permit Change	☐ Landfill Alternate Compliance Submittal	☐ Modification of Existing Facilities
☐ Ownership Change	☐ Closure		

Requested Status: ☐ Title V ☑ Conditional Major ☐ State-Origin ☐ PSD ☐ NSR ☐ Other: _____

Is the source requesting a limitation of potential emissions? ☐ Yes ☑ No

Pollutant:	Requested Limit:	Pollutant:	Requested Limit:
☐ Particulate Matter		☐ Single HAP	
☐ Volatile Organic Compounds (VOC)		☐ Combined HAPs	
☐ Carbon Monoxide		☐ Air Toxics (40 CFR 68, Subpart F)	
☐ Nitrogen Oxides		☐ Carbon Dioxide	
☐ Sulfur Dioxide		☐ Greenhouse Gases (GHG)	
☐ Lead		☐ Other	

For New Construction:

Proposed Start Date of Construction: *(MM/YYYY)* NA

Proposed Operation Start-Up Date: *(MM/YYYY)* NA

For Modifications:

Proposed Start Date of Modification: *(MM/YYYY)* N/A

Proposed Operation Start-Up Date: *(MM/YYYY)* N/A

Applicant is seeking coverage under a permit shield. ☐ **Yes** ☑ **No**

Identify any non-applicable requirements for which permit shield is sought on a separate attachment to the application.

Section AI.5 Other Required Information

Indicate the documents attached as part of this application:

- ☐ DEP7007A Indirect Heat Exchangers and Turbines
- ☑ DEP7007B Manufacturing or Processing Operations
- ☐ DEP7007C Incinerators and Waste Burners
- ☐ DEP7007F Episode Standby Plan
- ☐ DEP7007J Volatile Liquid Storage
- ☐ DEP7007K Surface Coating or Printing Operations
- ☐ DEP7007L Mineral Processes
- ☐ DEP7007M Metal Cleaning Degreasers
- ☑ DEP7007N Source Emissions Profile
- ☐ DEP7007P Perchloroethylene Dry Cleaning Systems
- ☐ DEP7007R Emission Offset Credit
- ☐ DEP7007S Service Stations
- ☐ DEP7007T Metal Plating and Surface Treatment Operations
- ☑ DEP7007V Applicable Requirements and Compliance Activities
- ☐ DEP7007Y Good Engineering Practice and Stack Height Determination
- ☐ DEP7007AA Compliance Schedule for Non-complying Emission Units
- ☐ DEP7007BB Certified Progress Report
- ☐ DEP7007CC Compliance Certification
- ☐ DEP7007DD Insignificant Activities
- ☐ DEP7007EE Internal Combustion Engines
- ☐ DEP7007FF Secondary Aluminum Processing
- ☐ DEP7007GG Control Equipment
- ☐ DEP7007HH Haul Roads
- ☐ Confidentiality Claim
- ☐ Ownership Change Form
- ☐ Secretary of State Certificate
- ☐ Flowcharts or diagrams depicting process
- ☐ Digital Line Graphs (DLG) files of buldings, roads, etc.
- ☐ Site Map
- ☐ Map or drawing depicting location of facility
- ☐ Safety Data Sheet (SDS)
- ☐ Emergency Response Plan
- ☐ Other: _____

Section AI.6: Signature Block

I, the undersigned, hereby certify under penalty of law, that I am a responsible official*, and that I have personally examined, and am familiar with, the information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the information is on knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false or incomplete information, including the possibility of fine or imprisonment.

Joshua Evans
Authorized Signature

11/14/2025
Date

Joshua Evans
Type or Printed Name of Signatory

Plant Manager
Title of Signatory

*Responsible official as defined by 401 KAR 52:001.

Section AI.7: Notes, Comments, and Explanations

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007B

Manufacturing or Processing Operations

___ Section B.1: Process Information
___ Section B.2: Materials and Fuel Information
___ Section B.3: Notes, Comments, and Explanations

Additional Documentation

___ Complete DEP7007AI, DEP7007N, DEP7007V, and DEP7007GG.
___ Attach a flow diagram
___ Attach SDS

Source Name: Kentucky Cooperage
KY EIS (AFS) #: 21- 155-00001
Permit #: F-20-032 R1
Agency Interest (AI) ID: 2899
Date: 11/14/2025

Section B.1: Process Information

Emission Unit #	Emission Unit Name	Describe Emission Unit	Process ID	Process Name	Manufacturer	Model No.	Proposed/Actual Date of Construction Commencement *(MM/YYYY)*	Is the Process Continuous or Batch?	Number of Batches per 24 Hours *(if applicable)*	Hours per Batch *(if applicable)*
EU 011	Heading Char	Head Charring	02	Barrel Heads (Char Only)	N/A	N/A	1960	Continuous	N/A	N/A
EU 011	**Heading Char**	**Head Charring**	**03**	**Natural Gas Fuel**	**N/A**	**N/A**	**2025**	**Continuous**	**N/A**	**N/A**
EU 012	Barrel Char	Barrel Charring	03	Staves (Char Only)	N/A	N/A	2017	Continuous	N/A	N/A
EU 13	G5 Process	G5 Process	05	Combined Processes	N/A	N/A	2018	Continuous	N/A	N/A

Section B.2: Materials and Fuel Information

**Maximum yearly fuel usage rate only applies if applicant request operating restrictions through federally enforceable limitations.*

Emission Unit #	Emission Unit Name	Name of Raw Materials Input	Maximum Quantity of Each Raw Material Input		Total Process Weight Rate for Emission Unit (tons/hr)	Name of Finished Materials	Maximum Quantity of Each Finished Material Output		Fuel Type	Maximum Hourly Fuel Usage Rate		Maximum Yearly Fuel Usage Rate		Sulfur Content (%)	Ash Content (%)
				(Specify Units/hr)				(Specify Units/hr)			(Specify Units)		(Specify Units)		
EU 011	Heading Char	Pre-Chared Wood	0.30	tons/hr	0.30	Post-Chared Wood	0.30	tons/hr	Natural Gas	1.05	MMBtu/hr	9,198	MMBtu/hr	N/A	N/A
EU 012	Heading Char	Pre-Chared Wood	0.47	tons/hr	0.47	Post-Chared Wood	0.47	tons/hr	Natural Gas	6.00	MMBtu/hr	52,560	MMBtu/hr	N/A	N/A
EU 13	G5 Process	Staves	10.8	tons/hr	10.80	Processed Staves	10.8	tons/hr	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Section B.3: Notes, Comments, and Explanations

Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007N

Source Emissions Profile

__ Section N.1: Emission Summary
__ Section N.2: Stack Information
__ Section N.3: Fugitive Information
__ Section N.4: Notes, Comments, and Explanations

Additional Documentation

___ Complete DEP7007AI

Source Name: Kentucky Cooperage
KY EIS (AFS) #: 21- 155-00001
Permit #: F-20-032 R1
Agency Interest (AI) ID: 2899
Date: 11/14/2025

N.1: Emission Summary

Emission Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity *(SCC Units/hour)*	Pollutant	Uncontrolled Emission Factor *(lb/SCC Units)*	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency *(%)*	Control Efficiency *(%)*	Hourly Emissions		Annual Emissions	
													Uncontrolled Potential *(lb/hr)*	Controlled Potential *(lb/hr)*	Uncontrolled Potential *(tons/yr)*	Controlled Potential *(tons/yr)*
EU-011	(EU-11) Head Char	02	Charred Wood	N/A	N/A	--	0.30	PM	1.60	2024 Alliance Stack Test	N/A	N/A	0.48	0.48	2.10	2.10
							0.30	PM10	1.60	2024 Alliance Stack Test	N/A	N/A	0.48	0.48	2.10	2.10
							0.30	PM2.5	1.60	2024 Alliance Stack Test	N/A	N/A	0.48	0.48	2.10	2.10
							0.30	NOX	7.55	AP-42 Table 1.6-1	N/A	N/A	2.25	2.25	9.87	9.87
							0.30	CO	4.78	2024 Alliance Stack Test	N/A	N/A	1.43	1.43	6.26	6.26
							0.30	VOC	0.26	AP-42 Table 1.6-3	N/A	N/A	0.08	0.08	0.34	0.34
							0.30	SOX	0.39	AP-42 Table 1.6-1	N/A	N/A	0.12	0.12	0.50	0.50
							0.30	Total HAPs	0.58	AP-42 Table 1.6-3; AP-42 Table 1.6-4	N/A	N/A	0.17	0.17	0.76	0.76
EU-011	(EU-11) Head Char	03	Natural Gas (1.05 MMBtu/hr)	N/A	N/A	--	1.03E-03	PM	--	2024 Alliance Stack Test, emission counted in "Charring" EF	N/A	N/A	#VALUE!	#VALUE!	#VALUE!	#VALUE!

Emission Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity *(SCC Units/hour)*	Pollutant	Uncontrolled Emission Factor *(lb/SCC Units)*	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency *(%)*	Control Efficiency *(%)*	Hourly Emissions		Annual Emissions	
													Uncontrolled Potential *(lb/hr)*	Controlled Potential *(lb/hr)*	Uncontrolled Potential *(tons/yr)*	Controlled Potential *(tons/yr)*
							1.03E-03	PM10	--	2024 Alliance Stack Test, emission counted in "Charring" EF	N/A	N/A	#VALUE!	#VALUE!	#VALUE!	#VALUE!
							1.03E-03	PM2.5	--	2024 Alliance Stack Test, emission counted in "Charring" EF	N/A	N/A	#VALUE!	#VALUE!	#VALUE!	#VALUE!
							1.03E-03	NOX	100	AP-42 Table 1.4-1	N/A	N/A	0.10	0.10	0.45	0.45
							1.03E-03	CO	--	2024 Alliance Stack Test, emissions counted in "Charring" EF	N/A	N/A	--	--	--	--
							1.03E-03	VOC	5.50	AP-42 Table 1.4-2	N/A	N/A	5.66E-03	5.66E-03	0.02	0.02
							1.03E-03	SOX	0.60	AP-42 Table 1.4-2	N/A	N/A	6.18E-04	6.18E-04	2.71E-03	2.71E-03
							1.03E-03	Total HAPs	0.08	AP-42 Table 1.4-3	N/A	N/A	7.72E-05	7.72E-05	3.38E-04	3.38E-04
EU-012	(EU-012) Stave Char	02	Natural Gas (6.0 MMBtu/hr)	N/A	N/A	--	5.88E-03	PM	--	2024 Alliance Stack Test, emission counted in "Charring" EF	N/A	N/A	--	--	--	--
							5.88E-03	PM10	--	2024 Alliance Stack Test, emission counted in "Charring" EF	N/A	N/A	--	--	--	--
							5.88E-03	PM2.5	--	2024 Alliance Stack Test, emission counted in "Charring" EF	N/A	N/A	--	--	--	--
							5.88E-03	NOX	100	AP-42 Table 1.4-1	N/A	N/A	0.59	0.59	2.58	2.58

Emission Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity *(SCC Units/hour)*	Pollutant	Uncontrolled Emission Factor *(lb/SCC Units)*	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency *(%)*	Control Efficiency *(%)*	Hourly Emissions		Annual Emissions	
													Uncontrolled Potential *(lb/hr)*	Controlled Potential *(lb/hr)*	Uncontrolled Potential *(tons/yr)*	Controlled Potential *(tons/yr)*
							5.88E-03	CO	--	2024 Alliance Stack Test, emissions counted in "Charring" EF	N/A	N/A	--	--	--	--
							5.88E-03	VOC	5.50	AP-42 Table 1.4-2	N/A	N/A	0.03	0.03	0.14	0.14
							5.88E-03	SOX	0.60	AP-42 Table 1.4-2	N/A	N/A	3.53E-03	3.53E-03	0.02	0.02
							5.88E-03	Total HAPs	0.08	AP-42 Table 1.4-3	N/A	N/A	4.41E-04	4.41E-04	1.93E-03	1.93E-03
EU-012	(EU-012) Stave Char	03	Charred Wood	N/A	N/A	--	0.47	PM	1.60	2024 Alliance Stack Test	N/A	N/A	0.75	0.75	3.29	3.29
							0.47	PM10	1.60	2024 Alliance Stack Test	N/A	N/A	0.75	0.75	3.29	3.29
							0.47	PM2.5	1.60	2024 Alliance Stack Test	N/A	N/A	0.75	0.75	3.29	3.29
							0.47	NOX	7.55	AP-42 Table 1.6-1	N/A	N/A	3.53	3.53	15.45	15.45
							0.47	CO	4.78	2024 Alliance Stack Test	N/A	N/A	2.24	2.24	9.80	9.80
							0.47	VOC	0.26	AP-42 Table 1.6-3	N/A	N/A	0.12	0.12	0.54	0.54
							0.47	SOX	0.39	AP-42 Table 1.6-1	N/A	N/A	0.18	0.18	0.79	0.79
EU13	G5 Processes	05	Combined	N/A	N/A	--	10.80	PM	0.03	Alliance 4/30-5/1 stack test	N/A	N/A	28.80	0.29	126	1.26
							10.80	PM10	0.03	Conservatively assuming PM10 = PM	N/A	N/A	28.80	0.29	126	1.26
							10.80	PM2.5	0.03	Conservatively assuming PM2.5 = PM	N/A	N/A	28.80	0.29	126	1.26

Section N.2: Stack Information

UTM Zone: 16

Stack ID	Identify all Emission Units (with Process ID) and Control Devices that Feed to Stack	Stack Physical Data			Stack UTM Coordinates		Stack Gas Stream Data		
		Equivalent Diameter *(ft)*	Height *(ft)*	Base Elevation *(ft)*	Northing *(m)*	Easting *(m)*	Flowrate *(acfm)*	Temperature *(° F)*	Exit Velocity *(ft/sec)*
Not Applicable for this Application									

Section N.3: Fugitive Information

UTM Zone:

Emission Unit #	Emission Unit Name	Process ID	Area Physical Data		Area UTM Coordinates		Area Release Data	
			Length of the X Side *(ft)*	Length of the Y Side *(ft)*	Northing *(m)*	Easting *(m)*	Release Temperature *(°F)*	Release Height *(ft)*
Not Applicable for this Application								

Section N.4: Notes, Comments, and Explanations

The G5 Process emission factors reflect "post-control" emissions as the stack test was conducted at the egress point of the CAMCORP Baghouse.

Division for Air Quality

300 Sower Boulevard

Frankfort, KY 40601

(502) 564-3999

DEP7007V

Applicable Requirements and Compliance Activities

___ Section V.1: Emission and Operating Limitation(s)

___ Section V.2: Monitoring Requirements

___ Section V.3: Recordkeeping Requiremer

___ Section V.4: Reporting Requirements

___ Section V.5: Testing Requirements

___ Section V.6: Notes, Comments, and Explanations

Additional Documentation

___ Complete DEP7007AI

Source Name: Kentucky Cooperage

KY EIS (AFS) #: 21- 155-00001

Permit #: F-20-032 R1

Agency Interest (AI) ID: 2899

Date: 11/14/2025

Section V.1: Emission and Operating Limitation(s)

Emission Unit #	Emission Unit Description	Applicable Regulation or Requirement	Pollutant	Emission Limit (if applicable)	Voluntary Emission Limit or Exemption (if applicable)	Operating Requirement or Limitation (if applicable)	Method of Determining Compliance with the Emission and Operating Requirement(s)
All	Site-Wide	401 KAR 52:030, Section 10	NO_X		100 tons/rolling 12-month period	Site-wide non-fugitive NO_X limit requested to preclude applicability of Title V permitting requirements under 401 KAR 52:020.	Calculate and record 12-month rolling emissions of NO_X from all non-fugitive sources at KYC.

Section V.2: Monitoring Requirements

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Monitored	Description of Monitoring
No updates as part of this application.					

Section V.3: Recordkeeping Requirements

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Recorded	Description of Recordkeeping
No updates as part of this application.					

Section V.4: Reporting Requirements

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Reported	Description of Reporting
No updates as part of this application.					

Section V.5: Testing Requirements

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Tested	Description of Testing
No updates as part of this application.					

Section V.6: Notes, Comments, and Explanations

These DEP7007V-series forms request a voluntary limit on site-wide non-fugitive NO_X emissions to preclude the applicability of the requirements of 401 KAR 52:020 for major sources under the Title V permitting program. While the regulatory threshold is 100 tons per year (as represented in the V.1 form), KYC understands that KDAQ includes a 10% compliance margin such that the actual permit limit will be 90 tons per year.

APPENDIX B. DETAILED EMISSION CALCULATIONS

Appendix B-1. Revised Facility Wide Potential to Emit Summary

Table 2-1 summarizes site-wide emissions reflecting current operations at the KYC Lebanon facility.

Table B-1 Facility Wide Potential to Emit Summary

Equipment ID	Emission Unit Description	KyEIS Process ID	KyEIS Process Desc	Units Description	Maximum Design Capacity (SCC Units/hr)		Control Efficiency	Controlled Emissions[1,2,3] PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NO_X (tpy)	CO (tpy)	VOC (tpy)	SO_X (tpy)	HAPS (tpy)
AREA1, EU-15	(EU-15) Paved and Unpaved Roads Construction Commenced:	01	Paved Into Plant	Miles Vehicle Travelled	0.119	VMT	None	7.81	1.42	0.35	-	-	-	-	-
AREA1, EU-15	(EU-15) Paved and Unpaved Roads Construction Commenced:	02	Paved into Predryers	Miles Vehicle Travelled	0.172	VMT	None	8.49	1.70	0.42	-	-	-	-	-
AREA1, EU-15	(EU-15) Paved and Unpaved Roads Construction Commenced:	03	Paved from Predryers	Miles Vehicle Travelled	0.087	VMT	None	4.29	0.86	0.21	-	-	-	-	-
AREA1, EU-15	(EU-15) Paved and Unpaved Roads Construction Commenced:	04	Paved to Dry Storage	Miles Vehicle Travelled	0.336	VMT	None	16.63	3.33	0.81	-	-	-	-	-
AREA1, EU-15	(EU-15) Paved and Unpaved Roads Construction Commenced:	05	Paved Waste Wood Out	Miles Vehicle Travelled	0.048	VMT	None	3.17	0.63	0.15	-	-	-	-	-
AREA1, EU-15	(EU-15) Paved and Unpaved Roads Construction Commenced:	06	Paved Barrels Out	Miles Vehicle Travelled	0.042	VMT	None	2.61	0.52	0.13	-	-	-	-	-
AREA1, EU-15	(EU-15) Paved and Unpaved Roads Construction Commenced:	07	Paved to Dry Storage	Miles Vehicle Travelled	0.025	VMT	None	0.98	0.20	0.05	-	-	-	-	-
AREA1, EU-15	(EU-15) Paved and Unpaved Roads Construction Commenced:	08	Paved to Secondary Storage	Miles Vehicle Travelled	0.009	VMT	None	0.22	0.04	0.01	-	-	-	-	-
AREA1, EU-15	(EU-15) Paved and Unpaved Roads Construction Commenced:	09	Unpaved to Secondary Storage	Miles Vehicle Travelled	0.003	VMT	None	0.05	0.01	1.36E-03	-	-	-	-	-
AREA1, EU-15	(EU-15) Paved and Unpaved Roads Construction Commenced:	10	Unpaved from Secondary Storage	Miles Vehicle Travelled	0.003	VMT	None	-	-	-	-	-	-	-	-
AREA1, EU-15	(EU-15) Paved and Unpaved Roads Construction Commenced:	11	Paved from Secondary Storage	Miles Vehicle Travelled	0.003	VMT	None	0.06	0.01	3.02E-03	-	-	-	-	-
COMB1,EU 001	(EU01/02) 2 Wood Fired Indirect Heat Exchanges	01	Wood Burned, Boiler #1	Ton Wood/Bark Burned	0.799	Ton Wood/Bark Burned	None	21.55	19.38	16.69	26.41	32.32	0.91	1.36	-
COMB1,EU 001	(EU01/02) 2 Wood Fired Indirect Heat Exchanges	02	Wood Burned, Boiler #2	Ton Wood/Bark Burned	0.799	Ton Wood/Bark Burned	None	21.55	19.38	16.69	26.41	32.32	0.91	1.36	-
COMB3,EU 005	(EU-05) Dry Chamber Maximum Capacity: 32 MMBtu/hr	01	Natural Gas Usage	Million Cubic Feet Natural Gas Burned	0.021	MMscf	None	0.72	0.72	0.72	9.41	7.91	0.52	0.06	-
COMB4,EU-14	EU-14 Kilns (4) and Dryers Construction Commenced:	01	Kiln	1000 Board Feet Material Produced	2.920	1000 BF	None	-	-	-	-	-	2.90	-	-
COMB5,16	Natural Gas Boiler, 21.0 MMBtu/hr 500 hp Model: Johnson Boiler,	01	Natural Gas	Million Cubic Feet Natural Gas Burned	0.021	Mscf	None	0.69	0.69	0.69	9.02	7.58	0.50	0.05	-

Table B-1 Facility Wide Potential to Emit Summary

Equipment ID	Emission Unit Description	KyEIS Process ID	KyEIS Process Desc	Units Description	Maximum Design Capacity (SCC Units/hr)		Control Efficiency	Controlled Emissions[1,2,3] PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NO_X (tpy)	CO (tpy)	VOC (tpy)	SO_X (tpy)	HAPS (tpy)
EQPT1,EU 003	(EU-03A) Stave Processes Maximum Overall Design Rate: 2 Tons/hr	03	Stave Rip Saws -2	Tons Logs Processed	2.000	Ton Logs	PM / PM10: 99% PM2.5: 95%	0.38	0.18	0.07	-	-	-	-	-
EQPT2,EU 004	(EU-04) Sanding Processes Maximum Overall Design	01	Barrel Sander	Tons Logs Processed	6.700	Ton Logs	PM / PM10: 99% PM2.5: 95%	1.76	0.88	0.33	-	-	-	-	-
EQPT2,EU 004	(EU-04) Sanding Processes Maximum Overall Design	02	Head Sander	Tons Logs Processed	3.400	Ton Logs	PM / PM10: 99% PM2.5: 95%	0.89	0.45	0.17	-	-	-	-	-
EQPT2,EU 004	(EU-04) Sanding Processes Maximum Overall Design	03	Crozier (Router)	Tons Logs Processed	6.700	Ton Logs	PM / PM10: 99% PM2.5: 95%	1.26	0.62	0.23	-	-	-	-	-
EQPT3,EU 007	(EU-07) Silos Maximum Overall Design Rate: 5.3 ton/hr	01	Silo 1	Tons Wood Waste Processed	5.300	Ton Wood Waste	PM / PM10: 99% PM2.5: 95%	0.46	0.23	0.09	-	-	-	-	-
EQPT3,EU 007	(EU-07) Silos Maximum Overall Design Rate: 5.3 ton/hr	02	Silo 2	Tons Wood Waste Processed	5.300	Ton Wood Waste	PM / PM10: 99% PM2.5: 95%	0.46	0.23	0.09	-	-	-	-	-
EQPT4,EU 011	(EU-11) Head Charring Maximum Rated Capacity: 4.6 MMBtu/hr	01	Wood	Tons Material Processed	0.00	Tons Wood	None	-	-	-	-	-	-	-	-
EQPT4,EU 011	(EU-11) Head Charring Maximum Rated Capacity: 4.6 MMBtu/hr	02	Charred Wood	Heads Processed	0.30	Tons Wood Charred	None	2.10	2.10	2.10	9.87	6.26	0.34	0.50	0.76
EQPT4,EU 011	**(EU-11) Head Charring Maximum Rated Capacity: 4.6 MMBtu/hr**	**03**	**Natural Gas (1.05 MMBtu/hr)**	**Heads Processed**	**0.0010**	**MMscf**	**None**	**-**	**-**	**-**	**0.45**	**-**	**0.02**	**2.71E-03**	**3.38E-04**
EQPT5,EU 012	(EU-012) Stave Char Wood Capacity: 7.02 MMBtu/hr	01	Wood Burned	Tons Material Processed		Tons Wood	None	-	-	-	-	-	-	-	-
EQPT5,EU 012	(EU-012) Stave Char Wood Capacity: 7.02 MMBtu/hr	02	Natural Gas (6.0 MMBtu/hr)	Million Cubic Feet Natural Gas Burned	0.0059	MMscf	None	-	-	-	2.58	-	0.14	0.02	1.93E-03
EQPT5,EU 012	(EU-012) Stave Char Wood Capacity: 7.02 MMBtu/hr	03	Charred Wood	Barrels Processed	0.47	Tons Wood Charred	None	**3.29**	**3.29**	**3.29**	15.45	**9.80**	0.54	0.79	1.19
EQPT6,EU-03B	(EU-03B) Stave Processes New Equipment Maximum Overall Design	01	Stave Planers - 2	Tons Logs Processed	9.800	Tons Logs	PM / PM10: 99% PM2.5: 95%	1.85	0.90	0.33	-	-	-	-	-
EQPT6,EU-03B	(EU-03B) Stave Processes New Equipment Maximum Overall Design	02	Rough Joint Machine	Tons Logs Processed	0.620	Tons Logs	PM / PM10: 99% PM2.5: 95%	0.12	0.06	0.02	-	-	-	-	-
EQPT7,EU-03D	(EU-03G) Heading Processes New Equipment	06	Heading Jointers	Tons Logs Processed	4.28	Tons Logs	PM / PM10: 99% PM2.5: 95%	0.81	0.39	0.15	-	-	-	-	-
EQPT7,EU-03D	(EU-03G) Heading Processes New Equipment	07	Heading Rounders	Tons Logs Processed	4.28	Tons Logs	PM / PM10: 99% PM2.5: 95%	0.81	0.39	0.15	-	-	-	-	-
EQPT7,EU-03C	(EU-03C) Heading Processes Old Equipment Maximum Overall Design	03	Heading Rip Saws -2	Tons Logs Processed	2.000	Tons Logs	PM / PM10: 99% PM2.5: 95%	0.38	0.18	0.07	-	-	-	-	-
EQPT8,EU-03D	(EU-03D) Heading Processes New Equipment Maximum Overall Design	01	Heading Planers	Tons Logs Processed	4.28	Tons Logs	PM / PM10: 99% PM2.5: 95%	0.81	0.39	0.15	-	-	-	-	-
EQPT8,EU-03D	(EU-03D) Heading Processes New Equipment Maximum Overall Design	02	Heading Molders -4	Tons Logs Processed	4.280	Tons Logs	PM / PM10: 99% PM2.5: 95%	0.81	0.39	0.15	-	-	-	-	-
EQPT8,EU-03D	(EU-03D) Heading Processes New Equipment Maximum Overall Design	03	Heading Hog	Tons Logs Processed	3.000	Tons Logs	PM / PM10: 99% PM2.5: 95%	0.57	0.28	0.10	-	-	-	-	-

Table B-1 Facility Wide Potential to Emit Summary

Equipment ID	Emission Unit Description	KyEIS Process ID	KyEIS Process Desc	Units Description	Maximum Design Capacity (SCC Units/hr)	Control Efficiency	Controlled Emissions[1,2,3] PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NO_X (tpy)	CO (tpy)	VOC (tpy)	SO_X (tpy)	HAPS (tpy)
EQPT8,EU-03D	(EU-03D) Heading Processes New Equipment Maximum Overall Design	04	Heading Chop Saws -2	Tons Logs Processed	0.180 Tons Logs	PM / PM10: 99% PM2.5: 95%	0.03	0.02	6.13E-03	-	-	-	-	-
EQPT8,EU-03D	(EU-03D) Heading Processes New Equipment Maximum Overall Design	05	Grover -2	Tons Logs Processed	2.000 Tons Logs	PM / PM10: 99% PM2.5: 95%	0.38	0.18	0.07	-	-	-	-	-
EQPT9,EU-03E	(EU-03E) Dust Collection Old Equipment Maximum Overall Design	01	Wood Hog to Trailer Loadout	Tons Logs Processed	5.300 Tons Logs	PM / PM10: 99% PM2.5: 95%	0.46	0.23	0.09	-	-	-	-	-
EQPT9,EU-03E	(EU-03E) Dust Collection Old Equipment Maximum Overall Design	02	Wood Hog to Silos	Tons Logs Processed	5.300 Tons Logs	PM / PM10: 99% PM2.5: 95%	0.46	0.23	0.09	-	-	-	-	-
EQPT10,EU-03F	(EU-03F) Dust Collection New Equipment Maximum Overall Design	01	Enclosed Trailer Loadout	Tons Logs Processed	5.300 Tons Logs	PM / PM10: 99% PM2.5: 95%	0.46	0.23	0.09	-	-	-	-	-
EQPT11,13	G5 Process	01	Equalizer -2	Tons Material Processed	0 Tons Material	99.0%	-	-	-	-	-	-	-	-
EQPT11,13	G5 Process	02	Stave Planar -2	Tons Material Processed	0 Tons Material	99.0%	-	-	-	-	-	-	-	-
EQPT11,13	G5 Process	03	Stave G5 -24	Tons Logs Processed	0 Tons Logs	99.0%	-	-	-	-	-	-	-	-
EQPT11,13	G5 Process	04	Grinder -2	Tons Logs Processed	0 Tons Logs	99.0%	-	-	-	-	-	-	-	-
EQPT11,13	**G5 Process**	**05**	**Various**	**Tons Material Processed**	**10.8 Tons Material**	**99.0%**	**1.26**	**1.26**	**1.26**	**-**	**-**	**-**	**-**	**-**
Total Potential Emissions							**108.6**	**62.0**	**46.0**	**99.6**	**96.2**	**6.8**	**4.1**	**2.0**
Total Non-Fugitive Emissions							**63.0**	**52.0**	**42.6**	**99.6**	**96.2**	**6.8**	**4.1**	**2.0**

[1] SOx is representative of SO2 emissions, these terms are used synonymously throughout this application.

[2] As demonstrated, the facility-wide non-fugitive PTE for CO and PM is less than 90 tons per year. As such, KYC requests that the facility-wide CO and PM emission limits be removed from the renewal permit.

[3] As demonstrated, the facility-wide non-fugitive PTE for NOx is greater than 90 tons per year.

B-2. Head and Stave Charring Operations (Natural Gas Burners) (EU-011-3 and EU-012-2)

> This section accounts for emissions from the combustion of natural gas as fuel for head (EU-011-3) and stave charring operations (EU-12-2). Pursuant to Section D of Permit F-20-032, upon completion of the performance test, the site shall use the new emission factor (in lbs/barrel) to calculate the CO emissions for EU-011 Head Char and CO and PM emissions for EU-012 Stave Char. These new emission factors are inclusive of CO and PM emissions from both natural gas fuel combustion, and the wood charring in each process. As such, the CO and PM emission factors for this unit are 0.

B-2.1 Head Charring (EU-011-3) Operations Natural Gas Burners Process Rate

Heat Content of Natrual Gas (HHV):	1,020	Btu/scf	AP-42 Appendix A
Head Charring (EU-011-3) Capacity:	**1.05**	**MMBtu/hr**	**Per burner specifications**
	0.0010	**MMscf/hr**	

B-2.2 Stave Charring (EU-012-2) Operations Natural Gas Burners Process Rate

Heat Content of Natrual Gas (HHV):	1,020	Btu/scf	AP-42 Appendix A
Barrel Charring (EU-012-2) Existing Capacity:	6.00	MMBtu/hr	Existing permitted rate
	0.0059	MMscf/hr	

B-2.3 Emission Calculation Methodology and Emission Factors

> Emission factors for both processes are based on emission factors in AP-42 Section 1.4 (07/98 Edition). Emission factors are in lb/MMscf as provided in AP-42 which corresponds to the applicable SCC designation. The CO emission factor from the 2024 Alliance Stack Test for wood head char accounts incorporates a conservative estimate for CO emissions from natural gas fuel combustion. As such, the CO emission factor is 0 lb/MMscf in this section.

Note that per Section D of permit F-19-021 R1, CWC must use the CO emission factor for charring operations of 0.35 lbs/barrel for both the Barrel Charring (EP-07) and Head Charring (EP-14) based on AI 2591, CMN20180001. Since the 0.35 lbs/barrel CO emission factor accounts for emissions from natural gas combustion and wood charring, through this permit action, the summary of CO potential emissions will be accounted for in the calculations tab for the wood combustion from the charring operations.

B-2.3.1 NOx/CO

Pollutant	Emission Factor (lb/MMscf)	Emission Factor Basis
NO_x	100	AP-42 Table 1.4-1
CO	--	2024 Alliance Stack Test, emissions counted in "Charring" EF

B-2.3.2 PM/PM10/PM2.5

Pollutant	Emission Factor (lb/MMscf)	Emission Factor Basis
PM	--	2024 Alliance Stack Test, emission counted in "Charring" EF
PM-Cond	--	2024 Alliance Stack Test, emission counted in "Charring" EF
PM-Filt	--	2024 Alliance Stack Test, emission counted in "Charring" EF

B-2.3.3 Criteria Pollutants and Greenhouse Gases

Pollutant	Emission Factor (lb/MMscf)	Emission Factor Basis
CO2	120,000	AP-42 Table 1.4-2
Lead	0.0005	AP-42 Table 1.4-2
N2O	2.2	AP-42 Table 1.4-2
SO2	0.6	AP-42 Table 1.4-2
TOC	11	AP-42 Table 1.4-2
Methane	2.3	AP-42 Table 1.4-2
VOC	5.5	AP-42 Table 1.4-2

B-2.3.3 HAP Emission Estimates

Pollutant	CAS #	HAP?	Emission Factor (lb/MMscf)	Emission Factor Basis
2-Methylnaphthalene	71-43-2	Y	2.40E-05	AP-42 Table 1.4-3
3-Methylcholanthrene	56-49-5	Y	1.80E-06	AP-42 Table 1.4-3
7,12-Dimethylbenz(a)anthracene		Y	1.60E-05	AP-42 Table 1.4-3
Acenaphthene	83-32-9	Y	1.80E-06	AP-42 Table 1.4-3
Acenaphthylene	203-96-8	Y	1.80E-06	AP-42 Table 1.4-3
Anthracene	120-12-7	Y	2.40E-06	AP-42 Table 1.4-3
Benz(a)anthracene	56-55-3	Y	1.80E-06	AP-42 Table 1.4-3
Benzene	71-43-2	Y	2.10E-03	AP-42 Table 1.4-3
Benzo(a)pyrene	50-32-8	Y	1.20E-06	AP-42 Table 1.4-3
Benzo(b)fluoranthene	205-99-2	Y	1.80E-06	AP-42 Table 1.4-3
Benzo(g,h,i)perylene	191-24-2	Y	1.20E-06	AP-42 Table 1.4-3
Benzo(k)fluoranthene	207-08-9	Y	1.80E-06	AP-42 Table 1.4-3
Butane	106-97-8	N	2.10	AP-42 Table 1.4-3
Chrysene	218-01-9	Y	1.80E-06	AP-42 Table 1.4-3
Dibenzo(a,h)anthracene	53-70-3	Y	1.20E-06	AP-42 Table 1.4-3
Dichlorobenzene	25321-22-6	Y	1.20E-03	AP-42 Table 1.4-3
Ethane	74-84-0	N	3.10	AP-42 Table 1.4-3
Fluoranthene	206-44-0	Y	3.00E-06	AP-42 Table 1.4-3
Fluorene	86-73-7	Y	2.80E-06	AP-42 Table 1.4-3
Formaldehyde	50-00-0	Y	0.075	AP-42 Table 1.4-3
Hexane	110-54-3	Y	1.80	AP-42 Table 1.4-3
Indeno(1,2,3-cd)pyrene	193-39-5	Y	1.80E-06	AP-42 Table 1.4-3
Naphthalene	91-20-3	Y	6.10E-04	AP-42 Table 1.4-3
Pentane	109-66-0	N	2.60	AP-42 Table 1.4-3
Phenanathrene	85-01-8	Y	1.75E-05	AP-42 Table 1.4-3
Propane	74-98-6	N	1.60	AP-42 Table 1.4-3
Pyrene	129-00-0	Y	5.00E-06	AP-42 Table 1.4-3
Toluene	108-88-3	Y	3.40E-03	AP-42 Table 1.4-3
Combined HAP:			11.28	

B-2.4 Potential Emissions for Head Char Natural Gas Usage (EU-011-3)

Pollutant[1,2]	Emission Factor (lb/SCC)	Hourly Emissions (lb/hr)	Annual Emissions (tpy)	Emission Factor Basis
NOX	100.00	0.10	0.45	AP-42 Table 1.4-1
CO	--	--	--	2024 Alliance Stack Test, emissions counted in "Charring" EF
CO2	120,000	123.53	541.06	AP-42 Table 1.4-2
Lead	5.00E-04	5.15E-07	2.25E-06	AP-42 Table 1.4-2
N2O	2.2	2.26E-03	0.010	AP-42 Table 1.4-2
PM	--	--	--	2024 Alliance Stack Test, emission counted in "Charring" EF
PM10	--	--	--	2024 Alliance Stack Test, emission counted in "Charring" EF
PM2.5	--	--	--	2024 Alliance Stack Test, emission counted in "Charring" EF
SOX	0.6	6.18E-04	2.71E-03	AP-42 Table 1.4-2
Methane	2.3	2.37E-03	0.010	AP-42 Table 1.4-2
VOC	5.5	5.66E-03	0.025	AP-42 Table 1.4-2
Total HAPs	0.075	7.72E-05	3.38E-04	AP-42 Table 1.4-3
Formaldehyde	0.075	7.72E-05	3.38E-04	AP-42 Table 1.4-3

[1] Factor for PM10/PM2.5 is conservatively assumed as the factor for PM.

[2] CO and emissions are accounted for in the wood charring emissions (EU-011-2).

B-2.5 Potential Emissions for Stave Char Natural Gas Usage (EU-012-2)

Pollutant[1,2]	Emission Factor (lb/SCC)	Hourly Emissions (lb/hr)	Annual Emissions (tpy)	Emission Factor Basis
NOX	100.00	0.59	2.58	AP-42 Table 1.4-1
CO	--	--	--	2024 Alliance Stack Test, emissions counted in "Charring" EF
CO2	120,000	705.88	3,091.76	AP-42 Table 1.4-2
Lead	5.00E-04	2.94E-06	1.29E-05	AP-42 Table 1.4-2
N2O	2.2	1.29E-02	0.057	AP-42 Table 1.4-2
PM	--	--	--	2024 Alliance Stack Test, emission counted in "Charring" EF
PM10	--	--	--	2024 Alliance Stack Test, emission counted in "Charring" EF
PM2.5	--	--	--	2024 Alliance Stack Test, emission counted in "Charring" EF
SOX	0.6	3.53E-03	1.55E-02	AP-42 Table 1.4-2
Methane	2.3	1.35E-02	0.059	AP-42 Table 1.4-2
VOC	5.5	3.24E-02	0.142	AP-42 Table 1.4-2
Total HAPs	0.075	4.41E-04	1.93E-03	AP-42 Table 1.4-3
Formaldehyde	0.075	4.41E-04	1.93E-03	AP-42 Table 1.4-3

[1] Factor for PM10/PM2.5 is conservatively assumed as the factor for PM.

[2] CO and PM/PM10/PM2.5 emissions are accounted for in the wood charring emissions (EU-012-3).

B-3. Head and Barrel Charring Operations (EU-011-2 and EU-012-3)

> KYC has updated emission factors for the Barrel Charring (EU-12-03) and Head Charring (EU-011-2) Process ID's following the 2024 Alliance Stack Test. The impacts to the PTE from the wood combustion from charring operations are summarized below.

B-3.1 Rated Capacities

B-3.1.1 Charring Operations Maximum Design Capacity

Head Charring (EU-011-02) Throughput Capacity:	**500**	heads/hr
Barrel Charring (EU-012-03) Throughput Capacity:	**250**	barrels/hr

Mass of barrel:	90.0	lbs/bbl	Based on internal sampling and analysis from stack test
Mass of (1) head:	9.0	lbs/head	Based on internal sampling and analysis from stack test
Total Wood Throughput (Head Charring)	2.25	tons/hr	
Total Wood Throughput (Barrel Charring)	11.25	tons/hr	

> Since not all wood is combusted from the heads and staves that pass through this process, a char fraction is added to account for combustion of *only* the wood that is chared on the outer layer of the heads and staves.

Head Charring (EU-011-02) Charring Fraction:	13.28%	Based on internal sampling and analysis from other ISC sites
Barrel Charring (EU-012-03) Charring Fraction:	4.16%	Based on internal sampling and analysis from other ISC sites

Total Charred Wood Throughput (Head Charring)	**0.30**	tons/hr
Total Charred Wood Throughput (Barrel Charring)	**0.47**	tons/hr

B-3.1.2 Wood Combustion Fuel Data

Wood HHV at 11% moisture content:	15.40	MMBtu/ton

B-3.2 Wood Combustion Emission Calculation Methodology and Emission Factors

> Emission factors are based on emission factors in AP-42 Section 1.6 (09/03 Edition) and on stack testing performed by Alliance from 4/30-5/2 2024. Emission factors are converted from lb/MMBtu as provided in AP-42 to lb/barrels or lb/heads as applicable to the SCC designation per Section D of Permit F-20-032 R1.

B-3.2.1 PM/PM10/PM2.5

Pollutant	Emission Factor EU-012 (lb/barrel)[1]	Emission Factor EU-012 (lb/ton wood charred)	Emission Factor EU-011 (lb/ton wood charred)	Emission Factor Basis
PM-Total:	**0.0030**	**1.60**	**1.60**	2024 Alliance Stack Test
PM_{10}-Total:	**0.0030**	**1.60**	**1.60**	2024 Alliance Stack Test
$PM_{2.5}$-Total:	**0.0030**	**1.60**	**1.60**	2024 Alliance Stack Test

[1] PM10 and PM2.5 is equal to PM for conservatism.

[2] Emission factor units are in lb/ton wood charred

B-3.2.2 NOx/SO2

Pollutant	Uncontrolled Emission Factor (lb/MMBtu)	Uncontrolled Emission Factor (lb/ton wood charred)	Emission Factor (lb/head)	Emission Factor (lb/barrel)	Emission Factor Basis
NO_x	0.49	**7.55**	0.0045	0.0141	AP-42 Table 1.6-1
SO_2	0.025	**0.39**	0.0002	0.0007	AP-42 Table 1.6-1
	0.6	**9.24**			

B-3.2.3 CO

Barrel Char CO EF (EU-012-03)[1]:	**0.0089**	lb CO/bbl	= 1 / (215 barrels/hr * 8760 hr/yr / 8.42 tons CO/year / 2000 lb CO/ton)
	4.784	lb/ton wood char	= 8.95E-03 lb CO/bbl / 90.00 lbs/bbl X 4.16% lb/wood charred per lb/wood throughput X 2,000 lbs/ton
Head Char CO EF (EU-011-02)[1,2]:	**4.784**	lb/ton wood char	= 8.95E-03 lb CO/bbl / 90.00 lbs/bbl X 4.16% lb/wood charred per lb/wood throughput X 2,000 lbs/ton

[1] Emission factors were back-calculated from annual emission rates determined in the 2024 Alliance Stack Test. The 2024 Allicance Stack Test operated at an average of 228 heads per hour, this value exceeds the maximum capacity of the head char unit but is not sustainable over the course of a year.

[2] Emission factors for Barrel Char are used for Head Char to reflect the modified natural gas fuel configuration.

B-3.2.4 TOC/VOC/N2O/CO2

Pollutant	Uncontrolled Emission Factor (lb/MMBtu)	Uncontrolled Emission Factor (lb/ton wood charred)	Emission Factor (lb/head)	Emission Factor (lb/barrel)	Emission Factor Basis
VOC	0.017	**0.262**	0.0002	0.0005	AP-42 Table 1.6-3
N2O	0.013	**0.20**	0.0001	0.0004	AP-42 Table 1.6-3
CO2	195	**3,003**	1.7941	5.6160	AP-42 Table 1.6-3

B-3.2.5 HAP Emission Estimates

Pollutant	Uncontrolled Emission Factor (lb/MMBtu)	Uncontrolled Emission Factor (lb/ton wood charred)	Emission Factor (lb/head)	Emission Factor (lb/barrel)	Emission Factor Basis
Total HAPs	0.038	**0.58**	3.48E-04	1.09E-03	AP-42 Table 1.6-3; AP-42 Table 1.6-4
Formaldehyde	4.40E-03	**0.068**	4.05E-05	1.27E-04	AP-42 Table 1.6-3
HCl	0.019	**0.29**	1.75E-04	5.47E-04	AP-42 Table 1.6-3
Benzene	4.20E-03	**0.065**	3.86E-05	1.21E-04	AP-42 Table 1.6-3
Lead	4.80E-05	**7.39E-04**	4.42E-07	1.38E-06	AP-42 Table 1.6-4

B-3.3 Summary of Potential Emissions

B-3.3.1 Potential Emissions for Head Charring (EU-011-02)

Pollutant	Uncontrolled Emission Factor (lb/ton wood charred)	Annual Uncontrolled Emissions (lb/hr)	Annual Uncontrolled Emissions (tpy)	Emission Factor Basis
NO_X	7.55	2.25	9.87	AP-42 Table 1.6-1
SO_X	0.39	0.12	0.50	AP-42 Table 1.6-1
CO	**4.78**	**1.43**	**6.26**	**2024 Alliance Stack Test**
PM	**1.60**	**0.48**	**2.10**	**2024 Alliance Stack Test**
PM10	**1.60**	**0.48**	**2.10**	**2024 Alliance Stack Test**
PM2.5	**1.60**	**0.48**	**2.10**	**2024 Alliance Stack Test**
VOC	0.26	0.08	0.34	AP-42 Table 1.6-3
N2O	0.20	0.06	0.26	AP-42 Table 1.6-3
CO2	3003	897	3,929	AP-42 Table 1.6-3
Total HAPs	0.58	0.17	0.76	AP-42 Table 1.6-3; AP-42 Table 1.6-4
Formaldehyde	0.07	0.02	0.09	AP-42 Table 1.6-3
HCl	0.29	0.09	0.38	AP-42 Table 1.6-3
Benzene	0.06	0.02	0.08	AP-42 Table 1.6-3
Lead	7.4E-04	2.2E-04	9.67E-04	AP-42 Table 1.6-4

B-3.4 Summary of Potential Emissions

B-3.4.1 Potential Emissions for Barrel Charring (EU-012-03)

Pollutant	Uncontrolled Emission Factor (lb/ton wood charred)	Annual Uncontrolled Emissions (lb/hr)	Annual Uncontrolled Emissions (tpy)	Emission Factor Basis
NO_X	7.55	3.53	15.45	AP-42 Table 1.6-1
SO_X	0.39	0.18	0.79	AP-42 Table 1.6-1
CO	**4.78**	**2.24**	**9.80**	**2024 Alliance Stack Test**
PM	**1.60**	**0.75**	**3.29**	**2024 Alliance Stack Test**
PM10	**1.60**	**0.75**	**3.29**	**2024 Alliance Stack Test**
PM2.5	**1.60**	**0.75**	**3.29**	**2024 Alliance Stack Test**
VOC	0.26	0.12	0.54	AP-42 Table 1.6-3
N2O	0.20	0.09	0.41	AP-42 Table 1.6-3
CO2	3003	1,404	6,150	AP-42 Table 1.6-3
Total HAPs	0.58	0.27	1.19	AP-42 Table 1.6-3; AP-42 Table 1.6-4
Formaldehyde	0.07	0.03	0.14	AP-42 Table 1.6-3
HCl	0.29	0.14	0.60	AP-42 Table 1.6-3
Benzene	0.06	0.03	0.13	AP-42 Table 1.6-3
Lead	7.4E-04	3.5E-04	1.51E-03	AP-42 Table 1.6-4

B-4. G5 Processes - EU 13 Emission Calculations

> Emission calculations for G5 Processes incorporating the emission factors determined from the 2024 Allicance Stack Testing are presented in this section. All processes in this section route to the same CAMCORP Baghouse. As such, emissions from the various processes within the G5 Stave have been grouped into this emission unit with one emission factor.

B-4.1 G5 Processes - Throughput Rates

Process Rates and Descriptions:

Total G5 Throughput: 10.80 tons/hr

B-4.2 Emission Calculation Methodology and Emission Factors

> Pursuant to Permit F-20-032 R1 Section 3 for the G5 Processes units, performance testing must be conducted to establish a PM emission factor for the G5 Process. As such, revised emission factors following stack testing conducted by Alliance on 4/30-5/2 2024, have been included. These emission factors reflect "post-control" emissions as the stack test was conducted at the egress point of the CAMCORP Baghouse.

B-4.2.1 Revised PM Emission Factors

Emission factor for PM:	0.0267	lb/ton	= (1.20E-03 lb PM / bbl produced) / 90.0 lbs/bbl * 2,000 lbs/ton
Emission factor for PM10:	0.0267	lb/ton	Conservatively assuming PM10 = PM
Emission factor for PM2.5:	0.0267	lb/ton	Conservatively assuming PM2.5 = PM

B-4.3 Emission Calculation Control Efficiencies

B-4.3.1 Revised Control Efficiency Emission Factors

Control Efficiency for PM:	99.0%	Assumed Baghouse Control Efficiency

B-4.4 Summary of Potential Post Replacement Emissions

B-4.4.1 Comprehensive Potential Emissions for G5 Processes (EU-13)

Pollutant	Controlled Emission Factor (lb/ton)	Uncontrolled Emission Factor (lb/ton)	Controlled Hourly Emissions (lb/hr)	**Controlled Annual Emissions (tpy)**	Uncontrolled Hourly Emissions (lb/hr)	Uncontrolled Annual Emissions (tpy)	Emission Factor Basis
PM	0.03	2.67	0.29	**1.26**	28.8	126	Alliance 4/30-5/1 stack test
PM10	0.03	2.67	0.29	**1.26**	28.8	126	Conservatively assuming PM10 = PM
PM2.5	0.03	2.67	0.29	**1.26**	28.8	126	Conservatively assuming PM2.5 = PM

APPENDIX C. STACK TEST DOCUMENTATION

Source Test Report

Kentucky Cooperage
712 Main Street
Lebanon, KY 40033
AI No. 2899

Source Tested: Heading Char (EU-011), Stave Char (EU-012) and G5 Processing (EU-013)
Test Date: April 30 – May 2, 2024

Project No. AST-2024-1515

Prepared By
Alliance Technical Group, LLC
214 Central Circle SW
Decatur, AL 35603

Regulatory Information

Permit No.	KDAQ Permit No. F-20-032
AI No.	2899

Source Information

Source Name	*Source ID*	*Target Parameters*
Heading Char	EU-011	CO
Stave Char	EU-012	PM, CO
G5 Process	EU-013	PM

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Alliance Technical Group, LLC (Alliance) has completed the source testing as described in this report. Results apply only to the source(s) tested and operating condition(s) for the specific test date(s) and time(s) identified within this report. All results are intended to be considered in their entirety, and Alliance is not responsible for use of less than the complete test report without written consent. This report shall not be reproduced in full or in part without written approval from the customer.

To the best of my knowledge and abilities, all information, facts and test data are correct. Data presented in this report has been checked for completeness and is accurate, error-free and legible. Onsite testing was conducted in accordance with approved internal Standard Operating Procedures. Any deviations or problems are detailed in the relevant sections in the test report.

This report is only considered valid once an authorized representative of Alliance has signed in the space provided below; any other version is considered draft. This document was prepared in portable document format (.pdf) and contains pages as identified in the bottom footer of this document.

Andy Roth, QSTI **Alliance Technical Group, LLC**	Date

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APPENDICES

Introduction

1.0 Introduction

Alliance Technical Group, LLC (Alliance) was retained by Kentucky Cooperage to conduct compliance testing at the Lebanon, Kentucky facility. The facility operates under Kentucky Department of Air Quality (KDAQ) Permit No. F-20-032. Testing was conducted to determine the emission rates of particulate matter from the exhaust of the Stave Char (EU-012) and G5 Process (EU-013). Testing was also conducted to determine the emission rates of carbon monoxide from the exhaust of the Heading Char (EU-011) and EU-012.

1.1 Project Team

Personnel involved in this project are identified in the following table.

Table 1-1: Project Team

Facility Personnel	John Mealey
Alliance Personnel	Nicholas Cornelius Austin Feinstein Norton Geisler Matthias Terpstra

1.2 Test Protocol & Notification

Testing was conducted in accordance with the test protocol submitted to KDAQ on February 29, 2024.

1.3 Test Program Notes

The post leak check after Run 1 of PM testing on EU-012 and Run 3 of PM testing on EU-013 failed and an additional run was conducted with no further issues. The voided run data has been placed in Appendix F.

Summary of Results

2.0 Summary of Results

Alliance conducted compliance testing at the Kentucky Cooperage facility in Lebanon, Kentucky on April 30 – May 2, 2024. Testing consisted of determining the emission rates of particulate matter (PM) from the exhaust of EU-012 and EU-013. Testing also consisted of determining the emission rates of carbon monoxide (CO) from the exhaust of EU-011 and EU-012.

Per the facility operating permit, the limit for PM emissions is determined from one (1) of the following equations:

If $P \leq 0.50$ ton/hr, Then $E = 2.34$ or *If $0.50 < P < 30$ ton/hr, Then $E = (3.59)(P)^{0.62}$*

where, E = emission rate limit, lb/hr
P = process throughput rate, ton/hr

Tables 2-1 through 2-3 provide summaries of the emission testing results with comparisons to the applicable KDAQ permit limits. Any difference between the summary results listed in the following tables and the detailed results contained in appendices is due to rounding for presentation.

Table 2-1: Summary of Heading Char Results (EU-011)

Run Number	Run 1	Run 2	Run 3	Average
Date	**5/2/24**	**5/2/24**	**5/2/24**	**--**
Carbon Monoxide Data				
Concentration, ppmvd	682.6	690.9	624.4	666.0
Emission Rate, ton/yr	58.4	59.0	53.3	56.9

Table 2-2: Summary of Stave Char Results (EU-012)

Run Number	Run 1 [1]	Run 2	Run 3	Run 4	Average
Date	**5/1/24**	**5/1/24**	**5/1/24**	**5/1/24**	**--**
Particulate Matter Data					
Filterable PM Emission Rate, lb/hr	--	0.29	0.22	0.29	0.26
KDAQ Limit, lb/hr	--	--	--	--	2.34
Percent of Limit, %	--	--	--	--	**11**
Filterable PM Emission Factor, lb/barrel produced	--	1.4E-03	1.0E-03	1.3E-03	1.2E-03
Condensable PM Emission Factor, lb/barrel produced	--	2.3E-03	1.8E-03	1.1E-03	1.8E-03
Total PM Emission Factor, lb/barrel produced	--	3.7E-03	2.8E-03	2.4E-03	3.0E-03
Carbon Monoxide Data					
Concentration, ppmvd	--	101.0	109.0	106.4	105.4
Emission Rate, ton/yr	--	8.20	8.55	8.49	8.42

[1] During PM testing, the post leak check failed after Run 1 and this run was voided. The voided data has been placed in Appendix F.

Table 2-3: Summary of G5 Process Results (EU-013)

Run Number	Run 1	Run 2	Run 3 [1]	Run 4	Average
Date	**4/30/24**	**4/30/24**	**4/30/24**	**5/1/24**	**--**
Particulate Matter Data					
Filterable PM Emission Rate, lb/hr	0.33	0.23	--	0.27	0.28
KDAQ Limit, lb/hr	--	--	--	--	2.34
Percent of Limit, %	--	--	--	--	**12**
Filterable PM Emission Factor, lb/barrel produced	1.5E-03	1.1E-03	--	8.9E-04	1.2E-03

[1] During PM testing, the post leak check failed after Run 1 and this run was voided. The voided data has been placed in Appendix F.

Testing Methodology

3.0 Testing Methodology

The emission testing program was conducted in accordance with the test methods listed in Table 3-1. Method descriptions are provided below while quality assurance/quality control data is provided in Appendix D.

Table 3-1: Source Testing Methodology

Parameter	U.S. EPA Reference Test Methods	Notes/Remarks
Volumetric Flow Rate	1 & 2	Full Velocity Traverses
Oxygen/Carbon Dioxide	3A	Instrumental Analysis
Oxygen/Carbon Dioxide	3/3A	Integrated Bag / Instrumental Analysis
Moisture Content	4	Gravimetric Analysis
Particulate Matter	5	Isokinetic Sampling
Particulate Matter	5 / 202	Isokinetic Sampling
Carbon Monoxide	10	Instrumental Analysis
Gas Dilution System Certification	205	--

3.1 U.S. EPA Reference Test Methods 1 and 2 – Sampling/Traverse Points and Volumetric Flow Rate

The sampling location and number of traverse (sampling) points were selected in accordance with U.S. EPA Reference Test Method 1. To determine the minimum number of traverse points, the upstream and downstream distances were equated into equivalent diameters and compared to Figure 1-1 and Figure 1-2 in U.S. EPA Reference Test Method 1.

Full velocity traverses were conducted in accordance with U.S. EPA Reference Test Method 2 to determine the average stack gas velocity pressure, static pressure and temperature. The velocity and static pressure measurement system consisted of a pitot tube and inclined manometer. The stack gas temperature was measured with a K-type thermocouple and pyrometer.

3.2 U.S. EPA Reference Test Method 3A – Oxygen/Carbon Dioxide

The oxygen (O_2) and carbon dioxide (CO_2) testing was conducted in accordance with U.S. EPA Reference Test Method 3A. Data was collected online and reported in one-minute averages. The sampling system consisted of a stainless-steel probe, Teflon sample line(s), gas conditioning system and the identified gas analyzer. The gas conditioning system was a non-contact condenser used to remove moisture from the stack gas. If an unheated Teflon sample line was used, then a portable non-contact condenser was placed in the system directly after the probe. Otherwise, a heated Teflon sample line was used. The quality control measures are described in Section 3.8.

3.3 U.S. EPA Reference Test Method 3/3A – Oxygen/Carbon Dioxide

The oxygen (O_2) and carbon dioxide (CO_2) testing was conducted in accordance with U.S. EPA Reference Test Method 3/3A. One (1) integrated Tedlar bag sample was collected during each test run. The bag samples were analyzed on site with a gas analyzer. The remaining stack gas constituent was assumed to be nitrogen for the stack gas molecular weight determination. The quality control measures are described in Section 3.9.

3.4 U.S. EPA Reference Test Method 4 – Moisture Content

The stack gas moisture content (BWS) was determined in accordance with U.S. EPA Reference Test Method 4. The gas conditioning train consisted of a series of chilled impingers. Prior to testing, each impinger was filled with a known quantity of water or silica gel. Each impinger was analyzed gravimetrically before and after each test run on the same balance to determine the amount of moisture condensed.

3.5 U.S. EPA Reference Test Method 5 – Particulate Matter

The filterable particulate matter testing was conducted accordance with U.S. EPA Reference Test Method 5. The complete sampling system consisted of a stainless-steel nozzle, heated stainless steel-lined probe, pre-weighed heated quartz filter, gas conditioning train, pump and calibrated dry gas meter. The gas conditioning train consisted of four (4) chilled impingers – the first and second containing 100 mL of H_2O, an empty third impinger and the fourth containing 200-300 grams of silica gel. The probe liner and filter heating systems were maintained at a temperature of 120 ± 14°C (248 ±25°F) and the impinger temperature was maintained at 20°C (68°F) or less throughout the testing.

Following the completion of each test run, the sampling train was leak checked at a vacuum pressure greater than or equal to the highest vacuum pressure observed during the run, and the contents of the impingers were measured for moisture gain. The probe and nozzle were rinsed and brushed six (6) times with acetone to remove any adhering particulate matter. This rinse was recovered in container 2. The front half of the filter holder was rinsed three (3) times with acetone and this rinse was added to container 2. The pre-weighed quartz filter was carefully removed and placed in container 1. All containers were sealed, labeled and liquid levels marked for transport to the identified laboratory.

3.6 U.S. EPA Reference Test Methods 5 and 202 – Total Particulate Matter

The total particulate matter (filterable and condensable PM) testing was conducted in accordance with U.S. EPA Reference Test Methods 5 and 202. The complete sampling system consisted of a stainless steel nozzle, stainless steel-lined probe, pre-weighed quartz filter, coil condenser, un-weighed Teflon filter, gas conditioning train, pump and calibrated dry gas meter. The gas conditioning train consisted of a coiled condenser and five (5) chilled impingers. The first, and second impingers were initially empty, the third contained 100 mL of de-ionized water and the last impinger contained 200-300 grams of silica gel. The un-weighed 90 mm Teflon filter was placed between the second and third impingers. The probe liner heating system was maintained at a temperature of 248 ±25°F, and the impinger temperature was maintained at 68°F or less throughout testing. The temperature of the Teflon filter was maintained greater than 65°F but less than or equal to 85°F.

Following the completion of each test run, the sampling train was leak checked at a vacuum pressure greater than or equal to the highest vacuum pressure observed during the run. The nitrogen purge was omitted due to minimal condensate collected in the dry impingers. After the leak check the impinger contents were measured for moisture gain.

The pre-weighed quartz filter was carefully removed and placed in container 1. The probe, nozzle and front half of the filter holder were rinsed six (6) times with acetone to remove any adhering particulate matter and these rinses were recovered in container 2. All containers were sealed, labeled and liquid levels marked for transport to the identified laboratory for filterable particulate matter analysis.

The contents of impingers 1 and 2 were recovered in container CPM Cont. #1. The back half of the filterable PM filter holder, the coil condenser, impingers 1 and 2 and all connecting glassware were rinsed with DIUF water and

then rinsed with acetone, followed by hexane. The water rinses were added to container CPM Cont. #1 while the solvent rinses were recovered in container CPM Cont. #2. The Teflon filter was removed from the filter holder and placed in container CPM Cont. #3. The front half of the condensable PM filter holder was rinsed with DIUF water and then with acetone, followed by hexane. The water rinse was added to container CPM Cont. #1 while the solvent rinses were added to container CPM Cont. #2. All containers were sealed, labeled and liquid levels marked for transport to the identified laboratory for condensable particulate matter analysis.

3.7 U.S. EPA Reference Test Method 10 – Carbon Monoxide

The carbon monoxide (CO) testing was conducted in accordance with U.S. EPA Reference Test Method 10. Data was collected online and reported in one-minute averages. The sampling system consisted of a stainless-steel probe, Teflon sample line(s), gas conditioning system, and the identified analyzer. The gas conditioning system was a non-contact condenser used to remove moisture from the gas. If an unheated Teflon sample line was used, then a portable non-contact condenser was placed in the system directly after the probe. Otherwise, a heated Teflon sample line was used. The quality control measures are described in Section 3.8.

3.8 U.S. EPA Reference Test Method 205 – Gas Dilution System Certification

A calibration gas dilution system field check was conducted in accordance with U.S. EPA Reference Method 205. Multiple dilution rates and total gas flow rates were utilized to force the dilution system to perform two dilutions on each mass flow controller. The diluted calibration gases were sent directly to the analyzer, and the analyzer response recorded in an electronic field data sheet. The analyzer response agreed within 2% of the actual diluted gas concentration. A second Protocol 1 calibration gas, with a cylinder concentration within 10% of one of the gas divider settings described above, was introduced directly to the analyzer, and the analyzer response recorded in an electronic field data sheet. The cylinder concentration and the analyzer response agreed within 2%. These steps were repeated three (3) times. Copies of the Method 205 data can be found in the Quality Assurance/Quality Control Appendix.

3.9 Quality Assurance/Quality Control – U.S. EPA Reference Test Methods 3A and 10

Cylinder calibration gases used met EPA Protocol 1 (+/- 2%) standards. Copies of all calibration gas certificates can be found in the Quality Assurance/Quality Control Appendix.

Low Level gas was introduced directly to the analyzer. After adjusting the analyzer to the Low-Level gas concentration and once the analyzer reading was stable, the analyzer value was recorded. This process was repeated for the High-Level gas. For the Calibration Error Test, Low, Mid, and High Level calibration gases were sequentially introduced directly to the analyzer. All values were within 2.0 percent of the Calibration Span or 0.5 ppmv/% absolute difference.

High or Mid-Level gas (whichever was closer to the stack gas concentration) was introduced at the probe and the time required for the analyzer reading to reach 95 percent or 0.5 ppmv/% (whichever was less restrictive) of the gas concentration was recorded. The analyzer reading was observed until it reached a stable value, and this value was recorded. Next, Low Level gas was introduced at the probe and the time required for the analyzer reading to decrease to a value within 5.0 percent or 0.5 ppmv/% (whichever was less restrictive) was recorded. If the Low-Level gas was zero gas, the response was 0.5 ppmv/% or 5.0 percent of the upscale gas concentration (whichever was less restrictive). The analyzer reading was observed until it reached a stable value and this value was recorded. The measurement system response time and initial system bias were determined from these data. The System Bias was within 5.0 percent of the Calibration Span or 0.5 ppmv/% absolute difference.

High or Mid-Level gas (whichever was closer to the stack gas concentration) was introduced at the probe. After the analyzer response was stable, the value was recorded. Next, Low Level gas was introduced at the probe, and the analyzer value recorded once it reached a stable response. The System Bias was within 5.0 percent of the Calibration Span or 0.5 ppmv/% absolute difference or the data was invalidated and the Calibration Error Test and System Bias were repeated.

Drift between pre- and post-run System Bias was within 3 percent of the Calibration Span or 0.5 ppmv/% absolute difference. If the drift exceeded 3 percent or 0.5 ppmv/%, the Calibration Error Test and System Bias were repeated.

To determine the number of sampling points, a gas stratification check was conducted prior to initiating testing. The pollutant concentrations were measured at three points (16.7, 50.0 and 83.3 percent of the measurement line). Each traverse point was sampled for a minimum of twice the system response time.

If the pollutant concentration at each traverse point did not differ more than 5 percent or 0.5 ppmv/0.3% (whichever was less restrictive) of the average pollutant concentration, then single point sampling was conducted during the test runs. If the pollutant concentration did not meet these specifications but differed less than 10 percent or 1.0 ppmv/0.5% from the average concentration, then three (3) point sampling was conducted (stacks less than 7.8 feet in diameter - 16.7, 50.0 and 83.3 percent of the measurement line; stacks greater than 7.8 feet in diameter – 0.4, 1.0, and 2.0 meters from the stack wall). If the pollutant concentration differed by more than 10 percent or 1.0 ppmv/0.5% from the average concentration, then sampling was conducted at a minimum of twelve (12) traverse points. Copies of stratification check data can be found in the Quality Assurance/Quality Control Appendix.

A Data Acquisition System with battery backup was used to record the instrument response in one (1) minute averages. The data was continuously stored as a *.CSV file in Excel format on the hard drive of a computer. At the completion of testing, the data was also saved to the Alliance server. All data was reviewed by the Field Team Leader before leaving the facility. Once arriving at Alliance's office, all written and electronic data was relinquished to the report coordinator and then a final review was performed by the Project Manager.

3.10 Quality Assurance/Quality Control – U.S. EPA Reference Test Method 3/3A

Cylinder calibration gases used met EPA Protocol 1 (+/- 2%) standards. Copies of all calibration gas certificates can be found in the Quality Assurance/Quality Control Appendix.

Low-Level gas was introduced directly to the analyzer. After adjusting the analyzer to the Low-Level gas concentration and once the analyzer reading was stable, the analyzer value was recorded. This process was repeated for the High-Level gas. For the Calibration Error Test, Low, Mid, and High-Level calibration gases were sequentially introduced directly to the analyzer. All values were within 2.0 percent of the Calibration Span or 0.5% absolute difference.

At the completion of testing, the data was also saved to the Alliance server. All data was reviewed by the Field Team Leader before leaving the facility. Once arriving at Alliance's office, all written and electronic data was relinquished to the report coordinator and then a final review was performed by the Project Manager.

Appendix A

Example Calculations

Location	**Kentucky Cooperage - Lebanon, KY**
Source	**Heading Char EU-011**
Project No.	**AST-2024-1515**
Run No.	**1**
Parameter(s)	**VFR**

Meter Pressure (Pm), in. Hg

$$Pm = Pb + \frac{\Delta H}{13.6}$$

where,

Pb	29.09	= barometric pressure, in. Hg
ΔH	1.100	= pressure differential of orifice, in H_2O
Pm	29.17	= in. Hg

Absolute Stack Gas Pressure (Ps), in. Hg

$$Ps = Pb + \frac{Pg}{13.6}$$

where,

Pb	29.09	= barometric pressure, in. Hg
Pg	-0.14	= static pressure, in. H_2O
Ps	29.08	= in. Hg

Standard Meter Volume (Vmstd), dscf

$$Vmstd = \frac{17.636 \times Vm \times Pm \times Y}{Tm}$$

where,

Y	0.994	= meter correction factor
Vm	37.100	= meter volume, cf
Pm	29.17	= absolute meter pressure, in. Hg
Tm	522.2	= absolute meter temperature, °R
Vmstd	36.330	= dscf

Standard Wet Volume (Vwstd), scf

$$Vwstd = 0.04716 \times Vlc$$

where,

Vlc	19.8	= weight of H_2O collected, g
Vwstd	0.934	= scf

Moisture Fraction (BWSsat), dimensionless (theoretical at saturated conditions)

$$BWSsat = \frac{10^{6.37-\left(\frac{2,827}{Ts+365}\right)}}{Ps}$$

where,

Ts	292.4	= stack temperature, °F
Ps	29.1	= absolute stack gas pressure, in. Hg
BWSsat	1.000	= dimensionless

Moisture Fraction (BWS), dimensionless

$$BWS = \frac{Vwstd}{(Vwstd + Vmstd)}$$

where,

Vwstd	0.934	= standard wet volume, scf
Vmstd	36.330	= standard meter volume, dscf
BWS	0.025	= dimensionless

Moisture Fraction (BWS), dimensionless

$$BWS = BWSmsd \text{ unless } BWSsat < BWSmsd$$

where,

BWSsat	1.000	= moisture fraction (theoretical at saturated conditions)
BWSmsd	0.025	= moisture fraction (measured)
BWS	0.025	

Example Calculations

Location	**Kentucky Cooperage - Lebanon, KY**
Source	**Heading Char EU-011**
Project No.	**AST-2024-1515**
Run No.	**1**
Parameter(s)	**VFR**

Molecular Weight (DRY) (Md), lb/lb-mole

$$Md = (0.44 \times \%CO_2) + (0.32 \times \%O2) + (0.28\,(100 - \%CO_2 - \%O2))$$

where,

CO_2	1.3	= carbon dioxide concentration, %
O_2	19.6	= oxygen concentration, %
Md	28.99	= lb/lb mol

Molecular Weight (WET) (Ms), lb/lb-mole

$$Ms = Md\,(1 - BWS) + 18.015\,(BWS)$$

where,

Md	28.99	= molecular weight (DRY), lb/lb mol
BWS	0.025	= moisture fraction, dimensionless
Ms	28.71	= lb/lb mol

Average Velocity (Vs), ft/sec

$$Vs = 85.49 \times Cp \times (\Delta P^{1/2})\,avg \times \sqrt{\frac{Ts}{Ps \times Ms}}$$

where,

Cp	0.84	= pitot tube coefficient
$\Delta P^{1/2}$	0.295	= average pre/post test velocity head of stack gas, $(in.\ H_2O)^{1/2}$
Ts	752.1	= average pre/post test absolute stack temperature, °R
Ps	29.08	= absolute stack gas pressure, in. Hg
Ms	28.71	= molecular weight of stack gas, lb/lb mol
Vs	20.1	= ft/sec

Average Stack Gas Flow at Stack Conditions (Qa), acfm

$$Qa = 60 \times Vs \times As$$

where,

Vs	20.1	= stack gas velocity, ft/sec
As	5.59	= cross-sectional area of stack, ft^2
Qa	6,737	= acfm

Average Stack Gas Flow at Standard Conditions (Qs), dscfm

$$Qsd = 17.636 \times Qa \times (1 - BWS) \times \frac{Ps}{Ts}$$

where,

Qa	6,737	= average stack gas flow at stack conditions, acfm
BWS	0.025	= moisture fraction, dimensionless
Ps	29.08	= absolute stack gas pressure, in. Hg
Ts	752.1	= average pre/post test absolute stack temperature, °R
Qs	4,479	= dscfm

Dry Gas Meter Calibration Check (Yqa), percent

$$Yqa = \frac{Y - \left(\frac{\Theta}{Vm}\sqrt{\frac{0.0319 \times Tm \times 29}{\Delta H@ \times \left(Pb + \frac{\Delta\,Havg.}{13.6}\right) \times Md}}\sqrt{\Delta H}\,avg.\right)}{Y} \times 100$$

where,

Y	0.994	= meter correction factor, dimensionless
Θ	60	= run time, min.
Vm	37.1	= total meter volume, dcf
Tm	522.2	= absolute meter temperature, °R
ΔH@	1.63	= orifice meter calibration coefficient, in. H_2O
Pb	29.09	= barometric pressure, in. Hg
ΔH avg	1.100	= average pressure differential of orifice, in H_2O
Md	28.99	= molecular weight (DRY), lb/lb mol
$(\Delta H)^{1/2}$	1.049	= average square root pressure differential of orifice, $(in.\ H_2O)^{1/2}$
Yqa	-1.0	= percent

Example Calculations

Location: Kentucky Cooperage - Lebanon, KY
Source: Stave Char EU012
Project No.: AST-2024-1515
Run No.: 1
Parameter: PM,CPM

Filterable PM Concentration (C_s), grain/dscf

$$C_s = \frac{M_n \times 0.0154}{Vmstd}$$

where,

Mn	19.1	= filterable PM mass, mg
Vmstd	37.628	= standard meter volume, dscf
C_s	7.8E-03	= grain/dscf

Filterable PM Emission Rate (PMR), lb/hr

$$PMR = \frac{C_s \times Qs \times 60}{7.0E+03}$$

where,

C_s	7.8E-03	= filterable PM concentration, grain/dscf
Qs	4,249	= average stack gas flow at standard conditions, dscfm
PMR	0.29	= lb/hr

Filterable PM Emission Factor (EF_{PM}), lb/barrels produced

$$EF_{PM} = \frac{FR}{PMR}$$

where,

FR	210.5	= production rate, barrels/hr
PMR	0.29	= filterable PM emission rate, lb/hr
EF_{PM}	1.4E-03	= lb/barrel produced

Condensable PM Concentration (C_{CPM}), grain/dscf

$$C_{CPM} = \frac{M_{CPM} \times 0.0154}{Vmstd}$$

where,

M_{CPM}	33.0	= condensable PM mass, mg
Vmstd	37.628	= standard meter volume, dscf
C_{CPM}	0.014	= grain/dscf

Condensable PM Emission Rate (ER_{CPM}), lb/hr

$$ER_{CPM} = \frac{C_{CPM} \times Qs \times 60\frac{min}{hr}}{7.0E+03}$$

where,

C_{CPM}	0.014	= condensable PM concentration, grain/dscf
Qs	4,249	= average stack gas flow at standard conditions, dscfm
ER_{CPM}	0.49	= lb/hr

Condensable PM Emission Factor (EF_{CPM}), lb/barrels produced

$$EF_{CPM} = \frac{FR}{ER_{CPM}}$$

where,

FR	210.5	= production rate, barrels/hr
ER_{CPM}	0.49	= condensable PM emission rate, lb/hr
EF_{CPM}	2.3E-03	= lb/barrel produced

Example Calculations

Location: Kentucky Cooperage - Lebanon, KY
Source: Stave Char EU012
Project No.: AST-2024-1515
Run No.: 1
Parameter: PM,CPM

Total PM Concentration (C_{TPM}), grain/dscf

$$C_{TPM} = C_S + C_{CPM}$$

where,

C_s	7.8E-03	= filterable PM concentration, grain/dscf
C_{CPM}	0.014	= condensable PM concentration, grain/dscf
C_{TPM}	0.021	= grain/dscf

Total PM Emission Rate (ER_{TPM}), lb/hr

$$ER_{TPM} = PMR + ER_{CPM}$$

where,

PMR	0.29	= filterable PM emission rate, lb/hr
ER_{CPM}	0.49	= condensable PM emission rate, lb/hr
ER_{TPM}	0.78	= lb/hr

Total PM Emission Rate (ER_{TPMTPY}), lb/barrels produced

$$EF_{TPM} = \frac{FR}{ER_{TPM}}$$

where,

FR	210.5	= production rate, barrels/hr
ER_{TPM}	0.78	= total PM emission rate, lb/hr
EF_{TPM}	3.7E-03	= lb/barrel produced

Example Calculations

Location: Kentucky Cooperage - Lebanon, KY
Source: Heading Char EU-011
Project No.: AST-2024-1515
Run No. /Method Run 1 / Method 3A

O_2 - Outlet Concentration (C_{O_2}), % dry

$$C_{O_2} = (C_{obs} - C_0) \times \left(\frac{C_{MA}}{(C_M - C_0)} \right)$$

where,

C_{obs}	19.5	= average analyzer value during test, % dry
C_o	0.1	= average of pretest & posttest zero responses, % dry
C_{MA}	10.0	= actual concentration of calibration gas, % dry
C_M	10.0	= average of pretest & posttest calibration responses, % dry
C_{O_2}	19.6	= O_2 Concentration, % dry

Example Calculations

Location: Kentucky Cooperage - Lebanon, KY
Source: Heading Char EU-011
Project No.: AST-2024-1515
Run No. /Method Run 1 / Method 3A

CO_2 - Outlet Concentration (C_{CO_2}), % dry

$$C_{CO_2} = (C_{obs} - C_0) \times \left(\frac{C_{MA}}{(C_M - C_0)} \right)$$

where,

C_{obs}	1.2	= average analyzer value during test, % dry
C_o	0.0	= average of pretest & posttest zero responses, % dry
C_{MA}	5.0	= actual concentration of calibration gas, % dry
C_M	4.9	= average of pretest & posttest calibration responses, % dry
C_{CO_2}	1.3	= CO_2 Concentration, % dry

Example Calculations

Location: Kentucky Cooperage - Lebanon, KY
Source: Heading Char EU-011
Project No.: AST-2024-1515
Run No. /Method Run 1 / Method 10

CO - Outlet Concentration (C_{CO}), ppmvd

$$C_{CO} = (C_{obs} - C_0) \times \left(\frac{C_{MA}}{(C_M - C_0)} \right)$$

where,

C_{obs}	677.3	= average analyzer value during test, ppmvd
C_o	0.1	= average of pretest & posttest zero responses, ppmvd
C_{MA}	500.0	= actual concentration of calibration gas, ppmvd
C_M	496.2	= average of pretest & posttest calibration responses, ppmvd
C_{CO}	682.6	= CO Concentration, ppmvd

CO - Outlet Emission Rate (ER_{COTPY}), ton/yr

$$ER_{COTPY} = \frac{ER_{CO} \times 8{,}760}{2{,}000 \frac{lb}{ton}} \frac{hr}{yr}$$

where,

ER_{CO}	13.3	= CO - Outlet Emission Rate, lb/hr
ER_{COTPY}	58.4	= ton/yr

Appendix B

Heading Char

Location Kentucky Cooperage - Lebanon, KY
Source Heading Char EU-011
Project No. AST-2024-1515

Run Number		Run 1	Run 2	Run 3	Average
Date		5/2/24	5/2/24	5/2/24	--
Start Time		7:30	8:41	9:50	--
Stop Time		8:29	9:40	10:49	--
Input Data - Outlet					
Volumetric Flow Rate (M1-4), dscfm	Qs	4,479	4,468	4,462	4,470
Calculated Data - Outlet					
O_2 Concentration, % dry	C_{O_2}	19.6	19.7	19.8	19.7
CO_2 Concentration, % dry	C_{CO_2}	1.3	1.2	1.1	1.2
CO Concentration, ppmvd	C_{CO}	682.6	690.9	624.4	666.0
CO Emission Rate, ton/yr	ER_{COTPY}	58.4	59.0	53.3	56.9

Run 1 - RM Data

Location: Kentucky Cooperage - Lebanon, KY
Source: Heading Char EU-011
Project No.: AST-2024-1515
Date: 5/2/24

Time Unit Status	O_2 - Outlet % dry Valid	CO_2 - Outlet % dry Valid	CO - Outlet ppmvd Valid
Uncorrected Run Average (C_{obs})	19.49	1.23	677.32
Cal Gas Concentration (C_{MA})	10.00	5.00	500.00
Pretest System Zero Response	0.08	0.00	0.20
Posttest System Zero Response	0.09	0.01	-0.06
Average Zero Response (Co)	0.09	0.01	0.07
Pretest System Cal Response	9.96	4.90	498.94
Posttest System Cal Response	9.97	4.91	493.37
Average Cal Response (C_M)	9.97	4.91	496.16
Corrected Run Average (Corr)	19.64	1.25	682.60
7:30	19.08	1.68	373.63
7:31	19.25	1.51	349.0
7:32	19.44	1.27	475.82
7:33	19.34	1.41	339.89
7:34	19.24	1.50	575.64
7:35	19.55	1.14	596.91
7:36	19.40	1.32	678.67
7:37	19.53	1.17	760.55
7:38	19.49	1.22	846.46
7:39	19.55	1.15	721.60
7:40	19.60	1.07	1,011.37
7:41	19.66	1.05	712.51
7:42	19.66	1.04	889.58
7:43	19.71	0.97	830.94
7:44	19.67	1.02	1,003.80
7:45	19.84	0.87	958.98
7:46	19.84	0.87	938.64
7:47	19.80	0.90	1,008.27
7:48	19.81	0.91	545.81
7:49	19.60	1.10	396.80
7:50	19.28	1.45	582.14
7:51	19.11	1.65	578.98
7:52	19.05	1.72	416.97
7:53	19.13	1.64	466.45
7:54	19.33	1.41	738.14
7:55	19.24	1.51	722.16
7:56	19.37	1.37	684.61
7:57	19.25	1.47	725.89
7:58	19.39	1.33	628.56
7:59	19.44	1.26	950.88
8:00	19.48	1.22	750.93
8:01	19.52	1.17	897.84
8:02	19.50	1.17	788.02
8:03	19.37	1.37	532.92
8:04	19.27	1.46	443.21
8:05	19.28	1.46	424.37
8:06	19.60	1.12	600.34
8:07	19.68	1.00	877.54
8:08	19.71	0.99	877.10
8:09	19.72	0.98	1,013.01
8:10	19.87	0.86	929.75
8:11	19.86	0.86	1,044.72
8:12	19.89	0.83	1,030.10
8:13	19.88	0.85	551.64
8:14	19.59	1.12	562.28
8:15	19.61	1.11	561.78
8:16	19.61	1.11	561.78
8:17	19.72	0.98	835.08
8:18	19.69	1.02	798.25
8:19	19.48	1.25	697.82
8:20	19.62	1.09	533.25
8:21	19.51	1.21	689.16
8:22	19.12	1.64	519.18
8:23	19.28	1.49	381.40
8:24	19.28	1.48	487.64
8:25	19.28	1.48	438.57
8:26	19.24	1.52	503.64
8:27	19.29	1.47	467.24
8:28	19.27	1.47	675.65
8:29	19.40	1.32	655.40

Run 2 - RM Data

Location: Kentucky Cooperage - Lebanon, KY
Source: Heading Char EU-011
Project No.: AST-2024-1515
Date: 5/2/24

Time Unit Status	O_2 - Outlet % dry Valid	CO_2 - Outlet % dry Valid	CO - Outlet ppmvd Valid
Uncorrected Run Average (C_{obs})	19.51	1.21	682.52
Cal Gas Concentration (C_{MA})	10.00	5.00	500.00
Pretest System Zero Response	0.09	0.01	-0.06
Posttest System Zero Response	0.08	0.00	0.68
Average Zero Response (Co)	0.09	0.01	0.31
Pretest System Cal Response	9.97	4.91	493.37
Posttest System Cal Response	9.96	4.91	494.72
Average Cal Response (C_M)	9.97	4.91	494.05
Corrected Run Average (Corr)	19.66	1.23	690.87
8:41	19.39	1.33	754.69
8:42	19.39	1.33	714.92
8:43	19.49	1.21	801.59
8:44	19.54	1.15	959.32
8:45	19.71	0.99	775.03
8:46	19.42	1.27	814.79
8:47	19.50	1.23	460.12
8:48	19.66	1.04	693.00
8:49	19.60	1.13	398.50
8:50	19.56	1.17	302.14
8:51	19.68	1.05	369.00
8:52	19.55	1.16	619.47
8:53	19.48	1.25	456.65
8:54	19.43	1.31	495.21
8:55	19.42	1.31	530.88
8:56	19.57	1.16	454.92
8:57	19.59	1.14	400.24
8:58	19.59	1.11	573.20
8:59	19.59	1.11	852.93
9:00	19.59	1.12	826.87
9:01	19.44	1.29	748.66
9:02	19.61	1.09	822.00
9:03	19.46	1.26	877.36
9:04	19.64	1.07	922.49
9:05	19.59	1.11	915.46
9:06	19.57	1.12	961.04
9:07	19.07	1.71	504.42
9:08	19.17	1.61	285.57
9:09	19.29	1.46	359.00
9:10	19.33	1.42	594.11
9:11	19.42	1.29	856.44
9:12	19.54	1.18	623.70
9:13	19.63	1.07	607.40
9:14	19.51	1.21	845.47
9:15	19.69	1.01	495.20
9:16	19.76	0.94	897.14
9:17	19.71	0.99	775.56
9:18	19.88	0.84	865.03
9:19	19.77	0.93	1,014.41
9:20	19.56	1.14	836.77
9:21	19.40	1.33	673.16
9:22	19.66	1.07	648.15
9:23	19.46	1.28	580.00
9:24	19.65	1.06	733.04
9:25	19.57	1.16	879.20
9:26	19.53	1.19	681.85
9:27	19.21	1.56	565.58
9:28	19.18	1.61	468.06
9:29	19.32	1.44	396.22
9:30	19.46	1.25	749.44
9:31	19.39	1.36	639.34
9:32	19.59	1.10	907.55
9:33	19.62	1.07	852.71
9:34	19.57	1.15	606.98
9:35	19.37	1.37	639.15
9:36	19.43	1.28	581.46
9:37	19.35	1.37	626.51
9:38	19.37	1.34	679.09
9:39	19.55	1.12	939.79
9:40	19.61	1.06	1,043.45

Run 3 - RM Data

Location: Kentucky Cooperage - Lebanon, KY
Source: Heading Char EU-011
Project No.: AST-2024-1515
Date: 5/2/24

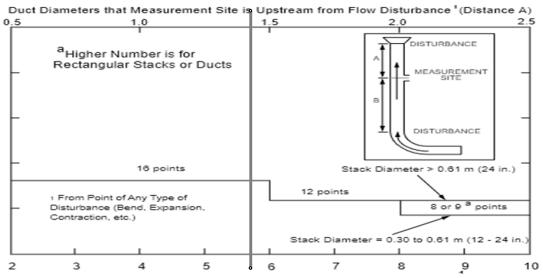
Time Unit Status	O_2 - Outlet % dry Valid	CO_2 - Outlet % dry Valid	CO - Outlet ppmvd Valid
Uncorrected Run Average (C_{obs})	19.61	1.10	620.19
Cal Gas Concentration (C_{MA})	10.00	5.00	500.00
Pretest System Zero Response	0.08	0.00	0.68
Posttest System Zero Response	0.06	0.00	0.60
Average Zero Response (Co)	0.07	0.00	0.64
Pretest System Cal Response	9.96	4.91	494.72
Posttest System Cal Response	9.95	4.91	498.77
Average Cal Response (C_M)	9.96	4.91	496.75
Corrected Run Average (Corr)	19.77	1.12	624.42
9:50	19.32	1.40	750.39
9:51	19.58	1.13	780.33
9:52	19.46	1.21	1,040.06
9:53	19.53	1.16	786.18
9:54	19.62	1.07	870.71
9:55	19.61	1.08	499.43
9:56	19.68	1.02	409.70
9:57	19.71	0.99	399.62
9:58	19.76	0.95	414.33
9:59	19.81	0.92	431.87
10:00	19.60	1.08	951.95
10:01	19.46	1.27	645.83
10:02	19.59	1.12	821.90
10:03	19.58	1.12	700.48
10:04	19.43	1.29	692.02
10:05	19.60	1.09	917.09
10:06	19.66	1.03	1,012.58
10:07	19.41	1.32	823.35
10:08	19.56	1.16	666.03
10:09	19.39	1.32	940.75
10:10	19.54	1.16	780.06
10:11	19.56	1.12	975.46
10:12	19.34	1.41	406.31
10:13	19.53	1.19	583.69
10:14	19.49	1.23	604.09
10:15	19.59	1.08	747.15
10:16	19.48	1.24	543.86
10:17	19.57	1.13	225.70
10:18	19.64	1.06	223.41
10:19	19.61	1.10	210.67
10:20	19.46	1.27	168.11
10:21	19.51	1.21	201.82
10:22	19.63	1.10	249.49
10:23	19.65	1.07	420.39
10:24	19.77	0.95	554.58
10:25	19.53	1.20	398.19
10:26	19.67	1.04	252.42
10:27	19.77	0.97	235.58
10:28	19.82	0.91	441.41
10:29	19.71	1.00	621.50
10:30	19.86	0.86	554.51
10:31	19.56	1.14	506.09
10:32	19.53	1.20	270.95
10:33	19.72	0.98	462.69
10:34	19.65	1.07	576.48
10:35	19.80	0.92	514.22
10:36	19.72	0.99	528.72
10:37	19.85	0.88	521.31
10:38	19.75	0.95	693.13
10:39	19.78	0.93	815.71
10:40	19.57	1.11	893.69
10:41	19.71	0.97	995.81
10:42	19.68	1.00	1,038.96
10:43	19.64	1.03	827.34
10:44	19.62	1.08	626.85
10:45	19.78	0.92	944.69
10:46	19.54	1.17	653.86
10:47	19.61	1.07	808.70
10:48	19.48	1.23	743.58
10:49	19.60	1.10	835.83

Method 1 Data

Location Kentucky Cooperage - Lebanon, KY
Source Heading Char EU-011
Project No. AST-2024-1515
Date: 05/01/24

Stack Parameters

Duct Orientation:	Vertical	
Duct Design:	Circular	
Distance from Far Wall to Outside of Port:	35.50	in
Nipple Length:	3.50	in
Depth of Duct:	32.00	in
Cross Sectional Area of Duct:	5.59	ft^2
No. of Test Ports:	2	
Number of Readings per Point:	1	
Distance A:	18.0	ft
Distance A Duct Diameters:	6.8	**(must be ≥ 0.5)**
Distance B:	15.0	ft
Distance B Duct Diameters:	5.6	**(must be ≥ 2)**
Actual Number of Traverse Points:	3	
Measurer (Initial and Date):	ABF	
Reviewer (Initial and Date):	NAC	



CIRCULAR DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

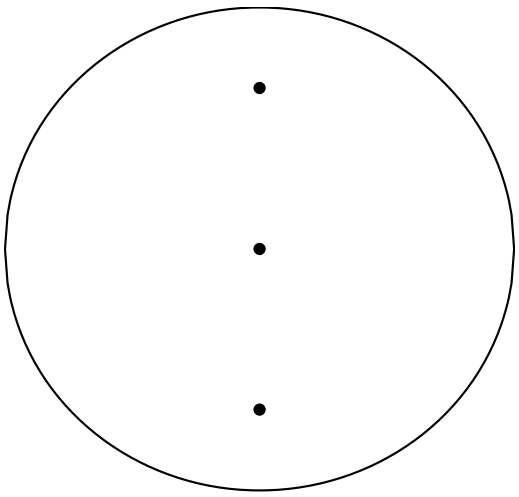
	2	3	4	5	6	7	8	9	10	11	12
1	14.6	16.7	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	50.0	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	83.3	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	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

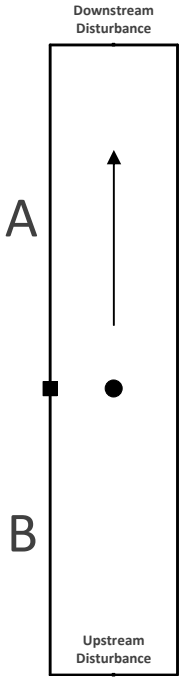
**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	16.7	5.34	8.84
2	50.0	16.00	19.50
3	83.3	26.66	30.16
4	--	--	--
5	--	--	--
6	--	--	--
7	--	--	--
8	--	--	--
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = 18 ft.
B = 15 ft.
Depth of Duct = 32 in.

Cross Sectional Area



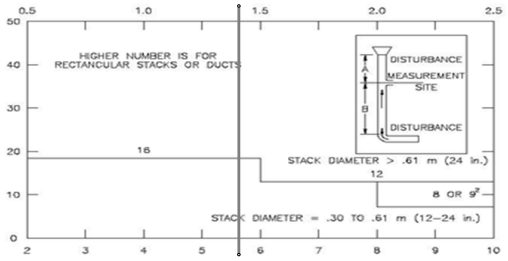


Method 1 Data

Location Kentucky Cooperage - Lebanon, KY
Source Heading Char EU-011
Project No. AST-2024-1515
Date 05/01/24

Stack Parameters

Duct Orientation:	Vertical	
Duct Design:	Circular	
Distance from Far Wall to Outside of Port:	35.50	in
Nipple Length:	3.50	in
Depth of Duct:	32.00	in
Cross Sectional Area of Duct:	5.59	ft^2
No. of Test Ports:	2	
Number of Readings per Point:	1	
Distance A:	18.0	ft
Distance A Duct Diameters:	6.8	**(must be > 0.5)**
Distance B:	15.0	ft
Distance B Duct Diameters:	5.6	**(must be > 2)**
Minimum Number of Traverse Points:	16	
Actual Number of Traverse Points:	16	
Measurer (Initial and Date):	ABF	
Reviewer (Initial and Date):	NAC	



CIRCULAR DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

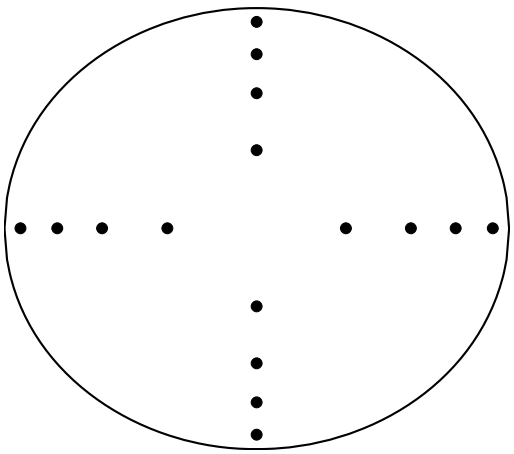
	2	3	4	5	6	7	8	9	10	11	12
1	14.6	--	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	--	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	--	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	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

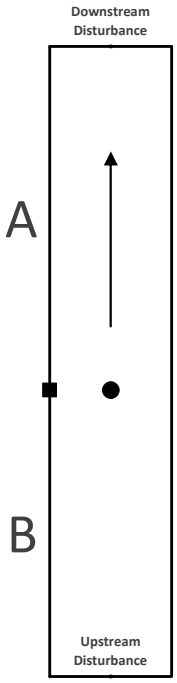
**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	3.2	1.02	4 1/2
2	10.5	3.36	6 7/8
3	19.4	6.21	9 11/16
4	32.3	10.34	13 13/16
5	67.7	21.66	25 3/16
6	80.6	25.79	29 5/16
7	89.5	28.64	32 1/8
8	96.8	30.98	34 1/2
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = 18 ft.
B = 15 ft.
Depth of Duct = 32 in.

Cross Sectional Area





Cyclonic Flow Check

Location Kentucky Cooperage - Lebanon, KY

Source Heading Char EU-011

Project No. AST-2024-1515

Date 5/1/24

Sample Point	Angle (ΔP=0)
1	5
2	5
3	0
4	0
5	0
6	0
7	5
8	5
9	5
10	5
11	0
12	0
13	0
14	0
15	0
16	5
Average	2.2

Method 2 Data

Location Kentucky Cooperage - Lebanon, KY
Source Heading Char EU-011
Project No. AST-2024-1515

		1		2		3		4	
Traverse No.									
Date		5/2/24		5/2/24		5/2/24		5/2/24	
Status		VALID		VALID		VALID		VALID	
Start Time		7:32		8:44		9:55		10:41	
Stop Time		7:40		8:51		10:00		10:45	
Leak Check		PASS		PASS		PASS		PASS	
Traverse Point		**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**	**Δ P (in. WC)**	**Ts (°F)**
1A		0.07	291	0.08	323	0.08	301	0.08	300
2		0.08	289	0.08	321	0.07	296	0.08	298
3		0.08	296	0.08	318	0.07	292	0.06	301
4		0.07	299	0.06	314	0.06	292	0.07	305
5		0.10	303	0.09	311	0.11	299	0.10	302
6		0.11	304	0.11	311	0.13	305	0.12	302
7		0.13	306	0.12	306	0.14	304	0.11	301
8		0.13	302	0.09	300	0.10	285	0.12	296
1B		0.07	280	0.08	274	0.06	280	0.06	278
2		0.07	277	0.08	277	0.07	284	0.07	279
3		0.08	276	0.07	280	0.08	288	0.07	281
4		0.08	276	0.08	280	0.09	283	0.07	275
5		0.08	277	0.08	285	0.08	280	0.07	282
6		0.09	281	0.08	284	0.09	277	0.09	281
7		0.10	282	0.10	279	0.10	289	0.10	288
8		0.08	278	0.11	277	0.11	287	0.10	274
Run No.		**1**		**2**		**3**		**Average**	
Square Root of ΔP, (in. WC)$^{1/2}$	**$(\Delta P)^{1/2}$**	0.295		0.296		0.294		0.295	
Average ΔP, in. WC	**(ΔP)**	0.09		0.09		0.09		0.09	
Pitot Tube Coefficient	**(Cp)**	0.840		0.840		0.840		0.840	
Barometric Pressure, in. Hg	**(Pb)**	29.09		29.09		29.09		29.09	
Static Pressure, in. WC	**(Pg)**	-0.14		-0.14		-0.13		-0.14	
Stack Pressure, in. Hg	**(Ps)**	29.08		29.08		29.08		29.08	
Average Temperature, °F	**(Ts)**	292.4		293.2		290.2		291.9	
Average Temperature, °R	**(Ts)**	752.1		752.9		749.8		751.6	
Measured Moisture Fraction	**(BWSmsd)**	0.025		0.030		0.029		0.028	
Moisture Fraction @ Saturation	**(BWSsat)**	1.000		1.000		1.000		1.000	
Moisture Fraction	**(BWS)**	0.025		0.030		0.029		0.028	
O2 Concentration, %	**(O_2)**	19.64		19.66		19.77		19.69	
CO2 Concentration, %	**(CO_2)**	1.25		1.23		1.12		1.20	
Molecular Weight, lb/lb-mole (dry)	**(Md)**	28.99		28.98		28.97		28.98	
Molecular Weight, lb/lb-mole (wet)	**(Ms)**	28.71		28.65		28.66		28.67	
Velocity, ft/sec	**(Vs)**	20.1		20.2		20.0		20.1	
VFR at stack conditions, acfm	**(Qa)**	6,737		6,763		6,715		6,738	
VFR at standard conditions, scfh	**(Qsw)**	275,635		276,421		275,589		275,882	
VFR at standard conditions, scfm	**(Qsw)**	4,594		4,607		4,593		4,598	
VFR at standard conditions, dscfm	**(Qsd)**	4,479		4,468		4,462		4,470	

Method 4 Data

Location Kentucky Cooperage - Lebanon, KY
Source Heading Char EU-011
Project No. AST-2024-1515
Parameter(s) VFR
Console Units / Method ft3 M4

Run No.		1					2					3				
Date		5/2/24					5/2/24					5/2/24				
Status		VALID					VALID					VALID				
Start Time		7:30					8:41					9:50				
End Time		8:30					9:41					10:50				
Run Time, min	(θ)	60					60					60				
Meter ID		1664					1664					1664				
Meter Correction Factor	(Y)	0.994					0.994					0.994				
Orifice Calibration Value	(ΔH @)	1.630					1.630					1.630				
Max Vacuum, in. Hg		2					2					2				
Post Leak Check, ft3/min (at max vac.)		0.000					0.000					0.000				
Meter Volume, ft3																
0		554.025					591.360					628.855				
5		557.170					594.540					631.960				
10		560.265					597.645					635.090				
15		563.360					600.735					638.235				
20		566.435					603.880					641.380				
25		569.565					607.040					644.500				
30		572.680					610.100					647.615				
35		575.780					613.180					650.715				
40		578.860					616.285					653.820				
45		581.930					619.340					656.920				
50		585.015					622.445					660.000				
55		588.065					625.550					663.055				
60		591.125					628.615					666.155				
Total Meter Volume, ft3	(Vm)	37.100					37.255					37.300				
Temperature, °F		Meter	Probe	Filter	Vacuum	Imp. Exit	Meter	Probe	Filter	Vacuum	Imp. Exit	Meter	Probe	Filter	Vacuum	Imp. Exit
0		60	--	--	2	64	64	--	--	2	63	64	--	--	2	61
5		61	--	--	2	52	65	--	--	2	58	65	--	--	2	54
10		61	--	--	2	50	65	--	--	2	56	65	--	--	2	55
15		61	--	--	2	51	65	--	--	2	56	66	--	--	2	56
20		62	--	--	2	52	65	--	--	2	56	66	--	--	2	57
25		62	--	--	2	53	65	--	--	2	57	66	--	--	2	58
30		63	--	--	2	54	65	--	--	2	57	66	--	--	2	58
35		63	--	--	2	55	65	--	--	2	58	66	--	--	2	59
40		63	--	--	2	55	66	--	--	2	59	66	--	--	2	59
45		64	--	--	2	56	65	--	--	2	60	66	--	--	2	59
50		64	--	--	2	57	65	--	--	2	60	66	--	--	2	60
55		64	--	--	2	57	66	--	--	2	61	66	--	--	2	61
60		65	--	--	2	58	66	--	--	2	61	66	--	--	2	61
Average Temperature, °F	(Tm)	63	--	--	2	55	65	--	--	2	59	66	--	--	2	58
Average Temperature, °R	(Tm)	522	--	--	--	--	525	--	--	--	--	525	--	--	--	--
Minimum Temperature, °F		60	--	--	2	50	64	--	--	2	56	64	--	--	2	54
Maximum Temperature, °F		65	--	--	2	64	66	--	--	2	63	66	--	--	2	61
Barometric Pressure, in. Hg	(Pb)	29.09					29.09					29.09				
Meter Orifice Pressure , in. WC	(ΔH)	1.100					1.100					1.100				
Meter Pressure, in. Hg	(Pm)	29.17					29.17					29.17				
Standard Meter Volume, ft3	(Vmstd)	36.330					36.300					36.307				
Analysis Type		Gravimetric					Gravimetric					Gravimetric				
Impinger 1, Pre/Post Test, g		H2O		736.0	748.4	12.4	H2O		778.6	791.0	12.4	H2O		748.4	761.3	12.9
Impinger 2, Pre/Post Test, g		H2O		844.2	847.1	2.9	H2O		851.0	853.0	2.0	H2O		847.1	849.1	2.0
Impinger 3, Pre/Post Test, g		Empty		758.8	759.7	0.9	Empty		754.8	756.1	1.3	Empty		759.7	760.6	0.9
Impinger 4, Pre/Post Test, g		Silica		962.9	966.5	3.6	Silica		961.5	969.8	8.3	Silica		966.5	973.3	6.8
Volume Water Collected, mL	(Vlc)	19.8					24.0					22.6				
Standard Water Volume, ft^3	(Vwstd)	0.934					1.132					1.066				
Moisture Fraction Measured	(BWS)	0.025					0.030					0.029				
Gas Molecular Weight, lb/lb-mole (dry)	(Md)	28.99					28.98					28.97				
DGM Calibration Check Value	(Yqa)	-1.0					-0.9					-0.8				

Stave Char

Emission Calculations

Location Kentucky Cooperage - Lebanon, KY
Source Stave Char EU012
Project No. AST-2024-1515
Parameter PM,CPM

Run Number		Run 2	Run 3	Run 4	Average
Date		5/1/24	5/1/24	5/1/24	--
Start Time		9:10	10:38	12:10	--
Stop Time		10:13	11:41	13:15	--
Run Time, min	(θ)	60.0	60.0	60.0	60.0
INPUT DATA					
Barrels Produced		221	229	234	228
Run Duration, min		63	63	65	64
Barrel Production Rate, barrels/hr		210.5	218.1	216.0	214.9
Barometric Pressure, in. Hg	(Pb)	29.06	29.06	29.06	29.06
Meter Correction Factor	(Y)	0.993	0.993	0.993	0.993
Orifice Calibration Value	(ΔH @)	1.771	1.771	1.771	1.771
Meter Volume, ft^3	(Vm)	39.810	38.290	39.985	39.362
Meter Temperature, °F	(Tm)	80.5	85.1	90.9	85.5
Meter Temperature, °R	(Tm)	540.2	544.8	550.5	545.2
Meter Orifice Pressure, in. WC	(ΔH)	1.279	1.194	1.274	1.249
Volume H_2O Collected, mL	(Vlc)	48.4	38.3	52.3	46.3
Nozzle Diameter, in	(Dn)	0.231	0.231	0.231	0.231
Area of Nozzle, ft^2	(An)	0.0003	0.0003	0.0003	0.0003
Filterable PM Mass, mg	(Mn)	19.1	14.6	19.2	17.6
Condensable PM Mass, mg	(M_{CPM})	33.0	26.2	16.0	25.1
ISOKINETIC DATA					
Standard Meter Volume, ft^3	(Vmstd)	37.628	35.876	37.081	36.862
Standard Water Volume, ft^3	(Vwstd)	2.283	1.806	2.466	2.185
Moisture Fraction Measured	(BWSmsd)	0.057	0.048	0.062	0.056
Moisture Fraction @ Saturation	(BWSsat)	555.771	720.480	472.622	582.958
Moisture Fraction	(BWS)	0.057	0.048	0.062	0.056
Meter Pressure, in Hg	(Pm)	29.15	29.15	29.15	29.15
Volume at Nozzle, ft^3	(Vn)	109.711	108.916	105.586	108.07
Isokinetic Sampling Rate, (%)	(I)	102.5	101.1	102.8	102.1
DGM Calibration Check Value, (+/- 5%)	(Y_{qa})	1.6	0.9	1.2	1.2
EMISSION CALCULATIONS					
Filterable PM Concentration, grain/dscf	(C_s)	7.8E-03	6.3E-03	8.0E-03	7.4E-03
Filterable PM Emission Rate, lb/hr	(PMR)	0.29	0.22	0.29	0.26
Filterable PM Emission Factor, lb/barrel produced	(EF_{PM})	1.4E-03	1.0E-03	1.3E-03	1.2E-03
Condensable PM Concentration, grain/dscf	(C_{CPM})	0.014	0.011	0.0067	0.010
Condensable PM Emission Rate, lb/hr	(ER_{CPM})	0.49	0.40	0.24	0.38
Condensable PM Emission Factor, lb/barrel produced	(EF_{CPM})	2.3E-03	1.8E-03	1.1E-03	1.8E-03
Total PM Concentration, grain/dscf	(C_{TPM})	0.021	0.018	0.015	0.018
Total PM Emission Rate, lb/hr	(ER_{TPM})	0.78	0.62	0.52	0.64
Total PM Emission Factor, lb/barrel produced	(EF_{TPM})	3.7E-03	2.8E-03	2.4E-03	3.0E-03

Emission Calculations

Location Kentucky Cooperage - Lebanon, KY
Source Stave Char EU012
Project No. AST-2024-1515
Parameter PM,CPM

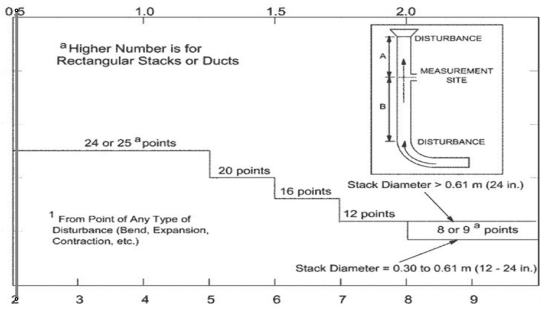
Run Number		Run 2	Run 3	Run 4	Average
Date		5/1/24	5/1/24	5/1/24	--
Start Time		9:10	10:38	12:10	--
Stop Time		10:13	11:41	13:15	--
Run Time, min		60.0	60.0	60.0	60.0
VELOCITY HEAD, in. WC					
Point 1		0.65	1.60	0.80	1.02
Point 2		0.70	1.70	0.84	1.08
Point 3		0.90	1.50	0.90	1.10
Point 4		1.00	1.40	0.89	1.10
Point 5		0.95	1.20	0.98	1.04
Point 6		0.94	1.30	0.95	1.06
Point 7		0.99	1.40	0.97	1.12
Point 8		1.00	1.50	1.10	1.20
Point 9		1.40	1.40	1.20	1.33
Point 10		1.50	1.20	1.10	1.27
Point 11		1.20	1.10	1.30	1.20
Point 12		1.20	1.20	1.20	1.20
Point 13		1.60	0.75	1.40	1.25
Point 14		1.30	0.72	1.50	1.17
Point 15		1.40	0.76	1.40	1.19
Point 16		1.30	0.90	1.50	1.23
Point 17		1.40	0.80	1.60	1.27
Point 18		1.20	0.90	1.10	1.07
Point 19		1.50	0.94	1.20	1.21
Point 20		1.30	1.00	1.10	1.13
Point 21		1.40	1.30	0.98	1.23
Point 22		1.30	1.20	1.10	1.20
Point 23		1.50	1.20	1.10	1.27
Point 24		1.30	1.10	1.10	1.17
CALCULATED DATA					
Square Root of ΔP, (in. WC)$^{1/2}$	(ΔP)	1.091	1.074	1.062	1.076
Pitot Tube Coefficient	(Cp)	0.840	0.840	0.840	0.840
Barometric Pressure, in. Hg	(Pb)	29.06	29.06	29.06	29.06
Static Pressure, in. WC	(Pg)	-2.10	-2.20	-2.40	-2.23
Stack Pressure, in. Hg	(Ps)	28.91	28.90	28.88	28.90
Stack Cross-sectional Area, ft^2	(As)	2.02	2.02	2.02	2.02
Temperature, °F	(Ts)	941.8	1013.5	900.5	952.0
Temperature, °R	(Ts)	1401.5	1473.2	1360.2	1411.6
Moisture Fraction Measured	(BWSmsd)	0.057	0.048	0.062	0.056
Moisture Fraction @ Saturation	(BWSsat)	555.771	720.480	472.622	582.958
Moisture Fraction	(BWS)	0.057	0.048	0.062	0.056
O_2 Concentration, %	(O_2)	17.7	17.2	17.4	17.4
CO_2 Concentration, %	(CO_2)	2.8	3.3	3.1	3.1
Molecular Weight, lb/lb-mole (dry)	(Md)	29.16	29.21	29.19	29.19
Molecular Weight, lb/lb-mole (wet)	(Ms)	28.52	28.68	28.49	28.56
Velocity, ft/sec	(Vs)	102.2	102.8	98.1	101.0
VOLUMETRIC FLOW RATE					
At Stack Conditions, acfm	(Qa)	12,390	12,468	11,892	12,250
At Standard Conditions, scfm	(Qsw)	4,507	4,313	4,454	4,425
At Standard Conditions, dscfm	(Qs)	4,249	4,106	4,176	4,177

Method 1 Data

Location Kentucky Cooperage - Lebanon, KY
Source Stave Char EU012
Project No. AST-2024-1515
Date: 04/30/24

Stack Parameters

Duct Orientation:	Vertical	
Duct Design:	Circular	
Distance from Far Wall to Outside of Port:	23.25	in
Nipple Length:	4.00	in
Depth of Duct:	19.25	in
Cross Sectional Area of Duct:	2.02	ft^2
No. of Test Ports:	2	
Distance A:	8.3	ft
Distance A Duct Diameters:	5.1	**(must be ≥ 0.5)**
Distance B:	3.3	ft
Distance B Duct Diameters:	2.1	**(must be ≥ 2)**
Minimum Number of Traverse Points:	24	
Actual Number of Traverse Points:	24	
Number of Readings per Point:	1	
Measurer (Initial and Date):	NBG	
Reviewer (Initial and Date):	NAC	



CIRCULAR DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

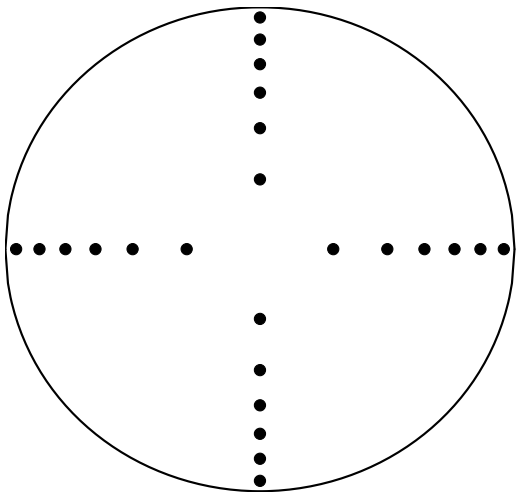
	2	3	4	5	6	7	8	9	10	11	12
1	14.6	--	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	--	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	--	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	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

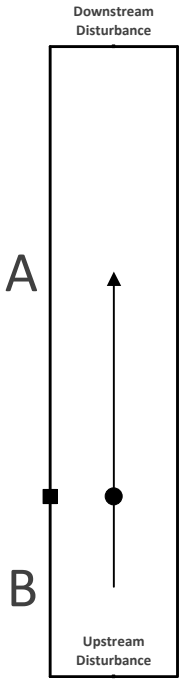
**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	2.1	0.50	4 1/2
2	6.7	1.29	5 5/16
3	11.8	2.27	6 1/4
4	17.7	3.41	7 7/16
5	25.0	4.81	8 13/16
6	35.6	6.85	10 7/8
7	64.4	12.40	16 3/8
8	75.0	14.44	18 7/16
9	82.3	15.84	19 13/16
10	88.2	16.98	21
11	93.3	17.96	21 15/16
12	97.9	18.75	22 3/4

Stack Diagram
A = 8.25 ft.
B = 3.3 ft.
Depth of Duct = 19.25 in.

Cross Sectional Area





Cyclonic Flow Check

Location Kentucky Cooperage - Lebanon, KY
Source Stave Char EU012
Project No. AST-2024-1515
Date 04/30/24

Sample Point	Angle (ΔP=0)
1	10
2	10
3	10
4	5
5	5
6	5
7	0
8	5
9	5
10	10
11	15
12	15
13	5
14	5
15	5
16	5
17	5
18	10
19	10
20	5
21	5
22	5
23	10
24	15
Average	8

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Isokinetic Field Data

Location:	Kentucky Cooperage - Lebanon, KY			**Start Time:**	9:10	**Source:**	Stave Char EU012
Date:	5/1/24	Run 2	VALID	**End Time:**	10:13	**Project No.:**	AST-2024-1515

Parameter: PM,CPM

STACK DATA (EST)			EQUIPMENT			STACK DATA (EST)			FILTER NO.	STACK DATA (FINAL)			MOIST. DATA
Moisture:	5.0	% est.	Meter Box ID:	1515		Est. Tm:	75	°F	23909-A	Pb:	29.06	in. Hg	Vlc (ml)
Barometric:	29.10	in. Hg	Y:	0.993		Est. Ts:	826	°F		Pg:	-2.10	in. WC	48.4
Static Press:	-2.10	in. WC	ΔH @ (in.WC):	1.771		Est. ΔP:	1.28	in. WC		O_2:	17.72	%	K-FACTOR
Stack Press:	28.95	in. Hg	Probe ID:	PR-104-0		Est. Dn:	0.241	in.		CO_2:	2.81	%	1.14
CO_2:	2.0	%	Liner Material:	stainless steel		Target Rate:	0.75	scfm					
O_2:	19.0	%	Pitot ID:	PT-110		LEAK CHECKS	Pre	Mid 1	Mid 2	Mid 3	Post	Check Pt.	Initial / Final / Corr.
N_2/CO:	79.0	%	Pitot Cp/Type:	0.840	S-type	Leak Rate (cfm):	0.000	--	--	--	0.000	Mid 1 (cf)	--
Md:	29.08	lb/lb-mole	Nozzle ID:	S-302	SS	Vacuum (in Hg):	10	--	--	--	4	Mid 2 (cf)	--
Ms:	28.53	lb/lb-mole	Nozzle Dn (in.):	0.231		Pitot Tube:	Pass	--	--	--	Pass	Mid 3 (cf)	--
												Mid-Point Leak Check Vol (cf):	--

Sample Pt.	Sample Time (minutes) Begin	End	Dry Gas Meter Reading (ft^3)	Pitot Tube ΔP (in WC)	Gas Temperatures (°F) DGM Average Amb.	Stack Amb.	Orifice Press. ΔH (in. WC) Ideal	Actual	Pump Vac (in. Hg)	Gas Temperatures (°F) Probe Amb.	Filter Amb.	Imp Exit Amb.	CPM Amb.	% ISO	Vs (fps)
1a	0.00	2.50	341.060	0.65	77	850	0.73	0.70	2	235	250	60	82	104.1	72.92
2	2.50	5.00	342.350	0.70	78	850	0.79	0.80	2	240	252	56	83	100.9	75.67
3	5.00	7.50	343.650	0.90	78	895	0.98	1.00	2	232	240	55	82	104.9	87.26
4	7.50	10.00	345.155	1.00	78	745	1.23	1.20	2	243	253	51	81	102.6	86.74
5	10.00	12.50	346.800	0.95	78	1000	0.96	1.00	2	235	255	49	82	102.1	93.06
6	12.50	15.00	348.250	0.94	78	958	0.98	1.00	2	245	259	49	82	104.6	91.23
7	15.00	17.50	349.750	0.99	80	974	1.02	1.00	2	234	252	52	84	105.5	94.15
8	17.50	20.00	351.300	1.00	80	822	1.16	1.20	2	238	258	53	84	99.3	89.47
9	20.00	22.50	352.850	1.40	80	812	1.63	1.60	2	240	257	52	84	100.7	105.45
10	22.50	25.00	354.715	1.50	80	855	1.69	1.70	2	238	257	52	82	100.3	110.98
11	25.00	27.50	356.605	1.20	80	875	1.33	1.30	3	238	256	51	82	104.2	100.01
12	27.50	30.00	358.350	1.20	80	950	1.26	1.30	3	232	256	52	83	101.3	102.79
1b	30.00	32.50	360.000	1.60	81	937	1.70	1.70	4	253	255	52	82	95.1	118.14
2	32.50	35.00	361.800	1.30	81	1000	1.32	1.30	4	238	250	52	82	102.7	108.86
3	35.00	37.50	363.515	1.40	81	875	1.56	1.60	4	232	255	53	84	102.7	108.03
4	37.50	40.00	365.375	1.30	81	1015	1.31	1.30	4	235	255	53	84	103.8	109.42
5	40.00	42.50	367.100	1.40	82	986	1.44	1.40	4	235	254	53	84	100.6	112.43
6	42.50	45.00	368.855	1.20	82	974	1.25	1.30	4	235	258	52	84	105.4	103.66
7	45.00	47.50	370.565	1.50	82	1005	1.52	1.50	4	235	256	52	84	101.2	117.14
8	47.50	50.00	372.380	1.30	83	1075	1.26	1.30	4	233	256	55	85	102.2	111.63
9	50.00	52.50	374.050	1.40	83	1008	1.42	1.40	4	234	255	56	85	100.9	113.28
10	52.50	55.00	375.800	1.30	83	975	1.35	1.40	4	233	255	56	85	103.5	107.93
11	55.00	57.50	377.550	1.50	83	1100	1.43	1.40	4	236	252	57	85	93.6	120.88
12	57.50	60.00	379.180	1.30	83	1068	1.27	1.30	4	235	255	57	84	103.2	111.37
	Final DGM:		380.870												

RESULTS	Run Time	Vm	ΔP	Tm	Ts	Max Vac	ΔH	%ISO	BWS	Y_{qa}
	60.0 min	39.810 ft^3	1.21 in. WC	80.5 °F	941.8 °F	4	1.279 in. WC	102.5	0.057	1.6

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Isokinetic Field Data

Location:	Kentucky Cooperage - Lebanon, KY			**Start Time:**	10:38	**Source:**	Stave Char EU012
Date:	5/1/24	Run 3	VALID	**End Time:**	11:41	**Project No.:**	AST-2024-1515

Parameter: PM,CPM

STACK DATA (EST)			EQUIPMENT			STACK DATA (EST)			FILTER NO.	STACK DATA (FINAL)			MOIST. DATA
Moisture:	5.0	% est.	Meter Box ID:	1515		Est. Tm:	81	°F	23905-A	Pb:	29.06	in. Hg	Vlc (ml)
Barometric:	29.10	in. Hg	Y:	0.993		Est. Ts:	942	°F		Pg:	-2.20	in. WC	38.3
Static Press:	-2.10	in. WC	ΔH @ (in.WC):	1.771		Est. ΔP:	1.21	in. WC		O_2:	17.15	%	K-FACTOR
Stack Press:	28.95	in. Hg	Probe ID:	PR-104-0		Est. Dn:	0.248	in.		CO_2:	3.29	%	1.058
CO_2:	2.0	%	Liner Material:	stainless steel		Target Rate:	0.75	scfm					
O_2:	19.0	%	Pitot ID:	PT-110		LEAK CHECKS	Pre	Mid 1	Mid 2	Mid 3	Post	Check Pt.	Initial / Final / Corr.
N_2/CO:	79.0	%	Pitot Cp/Type:	0.840	S-type	Leak Rate (cfm):	0.000	--	--	--	0.000	Mid 1 (cf)	--
Md:	29.08	lb/lb-mole	Nozzle ID:	S-302	SS	Vacuum (in Hg):	10	--	--	--	4	Mid 2 (cf)	--
Ms:	28.53	lb/lb-mole	Nozzle Dn (in.):	0.231		Pitot Tube:	Pass	--	--	--	Pass	Mid 3 (cf)	--
												Mid-Point Leak Check Vol (cf):	--

Sample Pt.	Sample Time (minutes)		Dry Gas Meter Reading (ft^3)	Pitot Tube ΔP (in WC)	Gas Temperatures (°F)		Orifice Press. ΔH (in. WC)		Pump Vac (in. Hg)	Gas Temperatures (°F)				% ISO	Vs (fps)
					DGM Average	Stack				Probe	Filter	Imp Exit	CPM		
	Begin	End			Amb.	Amb.	Ideal	Actual		Amb.	Amb.	Amb.	Amb.		
					--	--				--	--	--	--		
1a	0.00	2.50	381.065	1.60	82	914	1.73	1.70	3	237	252	64	80	97.3	117.16
2	2.50	5.00	382.925	1.70	82	1112	1.61	1.60	3	247	261	61	83	100.4	129.18
3	5.00	7.50	384.775	1.50	83	1026	1.50	1.50	3	238	254	60	84	99.5	117.97
4	7.50	10.00	386.550	1.40	83	1002	1.43	1.40	3	234	255	60	85	98.1	113.05
5	10.00	12.50	388.255	1.20	83	1101	1.15	1.20	3	230	252	60	85	104.0	108.15
6	12.50	15.00	389.875	1.30	83	1160	1.20	1.20	3	234	256	59	84	105.3	114.67
7	15.00	17.50	391.550	1.40	85	1134	1.31	1.30	3	234	255	59	84	98.8	118.04
8	17.50	20.00	393.200	1.50	85	975	1.56	1.60	3	238	254	58	84	96.4	115.93
9	20.00	22.50	394.955	1.40	85	999	1.44	1.40	3	236	255	57	85	100.8	112.93
10	22.50	25.00	396.715	1.20	85	980	1.25	1.30	3	238	255	56	85	100.5	103.87
11	25.00	27.50	398.350	1.10	85	964	1.16	1.20	3	239	256	53	84	108.5	98.90
12	27.50	30.00	400.050	1.20	85	990	1.24	1.20	3	236	235	52	85	99.9	104.23
1b	30.00	32.50	401.670	0.75	85	650	1.01	1.00	3	237	259	60	84	103.3	72.10
2	32.50	35.00	403.185	0.72	85	850	0.82	0.85	3	241	258	57	84	100.5	76.74
3	35.00	37.50	404.515	0.76	86	989	0.79	0.80	3	240	253	51	85	101.2	82.92
4	37.50	40.00	405.825	0.90	86	1015	0.92	0.90	3	232	254	50	84	104.6	91.04
5	40.00	42.50	407.285	0.80	86	1090	0.78	0.80	3	244	258	50	84	101.6	87.99
6	42.50	45.00	408.590	0.90	86	855	1.03	1.00	3	235	255	50	83	102.1	85.96
7	45.00	47.50	410.100	0.94	86	950	1.00	1.00	3	246	255	51	83	99.4	90.97
8	47.50	50.00	411.550	1.00	87	1110	0.96	1.00	3	235	255	52	82	101.1	99.01
9	50.00	52.50	412.995	1.30	87	1024	1.32	1.30	3	236	258	53	83	99.1	109.75
10	52.50	55.00	414.655	1.20	87	1110	1.15	1.20	3	238	253	54	83	103.5	108.46
11	55.00	57.50	416.275	1.20	88	1203	1.09	1.10	3	238	257	54	83	103.4	111.63
12	57.50	60.00	417.850	1.10	88	1122	1.05	1.10	3	237	255	56	83	100.6	104.24
	Final DGM:		419.355												

RESULTS	Run Time		Vm		ΔP		Tm		Ts		Max Vac	ΔH		%ISO	BWS	Y_{qa}
	60.0	min	38.290	ft^3	1.17	in. WC	85.1	°F	1013.5	°F	3	1.194	in. WC	101.1	0.048	0.9

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Isokinetic Field Data

Location:	Kentucky Cooperage - Lebanon, KY			**Start Time:**	12:10	**Source:**	Stave Char EU012
Date:	5/1/24	Run 4	VALID	**End Time:**	13:15	**Project No.:**	AST-2024-1515

Parameter: PM,CPM

STACK DATA (EST)			EQUIPMENT			STACK DATA (EST)			FILTER NO.		STACK DATA (FINAL)			MOIST. DATA
Moisture:	5.0	% est.	Meter Box ID:	1515		Est. Tm:	85	°F	23910-A		Pb:	29.06	in. Hg	Vlc (ml)
Barometric:	29.10	in. Hg	Y:	0.993		Est. Ts:	1014	°F			Pg:	-2.40	in. WC	52.3
Static Press:	-2.10	in. WC	ΔH @ (in.WC):	1.771		Est. ΔP:	1.17	in. WC			O_2:	17.40	%	K-FACTOR
Stack Press:	28.95	in. Hg	Probe ID:	PR-104-0		Est. Dn:	0.252	in.			CO_2:	3.06	%	1.015
CO_2:	2.0	%	Liner Material:	stainless steel		Target Rate:	0.75	scfm				Check Pt.	Initial	Final	Corr.
O_2:	19.0	%	Pitot ID:	PT-110		LEAK CHECKS	Pre	Mid 1	Mid 2	Mid 3	Post	Mid 1 (cf)	9.825	9.910	0.085
N_2/CO:	79.0	%	Pitot Cp/Type:	0.840	S-type	Leak Rate (cfm):	0.000	0.000	--	--	0.000	Mid 2 (cf)			--
Md:	29.08	lb/lb-mole	Nozzle ID:	S-302	SS	Vacuum (in Hg):	10	5	--	--	5	Mid 3 (cf)			--
Ms:	28.53	lb/lb-mole	Nozzle Dn (in.):	0.231		Pitot Tube:	Pass	--	--	--	Pass	Mid-Point Leak Check Vol (cf):			0.085

Sample Pt.	Sample Time (minutes)		Dry Gas Meter Reading (ft^3)	Pitot Tube ΔP (in WC)	Gas Temperatures (°F)		Orifice Press. ΔH (in. WC)		Pump Vac (in. Hg)	Gas Temperatures (°F)				% ISO	Vs (fps)
					DGM Average	Stack				Probe	Filter	Imp Exit	CPM		
	Begin	End			Amb. --	Amb. --	Ideal	Actual		Amb. --	Amb. --	Amb. --	Amb. --		
1a	0.00	2.50	420.565	0.80	89	755	0.99	1.00	3	235	250	60	84	105.3	77.90
2	2.50	5.00	422.100	0.84	88	711	1.08	1.10	3	235	255	60	84	97.8	78.37
3	5.00	7.50	423.585	0.90	88	678	1.19	1.20	3	246	255	60	84	101.3	79.97
4	7.50	10.00	425.200	0.89	88	774	1.09	1.10	3	245	252	58	84	105.1	82.81
5	10.00	12.50	426.800	0.98	90	800	1.18	1.20	3	241	255	55	83	104.9	87.81
6	12.50	15.00	428.465	0.95	90	1140	0.90	0.90	3	241	254	52	84	101.6	97.42
7	15.00	17.50	429.875	0.97	90	846	1.12	1.10	3	237	256	51	84	101.9	88.94
8	17.50	20.00	431.455	1.10	90	925	1.20	1.20	3	240	250	51	83	102.0	97.53
9	20.00	22.50	433.090	1.20	90	888	1.35	1.30	3	235	254	50	84	102.5	100.50
10	22.50	25.00	434.830	1.10	91	1011	1.13	1.10	3	242	255	49	83	100.0	100.52
11	25.00	27.50	436.390	1.30	91	1111	1.25	1.30	3	233	256	49	84	104.3	112.93
12	27.50	30.00	438.100	1.20	91	995	1.25	1.30	3	235	255	49	84	105.4	104.41
1b	30.00	32.50	439.825	1.40	90	800	1.68	1.70	3	237	256	50	84	98.7	104.95
2	32.50	35.00	441.780	1.50	91	872	1.70	1.70	3	235	255	52	84	100.2	111.69
3	35.00	37.50	443.695	1.40	91	1142	1.32	1.30	3	235	256	50	84	97.6	118.34
4	37.50	40.00	445.340	1.50	92	1050	1.51	1.50	3	235	254	50	84	99.2	118.92
5	40.00	42.50	447.125	1.60	92	1121	1.53	1.50	3	236	255	50	84	97.8	125.68
6	42.50	45.00	448.900	1.10	92	1125	1.05	1.10	3	233	254	51	84	100.7	104.34
7	45.00	47.50	450.415	1.20	92	1052	1.20	1.20	3	233	255	51	84	108.8	106.44
8	47.50	50.00	452.165	1.10	93	835	1.29	1.30	3	229	248	52	83	101.1	94.31
9	50.00	52.50	453.850	0.98	93	431	1.67	1.70	3	230	250	52	84	96.6	73.83
10	52.50	55.00	455.680	1.10	93	742	1.39	1.40	3	231	246	52	84	103.2	90.86
11	55.00	57.50	457.465	1.10	93	1026	1.13	1.10	3	231	249	53	83	102.8	101.03
12	57.50	60.00	459.065	1.10	93	782	1.35		3	232	249	54	84	91.9	92.36
	Final DGM:		460.635												

RESULTS	Run Time	Vm	ΔP	Tm	Ts	Max Vac	ΔH	%ISO	BWS	Y_{qa}
	60.0 min	39.985 ft^3	1.14 in. WC	90.9 °F	900.5 °F	3	1.274 in. WC	102.8	0.062	1.2

Method 4 Data

Location Kentucky Cooperage - Lebanon, KY
Source Stave Char EU012
Project No. AST-2024-1515
Parameter PM,CPM
Analysis Gravimetric

Run 2	Date:	5/1/24				
Impinger No.	**1**	**2**	**3**	**4**	**5**	**Total**
Contents	Empty	Empty	H2O	Empty	Silica	--
Initial Mass, g	836.4	767.4	728.6	751.0	961.0	4044.4
Final Mass, g	843.4	768.4	754.3	755.8	970.9	4092.8
Gain	7.0	1.0	25.7	4.8	9.9	48.4
Run 3	**Date:**	5/1/24				
Impinger No.	**1**	**2**	**3**	**4**	**5**	**Total**
Contents	Empty	Empty	H2O	Empty	Silica	--
Initial Mass, g	862.5	766.4	788.8	756.0	970.5	4144.2
Final Mass, g	871.1	767.3	812.2	752.6	979.3	4182.5
Gain	8.6	0.9	23.4	-3.4	8.8	38.3
Run 4	**Date:**	5/1/24				
Impinger No.	**1**	**2**	**3**	**4**	**5**	**Total**
Contents	Empty	Empty	H2O	Empty	Silica	--
Initial Mass, g	841.0	770.1	754.3	755.8	970.9	4092.1
Final Mass, g	855.4	772.0	777.6	758.4	981.0	4144.4
Gain	14.4	1.9	23.3	2.6	10.1	52.3

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Location Kentucky Cooperage - Lebanon, KY
Source Stave Char EU-012
Project No. AST-2024-1515

Run Number		Run 2	Run 3	Run 4	Average
Date		5/1/24	5/1/24	5/1/24	--
Start Time		9:10	10:38	12:10	--
Stop Time		10:09	11:37	13:09	--
Input Data - Outlet					
Volumetric Flow Rate (M1-4), dscfm	Qs	4,249	4,106	4,176	4,177
Calculated Data - Outlet					
O_2 Concentration, % dry	C_{O_2}	17.7	17.1	17.4	17.4
CO_2 Concentration, % dry	C_{CO_2}	2.8	3.3	3.1	3.1
CO Concentration, ppmvd	C_{CO}	101.0	109.0	106.4	105.4
CO Emission Rate, ton/yr	ER_{COTPY}	8.20	8.55	8.49	8.42

Run 2 - RM Data

Location: Kentucky Cooperage - Lebanon, KY
Source: Stave Char EU-012
Project No.: AST-2024-1515
Date: 5/1/24

Time Unit Status	O_2 - Outlet % dry Valid	CO_2 - Outlet % dry Valid	CO - Outlet ppmvd Valid
Uncorrected Run Average (C_{obs})	17.58	2.80	100.56
Cal Gas Concentration (C_{MA})	10.00	10.00	100.00
Pretest System Zero Response	0.08	0.00	0.15
Posttest System Zero Response	0.10	0.02	-0.13
Average Zero Response (Co)	0.09	0.01	0.01
Pretest System Cal Response	9.95	9.94	99.63
Posttest System Cal Response	9.97	9.94	99.51
Average Cal Response (C_M)	9.96	9.94	99.57
Corrected Run Average (Corr)	17.72	2.81	100.99
9:10	20.41	0.49	156.75
9:11	15.64	4.53	55.96
9:12	19.05	1.14	118.36
9:13	16.73	3.90	148.21
9:14	15.04	4.95	45.21
9:15	20.41	0.45	149.87
9:16	15.27	4.80	83.28
9:17	19.21	1.04	100.08
9:18	17.03	3.63	147.13
9:19	15.56	4.48	47.22
9:20	20.53	0.25	140.36
9:21	15.52	4.61	97.80
9:22	16.97	2.90	86.65
9:23	19.06	1.97	156.36
9:24	15.48	4.58	77.60
9:25	19.67	0.70	101.30
9:26	16.56	3.99	137.24
9:27	20.32	0.31	31.36
9:28	16.29	4.01	122.59
9:29	16.71	3.42	97.18
9:30	20.66	0.16	86.62
9:31	16.33	3.58	33.53
9:32	20.17	0.78	132.42
9:33	15.56	4.47	37.96
9:34	20.57	0.27	135.01
9:35	16.05	4.10	39.52
9:36	14.44	5.54	113.99
9:37	18.47	1.63	118.62
9:38	17.27	3.47	153.08
9:39	19.05	1.20	27.34
9:40	16.96	3.69	133.65
9:41	17.15	2.77	34.39
9:42	18.15	2.74	147.98
9:43	15.47	4.62	47.19
9:44	19.84	0.61	133.64
9:45	15.88	4.59	138.72
9:46	18.12	1.90	47.40
9:47	18.15	2.73	148.63
9:48	15.39	4.65	52.54
9:49	20.62	0.17	118.71
9:50	15.42	4.70	92.85
9:51	18.37	1.71	83.77
9:52	17.51	3.28	159.83
9:53	15.10	4.93	52.23
9:54	20.28	0.34	142.58
9:55	15.88	4.32	120.17
9:56	15.31	4.62	61.90
9:57	20.31	0.66	157.66
9:58	15.20	4.86	94.17
9:59	20.60	0.17	89.76
10:00	15.49	4.55	93.43
10:01	20.16	0.39	75.87
10:02	16.10	4.22	125.44
10:03	17.95	2.06	50.89
10:04	18.09	2.79	145.34
10:05	16.15	3.74	34.66
10:06	20.06	1.01	131.56
10:07	15.46	4.63	90.76
10:08	17.06	2.87	98.97
10:09	18.48	2.51	150.26

Run 3 - RM Data

Location: Kentucky Cooperage - Lebanon, KY
Source: Stave Char EU-012
Project No.: AST-2024-1515
Date: 5/1/24

Time Unit Status	O_2 - Outlet % dry Valid	CO_2 - Outlet % dry Valid	CO - Outlet ppmvd Valid
Uncorrected Run Average (C_{obs})	17.03	3.30	108.53
Cal Gas Concentration (C_{MA})	10.00	10.00	100.00
Pretest System Zero Response	0.10	0.02	-0.13
Posttest System Zero Response	0.11	0.03	0.01
Average Zero Response (Co)	0.11	0.03	-0.06
Pretest System Cal Response	9.97	9.94	99.51
Posttest System Cal Response	9.98	9.98	99.65
Average Cal Response (C_M)	9.98	9.96	99.58
Corrected Run Average (Corr)	17.15	3.29	108.98
10:38	14.79	5.19	63.45
10:39	20.14	0.39	127.14
10:40	15.29	4.93	129.01
10:41	20.63	0.15	52.98
10:42	14.41	5.59	91.19
10:43	14.83	5.09	119.05
10:44	20.59	0.22	158.06
10:45	14.72	5.24	45.56
10:46	17.30	2.60	134.35
10:47	18.45	2.55	159.95
10:48	14.68	5.26	87.93
10:49	18.64	1.52	109.40
10:50	16.97	3.78	161.32
10:51	14.63	5.42	68.69
10:52	18.77	1.38	130.65
10:53	16.68	3.90	159.71
10:54	15.35	4.70	75.37
10:55	20.62	0.20	160.97
10:56	17.31	2.62	22.14
10:57	18.17	2.73	148.95
10:58	14.31	5.77	36.72
10:59	20.54	0.28	171.71
11:00	14.89	5.05	59.33
11:01	18.35	1.76	129.08
11:02	16.64	4.19	165.84
11:03	14.83	5.17	66.31
11:04	19.71	0.63	147.65
11:05	15.60	4.83	149.24
11:06	14.60	5.32	53.43
11:07	20.34	0.37	164.27
11:08	14.68	5.36	98.97
11:09	19.48	0.85	87.40
11:10	16.19	4.36	144.60
11:11	15.61	4.25	43.30
11:12	20.10	0.92	157.45
11:13	14.70	5.35	86.37
11:14	20.66	0.16	122.11
11:15	15.19	4.89	39.02
11:16	18.73	1.39	148.27
11:17	17.24	3.61	152.86
11:18	16.06	4.01	65.38
11:19	20.48	0.22	111.85
11:20	15.13	5.03	104.14
11:21	15.33	4.70	85.93
11:22	20.39	0.40	151.90
11:23	14.64	5.41	104.69
11:24	18.42	1.76	102.28
11:25	17.21	3.55	142.57
11:26	16.50	3.41	42.17
11:27	18.62	2.39	167.64
11:28	14.65	5.43	37.45
11:29	20.12	0.49	147.78
11:30	15.01	5.29	120.22
11:31	20.66	0.16	68.52
11:32	14.31	5.71	29.57
11:33	18.84	1.40	152.53
11:34	16.03	4.56	144.25
11:35	15.36	4.67	56.60
11:36	14.22	5.82	112.67
11:37	14.55	5.51	133.91

Run 4 - RM Data

Location: Kentucky Cooperage - Lebanon, KY
Source: Stave Char EU-012
Project No.: AST-2024-1515
Date: 5/1/24

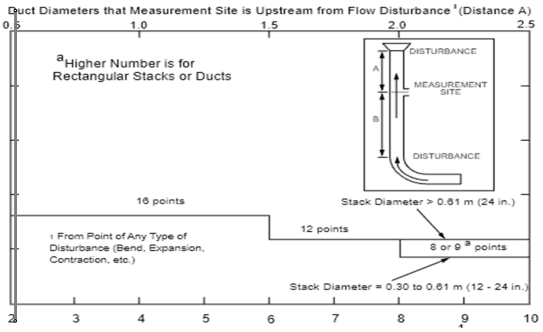
Time Unit Status	O_2 - Outlet % dry Valid	CO_2 - Outlet % dry Valid	CO - Outlet ppmvd Valid
Uncorrected Run Average (C_{obs})	17.27	3.07	106.10
Cal Gas Concentration (C_{MA})	10.00	10.00	100.00
Pretest System Zero Response	0.11	0.03	0.01
Posttest System Zero Response	0.09	0.01	-0.32
Average Zero Response (Co)	0.10	0.02	-0.16
Pretest System Cal Response	9.98	9.98	99.65
Posttest System Cal Response	9.96	9.98	99.84
Average Cal Response (C_M)	9.97	9.98	99.75
Corrected Run Average (Corr)	17.40	3.06	106.37
12:10	15.74	4.22	58.70
12:11	20.65	0.16	111.99
12:12	16.06	3.97	32.50
12:13	20.52	0.28	132.82
12:14	15.53	4.51	80.36
12:15	19.99	0.48	93.97
12:16	15.76	4.64	139.59
12:17	15.12	4.87	64.57
12:18	20.47	0.25	146.85
12:19	15.39	4.79	103.23
12:20	16.42	3.44	91.59
12:21	19.29	1.77	163.02
12:22	16.29	3.57	25.36
12:23	19.10	1.84	158.99
12:24	15.13	4.98	96.67
12:25	17.09	2.85	87.31
12:26	18.26	2.70	164.95
12:27	14.94	5.05	34.42
12:28	20.27	0.45	152.51
12:29	14.59	5.47	111.98
12:30	17.66	2.36	92.45
12:31	17.57	3.20	148.29
12:32	14.79	5.26	47.72
12:33	19.46	0.83	150.97
12:34	16.09	4.47	146.86
12:35	20.00	0.47	43.66
12:36	16.28	4.10	132.13
12:37	15.15	4.87	57.60
12:38	20.50	0.30	156.21
12:39	15.06	4.91	58.75
12:40	20.64	0.16	118.29
12:41	14.85	5.12	71.40
12:42	16.90	3.00	121.32
12:43	18.25	2.50	160.72
12:44	14.78	5.38	127.64
12:45	20.49	0.32	139.58
12:46	17.44	2.56	27.95
12:47	18.07	2.80	167.57
12:48	15.03	5.03	51.37
12:49	20.12	0.41	137.19
12:50	15.56	4.77	123.91
12:51	19.90	0.55	60.82
12:52	15.84	4.63	133.91
12:53	16.22	3.67	48.96
12:54	18.76	2.23	169.04
12:55	15.02	5.02	67.28
12:56	19.70	0.65	129.46
12:57	15.81	4.59	132.26
12:58	15.32	4.55	58.59
12:59	19.94	1.03	153.46
13:00	14.55	5.49	96.43
13:01	16.93	2.97	100.73
13:02	19.62	1.31	163.17
13:03	15.45	4.61	71.06
13:04	18.34	1.70	111.20
13:05	17.78	2.97	150.99
13:06	15.33	4.72	43.97
13:07	19.10	1.12	138.10
13:08	16.56	4.09	149.56
13:09	15.01	5.03	54.31

Method 1 Data

Location Kentucky Cooperage - Lebanon, KY
Source Stave Char EU-012
Project No. AST-2024-1515
Date: 05/01/24

Stack Parameters

Duct Orientation:	Vertical	
Duct Design:	Circular	
Distance from Far Wall to Outside of Port:	23.25	in
Nipple Length:	4.00	in
Depth of Duct:	19.25	in
Width of Duct:	--	in
Cross Sectional Area of Duct:	2.02	ft^2
Equivalent Diameter:	--	in
No. of Test Ports:	2	
Number of Readings per Point:	1	
Distance A:	8.3	ft
Distance A Duct Diameters:	5.2	**(must be ≥ 0.5)**
Distance B:	3.3	ft
Distance B Duct Diameters:	2.1	**(must be ≥ 2)**
Minimum Number of Traverse Points:	16	
Actual Number of Traverse Points:	3	
Measurer (Initial and Date):	NBG	
Reviewer (Initial and Date):	NAC	



CIRCULAR DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

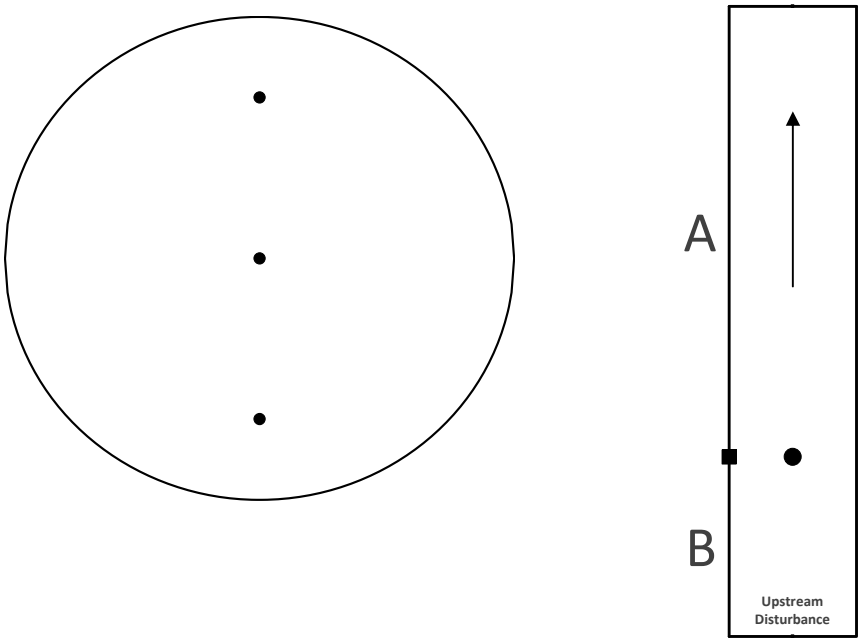
	2	3	4	5	6	7	8	9	10	11	12
1	14.6	16.7	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	50.0	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	83.3	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	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

**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	16.7	3.21	7.21
2	50.0	9.63	13.63
3	83.3	16.04	20.04
4	--	--	--
5	--	--	--
6	--	--	--
7	--	--	--
8	--	--	--
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = 8.3 ft.
B = 3.3 ft.
Depth of Duct = 19.25 in.

Cross Sectional Area



G5 Process

Emission Calculations

Location Kentucky Cooperage - Lebanon, KY
Source G5 Process EU-013 (Outlet)
Project No. AST-2024-1515
Parameter PM

Run Number		Run 1	Run 2	Run 4	Average
Date		4/30/24	4/30/24	5/1/24	--
Start Time		8:15	11:15	11:15	--
Stop Time		9:23	12:20	12:18	--
Run Time, min	(θ)	60.0	60.0	60.0	60.0
INPUT DATA					
Barrels Produced		245	235	320	267
Run Duration, min		68	65	63	65
Barrel Production Rate, barrels/hr		216.2	216.9	304.8	246.0
Barometric Pressure, in. Hg	(Pb)	29.10	29.10	29.14	29.11
Meter Correction Factor	(Y)	0.994	0.994	0.994	0.994
Orifice Calibration Value	(ΔH @)	1.630	1.630	1.630	1.630
Meter Volume, ft^3	(Vm)	43.906	41.645	39.175	41.575
Meter Temperature, °F	(Tm)	65.7	66.7	85.5	72.6
Meter Temperature, °R	(Tm)	525.3	526.4	545.2	532.3
Meter Orifice Pressure, in. WC	(ΔH)	1.442	1.325	1.188	1.318
Volume H_2O Collected, mL	(Vlc)	32.2	22.7	12.7	22.5
Nozzle Diameter, in	(Dn)	0.225	0.225	0.225	0.225
Area of Nozzle, ft^2	(An)	0.0003	0.0003	0.0003	0.0003
Filterable PM Mass, mg	(Mn)	3.4	2.4	2.7	2.8
ISOKINETIC DATA					
Standard Meter Volume, ft^3	(Vmstd)	42.790	40.494	36.815	40.033
Standard Water Volume, ft^3	(Vwstd)	1.519	1.071	0.599	1.063
Moisture Fraction Measured	(BWSmsd)	0.034	0.026	0.016	0.025
Moisture Fraction @ Saturation	(BWSsat)	0.030	0.040	0.046	0.039
Moisture Fraction	(BWS)	0.030	0.026	0.016	0.024
Meter Pressure, in Hg	(Pm)	29.21	29.20	29.23	29.21
Volume at Nozzle, ft^3	(Vn)	46.290	44.144	39.964	43.47
Isokinetic Sampling Rate, (%)	(I)	102.4	101.0	98.1	100.5
DGM Calibration Check Value, (+/- 5%)	(Y_{qa})	2.2	1.0	-1.2	0.7
EMISSION CALCULATIONS					
Filterable PM Concentration, grain/dscf	(C_s)	1.2E-03	9.1E-04	1.1E-03	1.1E-03
Filterable PM Emission Rate, lb/hr	(PMR)	0.33	0.23	0.27	0.28
Filterable PM Emission Factor, lb/barrel produced	(EF_{PM})	1.5E-03	1.1E-03	8.9E-04	1.2E-03

Underlined values contained one fraction below the detection limit; the MDL was used in calculations.

Emission Calculations

Location Kentucky Cooperage - Lebanon, KY
Source G5 Process EU-013 (Outlet)
Project No. AST-2024-1515
Parameter PM

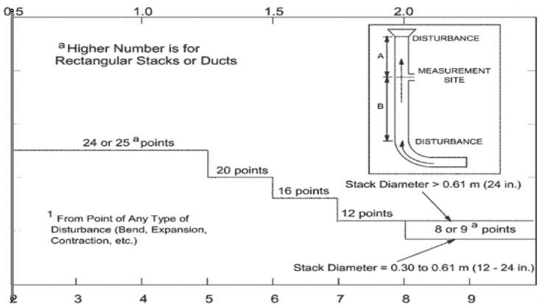
Run Number		Run 1	Run 2	Run 4	Average
Date		4/30/24	4/30/24	5/1/24	--
Start Time		8:15	11:15	11:15	--
Stop Time		9:23	12:20	12:18	--
Run Time, min		60.0	60.0	60.0	60.0
VELOCITY HEAD, in. WC					
Point 1		0.63	0.62	0.60	0.62
Point 2		0.60	0.63	0.54	0.59
Point 3		0.57	0.59	0.54	0.57
Point 4		0.62	0.57	0.59	0.59
Point 5		0.63	0.56	0.59	0.59
Point 6		0.64	0.58	0.54	0.59
Point 7		0.66	0.60	0.47	0.58
Point 8		0.70	0.69	0.43	0.61
Point 9		0.74	0.57	0.41	0.57
Point 10		0.80	0.62	0.39	0.60
Point 11		0.72	0.60	0.39	0.57
Point 12		0.64	0.60	0.38	0.54
Point 13		0.70	0.72	0.64	0.69
Point 14		0.72	0.74	0.64	0.70
Point 15		0.76	0.69	0.63	0.69
Point 16		0.67	0.68	0.64	0.66
Point 17		0.64	0.65	0.57	0.62
Point 18		0.61	0.49	0.50	0.53
Point 19		0.53	0.48	0.50	0.50
Point 20		0.47	0.43	0.46	0.45
Point 21		0.45	0.45	0.40	0.43
Point 22		0.44	0.43	0.40	0.42
Point 23		0.47	0.43	0.39	0.43
Point 24		0.48	0.42	0.38	0.43
CALCULATED DATA					
Square Root of ΔP, (in. WC)$^{1/2}$	(ΔP)	0.785	0.757	0.705	0.749
Pitot Tube Coefficient	(Cp)	0.840	0.840	0.840	0.840
Barometric Pressure, in. Hg	(Pb)	29.10	29.10	29.14	29.11
Static Pressure, in. WC	(Pg)	-0.85	-0.84	-0.78	-0.82
Stack Pressure, in. Hg	(Ps)	29.04	29.04	29.08	29.05
Stack Cross-sectional Area, ft^2	(As)	12.31	12.31	12.31	12.31
Temperature, °F	(Ts)	75.4	84.3	88.2	82.6
Temperature, °R	(Ts)	535.0	543.9	547.9	542.3
Moisture Fraction Measured	(BWSmsd)	0.034	0.026	0.016	0.025
Moisture Fraction @ Saturation	(BWSsat)	0.030	0.040	0.046	0.039
Moisture Fraction	(BWS)	0.030	0.026	0.016	0.024
O_2 Concentration, %	(O_2)	20.8	20.8	20.8	20.8
CO_2 Concentration, %	(CO_2)	0.3	0.3	0.3	0.3
Molecular Weight, lb/lb-mole (dry)	(Md)	28.89	28.88	28.88	28.88
Molecular Weight, lb/lb-mole (wet)	(Ms)	28.56	28.60	28.71	28.62
Velocity, ft/sec	(Vs)	45.3	44.0	41.0	43.4
VOLUMETRIC FLOW RATE					
At Stack Conditions, acfm	(Qa)	33,431	32,468	30,262	32,054
At Standard Conditions, scfm	(Qsw)	31,998	30,570	28,330	30,299
At Standard Conditions, dscfm	(Qs)	31,032	29,783	27,876	29,564

Method 1 Data

Location Kentucky Cooperage - Lebanon, KY
Source G5 Process EU-013 (Outlet)
Project No. AST-2024-1515
Date: 04/29/24

Stack Parameters

Duct Orientation:	Horizontal	
Duct Design:	Circular	
Distance from Far Wall to Outside of Port:	51.50	in
Nipple Length:	4.00	in
Depth of Duct:	47.50	in
Cross Sectional Area of Duct:	12.31	ft^2
No. of Test Ports:	2	
Distance A:	40.0	ft
Distance A Duct Diameters:	10.1	**(must be ≥ 0.5)**
Distance B:	8.0	ft
Distance B Duct Diameters:	2.0	**(must be ≥ 2)**
Minimum Number of Traverse Points:	24	
Actual Number of Traverse Points:	24	
Number of Readings per Point:	1	
Measurer (Initial and Date):	ABF-4/29/24	
Reviewer (Initial and Date):	MVT-4/29/24	



CIRCULAR DUCT

LOCATION OF TRAVERSE POINTS
Number of traverse points on a diameter

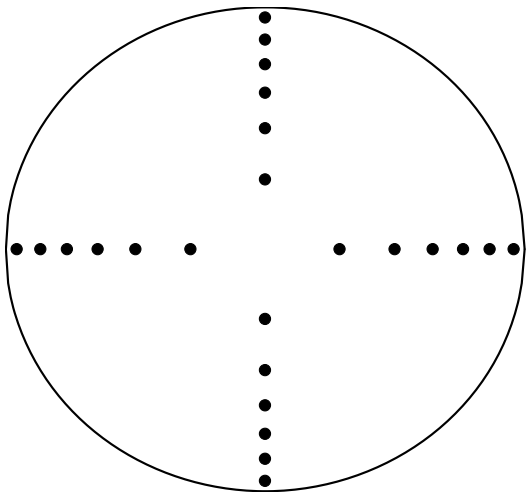
	2	3	4	5	6	7	8	9	10	11	12
1	14.6	--	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	--	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	--	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	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

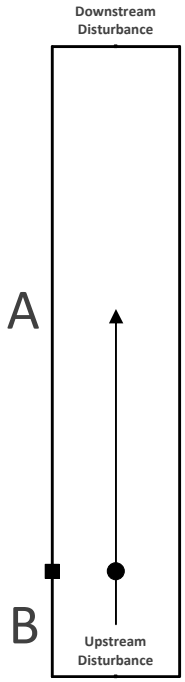
**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	2.1	1.00	5
2	6.7	3.18	7 3/16
3	11.8	5.61	9 5/8
4	17.7	8.41	12 7/16
5	25.0	11.88	15 7/8
6	35.6	16.91	20 15/16
7	64.4	30.59	34 9/16
8	75.0	35.63	39 5/8
9	82.3	39.09	43 1/16
10	88.2	41.90	45 7/8
11	93.3	44.32	48 5/16
12	97.9	46.50	50 1/2

Stack Diagram
A = 40 ft.
B = 8 ft.
Depth of Duct = 47.5 in.

Cross Sectional Area





Cyclonic Flow Check

Location Kentucky Cooperage - Lebanon, KY
Source G5 Process EU-013 (Outlet)
Project No. AST-2024-1515
Date 04/29/24

Sample Point	Angle (ΔP=0)
1	10
2	5
3	5
4	5
5	5
6	0
7	0
8	0
9	5
10	0
11	8
12	10
13	10
14	10
15	5
16	5
17	5
18	5
19	0
20	0
21	0
22	0
23	5
24	10
Average	5

Alliance TECHNICAL GROUP

Isokinetic Field Data

Location:	Kentucky Cooperage - Lebanon, KY			**Start Time:**	8:15	**Source:**	G5 Process EU-013 (Outlet)
Date:	4/30/24	**Run 1**	**VALID**	**End Time:**	9:23	**Project No.:**	AST-2024-1515 **Parameter:** PM

STACK DATA (EST)			EQUIPMENT			STACK DATA (EST)			FILTER NO.	STACK DATA (FINAL)		MOIST. DATA
Moisture:	3.0	% est.	Meter Box ID:	1664		Est. Tm:	70	°F	23906-A	Pb:	29.10 in. Hg	Vlc (ml)
Barometric:	29.09	in. Hg	Y:	0.994		Est. Ts:	74	°F		Pg:	-0.85 in. WC	32.2
Static Press:	-0.88	in. WC	ΔH @ (in.WC):	1.630		Est. ΔP:	0.57	in. WC		O_2:	20.84 %	K-FACTOR
Stack Press:	29.03	in. Hg	Probe ID:	PR-105-1		Est. Dn:	0.235	in.		CO_2:	0.34 %	2.343
CO_2:	1.0	%	Liner Material:	stainless steel		Target Rate:	0.75	scfm				
O_2:	20.0	%	Pitot ID:	PT-105		LEAK CHECKS	Pre	Mid 1	Mid 2 / Mid 3	Post	Check Pt. / Initial / Final / Corr.	
N_2/CO:	79.0	%	Pitot Cp/Type:	0.840	S-type	Leak Rate (cfm):	0.000	--	-- / --	0.000	Mid 1 (cf)	--
Md:	28.96	lb/lb-mole	Nozzle ID:	SS-303	SS	Vacuum (in Hg):	10	--	-- / --	3	Mid 2 (cf)	--
Ms:	28.63	lb/lb-mole	Nozzle Dn (in.):	0.225		Pitot Tube:	Pass	--	-- / --	Pass	Mid 3 (cf)	--
											Mid-Point Leak Check Vol (cf):	--

Sample Pt.	Sample Time (minutes) Begin	End	Dry Gas Meter Reading (ft^3)	Pitot Tube ΔP (in WC)	Gas Temperatures (°F) DGM Average Amb.	Stack Amb.	Orifice Press. ΔH (in. WC) Ideal	Actual	Pump Vac (in. Hg)	Gas Temperatures (°F) Probe Amb.	Filter Amb.	Imp Exit Amb.	Aux Amb.	% ISO	Vs (fps)
					77	78				78	79	74	-		
A	0.00	2.50	381.895	0.63	64	64	1.49	1.50	3	248	242	48	-	103.4	45.25
2	2.50	5.00	383.775	0.60	64	75	1.39	1.40	3	239	243	44	-	107.3	44.62
3	5.00	7.50	385.660	0.57	64	76	1.32	1.30	3	241	243	43	-	103.8	43.53
4	7.50	10.00	387.435	0.62	65	76	1.43	1.40	3	240	244	43	-	102.7	45.40
5	10.00	12.50	389.270	0.63	65	76	1.46	1.50	3	238	246	44	-	103.0	45.76
6	12.50	15.00	391.125	0.64	65	76	1.48	1.50	3	239	243	45	-	106.1	46.12
7	15.00	17.50	393.050	0.66	66	77	1.53	1.50	3	243	242	46	-	97.6	46.88
8	17.50	20.00	394.850	0.70	66	77	1.62	1.60	3	246	240	47	-	103.2	48.28
9	20.00	22.50	396.810	0.74	66	77	1.71	1.70	3	238	241	48	-	102.4	49.64
10	22.50	25.00	398.810	0.80	66	77	1.85	1.90	3	243	241	48	-	103.0	51.62
11	25.00	27.50	400.900	0.72	66	77	1.66	1.70	3	246	243	48	-	105.4	48.97
12	27.50	30.00	402.930	0.64	66	76	1.48	1.50	3	244	244	48	-	105.0	46.12
B	30.00	32.50	404.840	0.70	66	75	1.62	1.60	3	247	243	49	-	101.9	48.19
2	32.50	35.00	406.780	0.72	66	72	1.68	1.70	3	246	240	48	-	102.3	48.74
3	35.00	37.50	408.760	0.76	66	76	1.76	1.80	3	244	243	47	-	101.3	50.26
4	37.50	40.00	410.765	0.67	66	76	1.55	1.60	3	240	243	46	-	104.8	47.19
5	40.00	42.50	412.715	0.64	66	76	1.48	1.50	3	246	242	48	-	104.5	46.12
6	42.50	45.00	414.615	0.61	66	76	1.41	1.40	3	246	243	48	-	101.6	45.03
7	45.00	47.50	416.420	0.53	66	76	1.23	1.20	3	241	243	48	-	97.2	41.97
8	47.50	50.00	418.030	0.47	66	76	1.09	1.10	2	247	244	49	-	99.7	39.53
9	50.00	52.50	419.585	0.45	66	76	1.04	1.00	2	242	244	49	-	102.8	38.68
10	52.50	55.00	421.155	0.44	66	75	1.02	1.00	2	241	243	49	-	100.9	38.21
11	55.00	57.50	422.680	0.47	66	75	1.09	1.10	2	248	244	49	-	100.2	39.49
12	57.50	60.00	424.245	0.48	67	76	1.12	1.10	2	241	244	49	-	98.5	39.94
	Final DGM:		425.801												

RESULTS	Run Time		Vm		ΔP		Tm		Ts		Max Vac	ΔH		%ISO	BWS	Y_{qa}
	60.0	min	43.906	ft^3	0.62	in. WC	65.7	°F	75.4	°F	3	1.442	in. WC	102.4	0.030	2.2

Alliance TECHNICAL GROUP

Isokinetic Field Data

Location:	Kentucky Cooperage - Lebanon, KY			**Start Time:**	11:15	**Source:**	G5 Process EU-013 (Outlet)
Date:	4/30/24	Run 2	VALID	**End Time:**	12:20	**Project No.:**	AST-2024-1515	**Parameter:**	PM

STACK DATA (EST)			EQUIPMENT			STACK DATA (EST)			FILTER NO.		STACK DATA (FINAL)			MOIST. DATA
Moisture:	3.0	% est.	Meter Box ID:	1664		Est. Tm:	66	°F	23907-A		Pb:	29.10	in. Hg	Vlc (ml)
Barometric:	29.09	in. Hg	Y:	0.994		Est. Ts:	75	°F			Pg:	-0.84	in. WC	22.7
Static Press:	-0.88	in. WC	ΔH @ (in.WC):	1.630		Est. ΔP:	0.62	in. WC			O_2:	20.83	%	K-FACTOR
Stack Press:	29.03	in. Hg	Probe ID:	PR-105-1		Est. Dn:	0.231	in.			CO_2:	0.30	%	2.32
CO_2:	1.0	%	Liner Material:	stainless steel		Target Rate:	0.75	scfm						
O_2:	20.0	%	Pitot ID:	PT-105		LEAK CHECKS	Pre	Mid 1	Mid 2	Mid 3	Post	Check Pt.	Initial	Final	Corr.
N_2/CO:	79.0	%	Pitot Cp/Type:	0.840	S-type	Leak Rate (cfm):	0.000	--	--	--	0.000	Mid 1 (cf)			--
Md:	28.96	lb/lb-mole	Nozzle ID:	SS-303	SS	Vacuum (in Hg):	10	--	--	--	3	Mid 2 (cf)			--
Ms:	28.63	lb/lb-mole	Nozzle Dn (in.):	0.225		Pitot Tube:	Pass	--	--	--	Pass	Mid 3 (cf)			--
												Mid-Point Leak Check Vol (cf):			--

Sample Pt.	Sample Time (minutes)		Dry Gas Meter Reading (ft^3)	Pitot Tube ΔP (in WC)	Gas Temperatures (°F)		Orifice Press. ΔH (in. WC)		Pump Vac (in. Hg)	Gas Temperatures (°F)				% ISO	Vs (fps)
					DGM Average	Stack				Probe	Filter	Imp Exit	Aux		
	Begin	End			Amb.	Amb.	Ideal	Actual		Amb.	Amb.	Amb.	Amb.		
					--	--				--	--	--	--		
A	0.00	2.50	426.585	0.62	66	75	1.44	1.40	3	242	243	53	-	99.3	45.36
2	2.50	5.00	428.365	0.63	65	82	1.44	1.40	3	243	244	51	-	100.8	46.02
3	5.00	7.50	430.170	0.59	65	82	1.35	1.40	3	242	242	48	-	102.7	44.53
4	7.50	10.00	431.950	0.57	65	82	1.30	1.30	3	244	244	48	-	101.2	43.77
5	10.00	12.50	433.675	0.56	65	82	1.28	1.30	3	243	246	50	-	102.7	43.39
6	12.50	15.00	435.410	0.58	66	83	1.33	1.30	3	240	243	53	-	99.7	44.19
7	15.00	17.50	437.125	0.60	66	83	1.37	1.40	3	242	241	55	-	103.2	44.95
8	17.50	20.00	438.930	0.69	66	84	1.57	1.60	3	242	243	57	-	103.0	48.25
9	20.00	22.50	440.860	0.57	66	83	1.30	1.30	3	247	244	57	-	102.9	43.81
10	22.50	25.00	442.615	0.62	66	85	1.41	1.40	3	241	240	56	-	101.4	45.78
11	25.00	27.50	444.415	0.60	67	85	1.37	1.40	3	239	239	55	-	100.6	45.03
12	27.50	30.00	446.175	0.60	67	85	1.37	1.40	3	241	240	55	-	100.6	45.03
B	30.00	32.50	447.935	0.72	67	85	1.64	1.60	3	242	241	55	-	101.5	49.33
2	32.50	35.00	449.880	0.74	67	85	1.69	1.70	3	239	238	55	-	102.0	50.01
3	35.00	37.50	451.860	0.69	67	86	1.57	1.60	3	241	243	54	-	103.0	48.34
4	37.50	40.00	453.790	0.68	67	86	1.55	1.60	3	246	239	55	-	102.7	47.99
5	40.00	42.50	455.700	0.65	67	86	1.48	1.50	3	237	242	56	-	102.2	46.91
6	42.50	45.00	457.560	0.49	68	86	1.12	1.10	3	241	243	58	-	99.7	40.73
7	45.00	47.50	459.140	0.48	68	86	1.10	1.10	3	241	243	59	-	98.2	40.32
8	47.50	50.00	460.680	0.43	68	87	0.98	1.00	2	244	243	60	-	103.2	38.19
9	50.00	52.50	462.210	0.45	68	87	1.03	1.00	2	245	241	60	-	99.5	39.07
10	52.50	55.00	463.720	0.43	68	86	0.98	1.00	2	242	244	58	-	102.7	38.16
11	55.00	57.50	465.245	0.43	68	86	0.98	1.00	2	244	245	56	-	103.4	38.16
12	57.50	60.00	466.780	0.42	68	85	0.96	1.00	2	244	244	56	-	98.8	37.68
	Final DGM:		468.230												

RESULTS	Run Time		Vm		ΔP		Tm		Ts		Max Vac	ΔH		%ISO	BWS	Y_{qa}
	60.0	min	41.645	ft^3	0.58	in. WC	66.7	°F	84.3	°F	3	1.325	in. WC	101.0	0.026	1.0

Alliance TECHNICAL GROUP

Isokinetic Field Data

Location:	Kentucky Cooperage - Lebanon, KY			**Start Time:**	11:15	**Source:**	G5 Process EU-013 (Outlet)
Date:	5/1/24	Run 4	VALID	**End Time:**	12:18	**Project No.:**	AST-2024-1515	**Parameter:**	PM

STACK DATA (EST)			EQUIPMENT			STACK DATA (EST)			FILTER NO.	STACK DATA (FINAL)			MOIST. DATA
Moisture:	3.0	% est.	Meter Box ID:	1664		Est. Tm:	69	°F	23904-A	Pb:	29.14	in. Hg	Vlc (ml)
Barometric:	29.09	in. Hg	Y:	0.994		Est. Ts:	90	°F		Pg:	-0.78	in. WC	12.7
Static Press:	-0.88	in. WC	ΔH @ (in.WC):	1.630		Est. ΔP:	0.58	in. WC		O_2:	20.84	%	K-FACTOR
Stack Press:	29.03	in. Hg	Probe ID:	PR-105-1		Est. Dn:	0.236	in.		CO_2:	0.31	%	2.268
CO_2:	1.0	%	Liner Material:	stainless steel		Target Rate:	0.75	scfm					
O_2:	20.0	%	Pitot ID:	PT-105		LEAK CHECKS	Pre	Mid 1	Mid 2	Mid 3	Post	Check Pt.	Initial	Final	Corr.
N_2/CO:	79.0	%	Pitot Cp/Type:	0.840	S-type	Leak Rate (cfm):	0.000	--	--	--	0.000	Mid 1 (cf)			--
Md:	28.96	lb/lb-mole	Nozzle ID:	SS-303	SS	Vacuum (in Hg):	10	--	--	--	6	Mid 2 (cf)			--
Ms:	28.63	lb/lb-mole	Nozzle Dn (in.):	0.225		Pitot Tube:	Pass	--	--	--	Pass	Mid 3 (cf)			--
												Mid-Point Leak Check Vol (cf):			--

Sample Pt.	Sample Time (minutes)		Dry Gas Meter Reading (ft^3)	Pitot Tube ΔP (in WC)	Gas Temperatures (°F)		Orifice Press. ΔH (in. WC)		Pump Vac (in. Hg)	Gas Temperatures (°F)				% ISO	Vs (fps)
					DGM Average	Stack				Probe	Filter	Imp Exit	Aux		
	Begin	End			Amb. --	Amb. --	Ideal	Actual		Amb. --	Amb. --	Amb. --	Amb. --		
A	0.00	2.50	513.280	0.60	79	86	1.40	1.40	5	239	242	55	-	94.5	45.07
2	2.50	5.00	514.970	0.54	80	87	1.26	1.30	5	246	243	48	-	101.9	42.80
3	5.00	7.50	516.700	0.54	82	87	1.26	1.30	5	243	242	44	-	100.9	42.80
4	7.50	10.00	518.420	0.59	82	87	1.38	1.40	5	241	242	44	-	96.8	44.74
5	10.00	12.50	520.145	0.59	83	88	1.38	1.40	5	241	244	45	-	99.0	44.78
6	12.50	15.00	521.910	0.54	83	88	1.26	1.30	5	241	241	46	-	102.0	42.84
7	15.00	17.50	523.650	0.47	84	88	1.10	1.10	5	241	242	48	-	98.1	39.97
8	17.50	20.00	525.215	0.43	85	87	1.01	1.00	5	243	241	49	-	101.3	38.19
9	20.00	22.50	526.765	0.41	85	88	0.96	1.00	5	243	243	51	-	101.1	37.33
10	22.50	25.00	528.275	0.39	85	88	0.92	0.90	5	244	242	52	-	98.5	36.41
11	25.00	27.50	529.710	0.39	85	88	0.92	0.90	4	242	244	52	-	100.2	36.41
12	27.50	30.00	531.170	0.38	86	88	0.90	0.90	4	243	242	53	-	100.6	35.94
B	30.00	32.50	532.620	0.64	86	88	1.51	1.50	5	240	242	53	-	97.0	46.64
2	32.50	35.00	534.430	0.64	86	89	1.50	1.50	6	240	242	52	-	96.5	46.68
3	35.00	37.50	536.230	0.63	87	89	1.48	1.50	6	240	242	50	-	100.1	46.31
4	37.50	40.00	538.085	0.64	87	89	1.51	1.50	6	240	243	49	-	99.8	46.68
5	40.00	42.50	539.950	0.57	88	89	1.34	1.30	6	241	244	49	-	100.4	44.05
6	42.50	45.00	541.725	0.50	88	89	1.18	1.20	5	242	243	50	-	100.9	41.26
7	45.00	47.50	543.395	0.50	88	89	1.18	1.20	5	242	241	50	-	99.6	41.26
8	47.50	50.00	545.045	0.46	88	89	1.09	1.10	5	242	241	50	-	98.5	39.58
9	50.00	52.50	546.610	0.40	89	89	0.95	1.00	5	243	243	50	-	100.0	36.90
10	52.50	55.00	548.095	0.40	89	89	0.95	1.00	4	243	241	50	-	102.1	36.90
11	55.00	57.50	549.610	0.39	89	89	0.92	0.90	4	243	244	50	-	98.2	36.44
12	57.50	60.00	551.050	0.38	89	89	0.90	0.90	4	242	241	50	-	97.1	35.97
	Final DGM:		552.455												

RESULTS	Run Time		Vm		ΔP		Tm		Ts		Max Vac	ΔH		%ISO	BWS	Y_{qa}
	60.0	min	39.175	ft^3	0.50	in. WC	85.5	°F	88.2	°F	6	1.188	in. WC	98.1	0.016	-1.2

Method 4 Data

Location Kentucky Cooperage - Lebanon, KY
Source G5 Process EU-013 (Outlet)
Project No. AST-2024-1515
Parameter PM
Analysis Gravimetric

Run 1	**Date:**	4/30/24			
Impinger No.	**1**	**2**	**3**	**4**	**Total**
Contents	H2O	H2O	Empty	Silica	--
Initial Mass, g	752.2	853.3	752.0	963.6	3321.1
Final Mass, g	770.3	855.9	754.7	972.4	3353.3
Gain	18.1	2.6	2.7	8.8	32.2
Run 2	**Date:**	4/30/24			
Impinger No.	**1**	**2**	**3**	**4**	**Total**
Contents	H2O	H2O	Empty	Silica	--
Initial Mass, g	748.5	860.0	771.0	951.2	3330.7
Final Mass, g	757.2	862.4	772.8	961.0	3353.4
Gain	8.7	2.4	1.8	9.8	22.7
Run 4	**Date:**	5/1/24			
Impinger No.	**1**	**2**	**3**	**4**	**Total**
Contents	H2O	H2O	Empty	Silica	--
Initial Mass, g	773.7	851.5	754.6	965.3	3345.1
Final Mass, g	778.6	851.0	754.8	973.4	3357.8
Gain	4.9	-0.5	0.2	8.1	12.7

Appendix C

Alliance Technical Group, LLC
Analytical Services
214 Central Circle
Decatur, AL 35603
(256) 351-0121
www.stacktest.com

Analytical Laboratory Report

Kentucky Cooperage
712 Main Street
Lebanon, Kentucky 40033

Project No. AST-2024-1515-A LS

Version No. LT 2022-00_24.0

Certification Statement

Alliance Analytical Services, LLC (AAS) has completed the analysis as described in this report. Results apply only to the source(s) tested and operating condition(s) for the specific test date(s) and time(s) identified within this report. All results are intended to be considered in their entirety, and AAS is not responsible for use of less than the complete test report without written consent. This report shall not be reproduced in full or in part without written approval from the customer.

To the best of my knowledge and abilities, all information, facts and test data are correct. Data presented in this report has been checked for completeness and is accurate, error-free and legible. Any deviations or problems are detailed in the relevant sections on the test report.

This document was prepared in portable document format (.pdf) and contains pages as identified in the bottom footer of this document.

Validation Signature

The analytical data and all QC contained within this report was reviewed and validated by the following individual.

Digitally signed by John Lawrence
DN: OU=Alliance Analytical Services, O=Alliance Technical Group, CN=John Lawrence, E=John.Lawrence@AllianceTG.com
Reason: I have reviewed this document
Location:
Date: 2024.05.09 10:41:40-05'00'
Foxit PDF Editor Version: 12.1.5

John Lawrence
Laboratory Manager

Date

Project Narrative

Analytical Method(s):	*Method 5 - Determination of Particulate Matter Emissions From Stationary Sources*
Filterable	The filter(s) were oven dried and desiccated per the method until a final weight was obtained. The liquid fractions were extracted if required, evaporated and cooled until a final weight was obtained. These fractions were summed together to provide the total Filterable Particulate Matter collected.
MDL	The Minimum Detection Level (MDL) is 0.5 mg per fraction. If the measured result for a fraction is less than the MDL, the MDL was used in ensuing calculations.
Blank Correction	If blank correction is performed, only blank values returned higher than the MDL are used. If a blank returns a value less than the MDL, no correction is included.
Custody:	The samples were received by John Lawrence on 05/03/24 in Decatur, AL. The samples were received in good condition with proper Chain-of-Custody documentation. No apparent container problems were noted upon receipt. Prior to analysis, the samples were kept secure with access limited to authorized personnel of AAS.
Number of Samples:	9
Labeling:	Acceptable
Analyst:	Rebecca Pope- Laboratory Analyst
Equipment:	Ohaus Balance PX224, S/N B919636400. This scale was used for analytical determinations. A&D Weighing AND EJ-1500, S/N 5A2845843. This scale was only used to measure the total mass of rinse collected. Analysis was performed on the same balance as the associated tare. Quincy Lab Inc oven, 40CG, SN G4-007640.
Lab Reagents:	Acetone Lot Number: 232064
QC Notes:	The samples met the minimum criteria established by the relevant method.
Reporting Notes:	The run 3 samples were HELD per the COC.
Certifications:	Primary Accreditation: Louisiana Environmental Laboratory Accreditation Program (LELAP) Agency Interest (AI) No. 194891 Certificate: 05054, Expiration Date: 6/30/24 Secondary Accreditation: Texas Commission on Environmental Quality Certificate: T104704540-TX-C24-00053, Expiration Date: 2/28/25 Virginia Environmental Laboratory Accreditation Program (VELAP) VA Laboratory ID: 460299, Certificate: 12591 Expiration Date: 9/14/2024
State Registrations:	PADEP # 68-04598

Client	Kentucky Cooperage
City, State	Lebanon, KY
Project No.	AST-2024-1515-A
Method	EPA Method 5

Front Half Filter						
Lab ID	9639		9640		9642	
Field ID	EU-013 Outlet-Run 1		EU-013 Outlet-Run 2		EU-013 Outlet-Run 4	
Filter ID	23906-A		23907-A		23904-A	
Filter Tare Weight, g	0.5073		0.5159		0.5300	
Date - Oven	5/6/24		5/6/24		5/6/24	
Time - Oven	7:30		7:30		7:30	
Date of Weighing	5/6/24		5/6/24		5/6/24	
Time of Weighing	10:43		10:44		10:45	
Filter Weight, g	0.5075		0.5161		0.5301	
Filter PM Mass, mg*	**0.5**		**0.5**		**0.5**	
Front Half Rinse						
Lab ID	9647		9648		9650	
Field ID	EU-013 Outlet-Run 1		EU-013 Outlet-Run 2		EU-013 Outlet-Run 4	
Beaker ID	9647		9648		9650	
Beaker tare, g	4.2675		4.3309		4.3444	
Field Vessel with Acetone, g	91.8		85.9		102.2	
Empty Field Vessel,g	28.3		28.7		28.9	
Acetone Mass, g	63.5		57.2		73.3	
Date - Dessicator	5/6/24		5/6/24		5/6/24	
Time - Dessicator	9:30		9:30		9:30	
Date of Weighing	5/7/24	5/9/24	5/7/24	5/9/24	5/7/24	5/9/24
Time of Weighing	9:31	7:15	9:32	7:16	9:33	7:17
Weight, g	4.2705	4.2707	4.3329	4.3331	4.3466	4.3470
Rinse PM Mass, mg*	**3.1**		**2.1**		**2.4**	
Blank Corrected	Yes					
Residue from Blank (mg/g)	**0.0031**		**0.0031**		**0.0031**	
Acetone residue from rinse (mg)	**0.2**		**0.2**		**0.2**	
Max Acetone Residue (mg)	**0.6**		**0.6**		**0.7**	
Amount Subtracted for Blank (mg)	**0.2**		**0.2**		**0.2**	
Total Filterable PM Mass, mg	**3.4**		**2.4**		**2.7**	

*The total results have been calculated based on MDL values for any sample fractions which were below the MDL.

Client	Kentucky Cooperage
City, State	Lebanon, KY
Project No.	AST-2024-1515-A
Method	EPA Method 5

Blank Rinse		
Lab ID	9651	
Field ID	Acetone Blank	
Beaker ID	9651	
Beaker tare, g	4.3363	
Field Vessel with Acetone, g	351.1	
Empty Field Vessel, g	28.0	
Acetone Mass, g	323.1	
Date - Dessicator	5/6/24	
Time - Dessicator	9:30	
Date of Weighing	5/7/24	5/9/24
Time of Weighing	9:34	7:18
Weight, g	4.3374	4.3372
Measured Blank Mass, mg	**1.0**	
Blank Mass, mg*	**1.0**	
Blank Mass, mg/g	**0.0031**	

Alliance SOURCE TESTING

Chain-Of-Custody

Version No. LT 2017-01_17.0

Alliance Source Testing, LLC - Lab Services
214 Central Circle, Decatur, AL 35603
Phone (256) 351-0121

Client Name Kentucky Cooperage

City, State Lebanon, KY

Source ~~EU-013~~ Inlet, EU-013 Outlet 5-3-24

Project No. 24-1515

Turn Around Time ✔ Standard ☐ Expedited ____ days

Blank Manuf./Lot # ____

Blank Manuf./Lot # ____

Sample ID	Number of Containers	Date Collected	Time Recovered	Collector Initials	HOLD	Method/Media												
						Method 5				Method 17		Method 201A				Method 202		
						Filter Number - 83mm Quartz	Filter Number - 83mm Teflon	Probe Nozzle Rinse - Acetone	Probe Nozzle Rinse - 1-bromopropane	Filter Number - 47mm Quartz	Nozzle Rinse - Acetone	PM 2.5 Filter Number- 47mm Quartz	PM 2.5 Rinse - Acetone	PM 10 Filter Number- 47mm Quartz	PM 10 Rinse - Acetone	CPM Filter - 83mm Teflon	Condensate Catch - DIUF	Solvent Rinse - Acetone/Hexane
M5 - EU-013 Outlet - Run 1	2	4/30/24	9:30	NBG		23906-A		✔										
M5 - EU-013 Outlet - Run 2	2	4/30/24	12:30	NBG		23907-A		✔										
M5 - EU-013 Outlet - Run 3	2	4/30/24	15:30	NBG	✔	23911-A		✔										
M5 - EU-013 Outlet - Run 4	2	5/1/24	12:30	NBG		23904-A												
M5 Acetone Blank	1	4/30/24		NBG				✔										

Relinquished By _____ Date 5/3/24 Received By _____ Date 5-3-24

Relinquished By _____ Date _____ Received By _____ Date _____

Relinquished By _____ Date _____ Received By _____ Date _____

Sample Container Recieved Temperature (°F) 69.9

Notes

AST Office:DEC

Page 1 of 1

Weigh-Tec
4615 Marsha Ave
Decatur, Al. 35603

Weigh-Tec
Scale Test / Calibration Report
ISO/IEC 17025:2017 Accredited

Rev: 8/1/19 Cal. Rep. 4
Accreditation# 74114

Report Number: AST-0623-001

Customer	Location	Cal. Date	Expiration Date
Alliance Source Testing	**214 Central Circle SW Decatur, AL 35603**	**6/29/2023**	**6/24**

ID	Manufactuer	Model	Serial	Description	Capacity	Min. Grad.
	Ohaus	PA214	B919636400	Balance Room	210 g	0.0001g

REPEATABILITY TEST

As Found				As Left			
Test Wt.	Tolerance	Indication	Error	Test Wt.	Tolerance	Indication	Error
0	0.0000	0.0000	0.0000	0	0.0000	0.0000	0.0000
5	0.0001	5.0000	0.0000	5	0.0001	5.0000	0.0000
0	0.0000	0.0000	0.0000	0	0.0000	0.0000	0.0000

SHIFT TEST

As Found				As Left			
Test Wt.	Tolerance	Indication	Error	Test Wt.	Tolerance	Indication	Error
5	0.0001	5.0000	0.0000	5	0.0001	5.0000	0.0000
5	0.0001	5.0000	0.0000	5	0.0001	5.0000	0.0000
5	0.0001	5.0000	0.0000	5	0.0001	5.0000	0.0000
5	0.0001	5.0000	0.0000	5	0.0001	5.0000	0.0000

STRAIN TEST

As Found				As Left			
Test Wt.	Tolerance	Indication	Error	Test Wt.	Tolerance	Indication	Error
0.2	0.0001	0.2000	0.0000	0.2	0.0001	0.2000	0.0000
1	0.0001	1.0000	0.0000	1	0.0001	1.0000	0.0000
5	0.0001	5.0000	0.0000	5	0.0001	5.0000	0.0000
50	0.0003	50.0000	0.0000	50	0.0003	50.0000	0.0000
150	0.0003	150.0000	0.0000	150	0.0003	150.0000	0.0000

DECREASING LOAD TEST | **COUNTING TEST**

TOLERANCE

Tolerance: NIST HB44		Class: I	
AS FOUND		**AS LEFT**	
In Tolerance	Out of Tolerance	In Tolerance	Out of Tolerance
YES		**YES**	

ENVIROMENT		
Enviromental Conditions Have Been Met?	**YES**	Exceptions and Conditions Needing Attention:

CALIBRATION STANDARDS USED		***Expanded uncertainty (U) expressed at approximatley 95% with K=2 factor**	
Unit # (s)	Kits: 202002 LB / 2288 KG	N.I.S.T. Traceability (Exp 2/2024)	Measurement Uncertainty
50's (3-1 Thru 3-10), 1k's and 2k'sCast		02242306, GA24327, 02242304, 05132203, LA22-707	0.00011g

INVOLVED PARTIES

Technician(s)	License Number(s)	Customer Representative
	502908	**John Lawrence**
Test Method: Customer Stated Weight Increments	*Authorized by: Dawn Freeman QA Manager on 7-3-23*	

Weigh-Tec
4615 Marsha Ave
Decatur, Al. 35603

Weigh-Tec
Scale Test / Calibration Report
ISO/IEC 17025:2017 Accredited

Rev: 8/1/19 Cal. Rep. 4
Accreditation# 74114

Report Number: AST-0623-003

Customer	Location	Cal. Date	Expiration Date
Alliance Source Testing	**214 Central Circle SW Decatur, AL 35603**	**6/29/2023**	**6/24**

ID	Manufactuer	Model	Serial	Description	Capacity	Min. Grad.
	A&D	EJ-1500	5A2845843	LAB	1500 g	0.1g

REPEATABILITY TEST

As Found				As Left			
Test Wt.	Tolerance	Indication	Error	Test Wt.	Tolerance	Indication	Error
0	0.0	0.0	0.0	0	0.0	0.0	0.0
20	0.1	20.0	0.0	20	0.1	20.0	0.0
0	0.0	0.0	0.0	0	0.0	0.0	0.0

SHIFT TEST

As Found				As Left			
Test Wt.	Tolerance	Indication	Error	Test Wt.	Tolerance	Indication	Error
20	0.1	20.0	0.0	20	0.1	20.0	0.0
20	0.1	20.0	0.0	20	0.1	20.0	0.0
20	0.1	20.0	0.0	20	0.1	20.0	0.0
20	0.1	20.0	0.0	20	0.1	20.0	0.0

STRAIN TEST

As Found				As Left			
Test Wt.	Tolerance	Indication	Error	Test Wt.	Tolerance	Indication	Error
20	0.1	20.0	0.0	20	0.1	20.0	0.0
100	0.1	100.0	0.0	100	0.1	100.0	0.0
200	0.1	200.0	0.0	200	0.1	200.0	0.0
500	0.1	500.0	0.0	500	0.1	500.0	0.0
1000	0.1	1000.0	0.0	1000	0.1	1000.0	0.0

DECREASING LOAD TEST | **COUNTING TEST**

TOLERANCE

Tolerance: NIST HB-44		Class: I	
AS FOUND		**AS LEFT**	
In Tolerance	Out of Tolerance	In Tolerance	Out of Tolerance
YES		**YES**	

ENVIROMENT		
Enviromental Conditions Have Been Met?	**YES**	Exceptions and Conditions Needing Attention:

CALIBRATION STANDARDS USED		***Expanded uncertainty (U) expressed at approximatley 95% with K=2 factor**	
Unit # (s)	Kits: 202002 LB / 2288 KG	N.I.S.T. Traceability (Exp 2/2024)	Measurement Uncertainty
50's (3-1 Thru 3-10), 1k's and 2k'sCast		02242306, GA24327, 02242304, 05132203, LA22-707	0.11g

INVOLVED PARTIES

Technician(s)	License Number(s)	Customer Representative
	502908	**John Lawrence**
Test Method: Customer Stated Weight Increments	*Authorized by: Dawn Freeman QA Manager on 7-3-23*	

Filter ID	Weight 1 (g)	Date	Initials	Oven ID	Oven Temp	Thermometer
23880-A	0.5135	03/13/24	JRL	S/N G4-007640	105° C	378129
23881-A	0.5260	03/13/24	JRL	S/N G4-007640	105° C	378129
23882-A	0.5301	03/13/24	JRL	S/N G4-007640	105° C	378129
23883-A	0.5202	03/13/24	JRL	S/N G4-007640	105° C	378129
23884-A	0.5243	03/13/24	JRL	S/N G4-007640	105° C	378129
23885-A	0.5312	03/13/24	JRL	S/N G4-007640	105° C	378129
23886-A	0.5149	03/13/24	JRL	S/N G4-007640	105° C	378129
23887-A	0.4997	03/13/24	JRL	S/N G4-007640	105° C	378129
23888-A	0.5148	03/13/24	JRL	S/N G4-007640	105° C	378129
23889-A	0.5032	03/13/24	JRL	S/N G4-007640	105° C	378129
23890-A	0.5033	03/13/24	JRL	S/N G4-007640	105° C	378129
23891-A	0.5164	03/13/24	JRL	S/N G4-007640	105° C	378129
23892-A	0.5101	03/13/24	JRL	S/N G4-007640	105° C	378129
23893-A	0.4828	03/13/24	JRL	S/N G4-007640	105° C	378129
23894-A	0.5076	03/13/24	JRL	S/N G4-007640	105° C	378129
23895-A	0.5111	03/13/24	JRL	S/N G4-007640	105° C	378129
23896-A	0.5205	03/13/24	JRL	S/N G4-007640	105° C	378129
23897-A	0.4867	03/13/24	JRL	S/N G4-007640	105° C	378129
23898-A	0.5105	03/13/24	JRL	S/N G4-007640	105° C	378129
23899-A	0.5083	03/13/24	JRL	S/N G4-007640	105° C	378129
23900-A	0.5179	03/13/24	JRL	S/N G4-007640	105° C	378129
23901-A	0.5276	03/13/24	JRL	S/N G4-007640	105° C	378129
23902-A	0.5258	03/13/24	JRL	S/N G4-007640	105° C	378129
23903-A	0.5309	03/13/24	JRL	S/N G4-007640	105° C	378129
23904-A	0.5300	03/13/24	JRL	S/N G4-007640	105° C	378129
23905-A	0.5146	03/13/24	JRL	S/N G4-007640	105° C	378129
23906-A	0.5073	03/13/24	JRL	S/N G4-007640	105° C	378129
23907-A	0.5159	03/13/24	JRL	S/N G4-007640	105° C	378129
23908-A	0.5096	03/13/24	JRL	S/N G4-007640	105° C	378129
23909-A	0.5093	03/13/24	JRL	S/N G4-007640	105° C	378129
23910-A	0.5141	03/13/24	JRL	S/N G4-007640	105° C	378129
23911-A	0.5087	03/13/24	JRL	S/N G4-007640	105° C	378129
23912-A	0.5082	03/13/24	JRL	S/N G4-007640	105° C	378129
23913-A	0.4891	03/13/24	JRL	S/N G4-007640	105° C	378129
23914-A	0.5129	03/13/24	JRL	S/N G4-007640	105° C	378129
23915-A	0.5110	03/13/24	JRL	S/N G4-007640	105° C	378129
23916-A	0.5101	03/13/24	JRL	S/N G4-007640	105° C	378129
23917-A	0.4885	03/13/24	JRL	S/N G4-007640	105° C	378129
23918-A	0.5133	03/13/24	JRL	S/N G4-007640	105° C	378129
23919-A	0.5167	03/13/24	JRL	S/N G4-007640	105° C	378129

This is the last page of the report.

Alliance Technical Group, LLC
Analytical Services
214 Central Circle
Decatur, AL 35603
(256) 351-0121
www.stacktest.com

Analytical Laboratory Report

Kentucky Cooperage
712 Main Street
Lebanon, Kentucky 40033

Project No. AST-2024-1515-B LS

Version No. LT 2022-00_24.0

Certification Statement

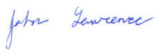
Alliance Analytical Services, LLC (AAS) has completed the analysis as described in this report. Results apply only to the source(s) tested and operating condition(s) for the specific test date(s) and time(s) identified within this report. All results are intended to be considered in their entirety, and AAS is not responsible for use of less than the complete test report without written consent. This report shall not be reproduced in full or in part without written approval from the customer.

To the best of my knowledge and abilities, all information, facts and test data are correct. Data presented in this report has been checked for completeness and is accurate, error-free and legible. Any deviations or problems are detailed in the relevant sections on the test report.

This document was prepared in portable document format (.pdf) and contains pages as identified in the bottom footer of this document.

Validation Signature

The analytical data and all QC contained within this report was reviewed and validated by the following individual.



Digitally signed by John Lawrence
DN: OU=Alliance Analytical Services, O=Alliance Technical Group, CN=John Lawrence, E=John.Lawrence@AllianceTG.com
Reason: I have reviewed this document
Location:
Date: 2024.05.09 10:48:20-05'00'
Foxit PDF Editor Version: 12.1.5

John Lawrence
Laboratory Manager

Date

Project Narrative

Analytical Method(s):	*Method 5 - Determination of Particulate Matter Emissions From Stationary Sources* *Method 202 - Dry Impinger Method for Determining Condensable Particulate Matter Emissions From Stationary Sources*
Filterable	The filter(s) were oven dried and desiccated per the method until a final weight was obtained. The liquid fractions were extracted if required, evaporated and cooled until a final weight was obtained. These fractions were summed together to provide the total Filterable Particulate Matter collected.
Condensable	The filter(s) were cut up and extracted per the method. The organic extract was added to the organic rinse, and the inorganic extract was added to the inorganic rinse. The inorganic fraction was extracted with solvent per the method. Extracts were combined with the organic rinse. The organic and inorganic fractions were evaporated and desiccated until a final weight was obtained.
MDL	The Minimum Detection Level (MDL) is 0.5 mg per fraction. If the measured result for a fraction is less than the MDL, the MDL was used in ensuing calculations.
Blank Correction	If blank correction is performed, only blank values returned higher than the MDL are used. If a blank returns a value less than the MDL, no correction is included. Method 202 Recovery Blank corrections are applied by fraction (inorganic subtracted from inorganic; organic subtracted from organic).
Custody:	The samples were received by John Lawrence on 05/03/24 in Decatur, AL. The samples were received in good condition with proper Chain-of-Custody documentation. No apparent container problems were noted upon receipt. Prior to analysis, the samples were kept secure with access limited to authorized personnel of AAS.
Number of Samples:	28
Labeling:	Acceptable
Analyst:	Rebecca Pope- Laboratory Analyst
Equipment:	Ohaus Balance PX224, S/N B919636400. This scale was used for analytical determinations. A&D Weighing AND EJ-1500, S/N 5A2845843. This scale was only used to measure the total mass of rinse collected. Analysis was performed on the same balance as the associated tare. Quincy Lab Inc oven, 40CG, SN G4-007640.
Lab Reagents:	Acetone Lot Number: 232064 Hexane Lot Number: 232082
QC Notes:	The samples met the minimum criteria established by the relevant method.
Reporting Notes:	The run 1 samples were HELD per the COC. The M202 DI water and hexane reagent blanks were HELD.
Certifications:	Primary Accreditation: Louisiana Environmental Laboratory Accreditation Program (LELAP) Agency Interest (AI) No. 194891 Certificate: 05054, Expiration Date: 6/30/24 Secondary Accreditation: Texas Commission on Environmental Quality Certificate: T104704540-TX-C24-00053, Expiration Date: 2/28/25 Virginia Environmental Laboratory Accreditation Program (VELAP) VA Laboratory ID: 460299, Certificate: 12591 Expiration Date: 9/14/2024
State Registrations:	PADEP # 68-04598

Client	Kentucky Cooperage
City, State	Lebanon, KY
Project No.	AST-2024-1515-B
Method	EPA Method 5

Front Half Filter						
Lab ID	9636		9637		9638	
Field ID	EU-012-Run 2		EU-012-Run 3		EU-012-Run 4	
Filter ID	23909-A		23905-A		23910-A	
Filter Tare Weight, g	0.5093		0.5146		0.5141	
Date - Oven	5/6/24		5/6/24		5/6/24	
Time - Oven	7:30		7:30		7:30	
Date of Weighing	5/6/24		5/6/24		5/6/24	
Time of Weighing	10:40		10:41		10:42	
Filter Weight, g	0.5235		0.5232		0.5232	
Filter PM Mass, mg*	**14.2**		**8.6**		**9.1**	
Front Half Rinse						
Lab ID	9644		9645		9646	
Field ID	EU-012-Run 2		EU-012-Run 3		EU-012-Run 4	
Beaker ID	9644		9645		9646	
Beaker tare, g	4.2806		4.3086		4.2847	
Field Vessel with Acetone, g	130.1		107.8		129.6	
Empty Field Vessel,g	28.8		28.4		28.6	
Acetone Mass, g	101.3		79.4		101.0	
Date - Dessicator	5/6/24		5/6/24		5/6/24	
Time - Dessicator	9:30		9:30		9:30	
Date of Weighing	5/7/24	5/9/24	5/7/24	5/9/24	5/7/24	5/9/24
Time of Weighing	9:35	7:00	9:36	7:01	9:37	7:02
Weight, g	4.2862	4.2860	4.3149	4.3152	4.2955	4.2953
Rinse PM Mass, mg*	**5.5**		**6.4**		**10.7**	
Blank Corrected	Yes					
Residue from Blank (mg/g)	**0.0058**		**0.0058**		**0.0058**	
Acetone residue from rinse (mg)	**0.6**		**0.5**		**0.6**	
Max Acetone Residue (mg)	**1.0**		**0.8**		**1.0**	
Amount Subtracted for Blank (mg)	**0.6**		**0.5**		**0.6**	
Total Filterable PM Mass, mg	**19.1**		**14.6**		**19.2**	

*All fractions were analyzed and returned values greater than the MDL of 0.5 mg.

Client	Kentucky Cooperage
City, State	Lebanon, KY
Project No.	AST-2024-1515-B
Method	EPA Method 5

Blank Rinse		
Lab ID	9652	
Field ID	Acetone Blank	
Beaker ID	9652	
Beaker tare, g	4.3615	
Field Vessel with Acetone, g	351.1	
Empty Field Vessel, g	177.3	
Acetone Mass, g	173.8	
Date - Dessicator	5/6/24	
Time - Dessicator	9:30	
Date of Weighing	5/7/24	5/9/24
Time of Weighing	9:38	7:03
Weight, g	4.3623	4.3627
Measured Blank Mass, mg	**1.0**	
Blank Mass, mg*	**1.0**	
Blank Mass, mg/g	**0.0058**	

Client	Kentucky Cooperage
City, State	Lebanon, KY
Project No.	AST-2024-1515-B
Method	US EPA Method 202

Teflon Filter						
Lab ID	9654		9655		9656	
Field ID	EU-012-Run 2		EU-012-Run 3		EU-012-Run 4	
Organic Fraction						
Lab ID	9658		9659		9660	
Field ID	EU-012-Run 2		EU-012-Run 3		EU-012-Run 4	
Beaker ID	9658		9659		9660	
Beaker tare, g	4.3470		4.3542		4.3330	
Field Vessel w/ Solvent, g	293.4		310.0		309.5	
Empty Field Vessel, g	177.9		177.2		176.8	
Solvent Mass, g	115.5		132.8		132.7	
Date - Dessicator	5/6/24		5/6/24		5/6/24	
Time - Dessicator	11:00		11:00		11:00	
Date of Weighing	5/7/24	5/9/24	5/7/24	5/9/24	5/7/24	5/9/24
Time of Weighing	12:01	7:04	12:02	7:05	12:03	7:06
Weight, g	4.3559	4.3561	4.3619	4.3620	4.3382	4.3383
Organic Condensable Mass, mg*	**9.0**		**7.8**		**5.3**	
Inorganic Fraction						
Lab ID	9662		9663		9664	
Field ID	EU-012-Run 2		EU-012-Run 3		EU-012-Run 4	
Beaker ID	G4230		G4231		G4232	
Beaker tare, g	40.5902		38.5040		41.5460	
Field Vessel w/ Water, g	275.1		285.0		305.7	
Empty Field Vessel, g	178.0		177.3		178.0	
Water Mass, g	97.1		107.7		127.7	
Date - Dessicator	5/6/24		5/6/24		5/6/24	
Time - Dessicator	12:00		12:00		12:00	
Date of Weighing	5/7/24	5/9/24	5/7/24	5/9/24	5/7/24	5/9/24
Time of Weighing	12:06	7:09	12:07	7:10	12:08	7:11
Weight, g	40.6163	40.6161	38.5246	38.5243	41.5589	41.5585
Inorganic Condensable Mass, mg*	**26.0**		**20.5**		**12.7**	
Blank Corrected	Yes					
Total Condensable PM Mass, mg	**33.0**		**26.2**		**16.0**	

*All fractions were analyzed and returned values greater than the MDL of 0.5 mg.

Client	Kentucky Cooperage
City, State	Lebanon, KY
Project No.	AST-2024-1515-B
Method	US EPA Method 202

Teflon Filter Blanks				
	Field Train Blank		**Proof Blank**	
Lab ID	9665		N/A	
Field ID	Field Train Blank		N/A	
Organic Fraction Blanks				
	Field Train Blank		**Proof Blank**	
Lab ID	9666		9668	
Field ID	Field Train Blank		Proof Blank	
Beaker ID	9666		9668	
Beaker tare, g	4.2371		4.2406	
Field Vessel w/ Solvent, g	283.6		257.1	
Empty Field Vessel, g	176.7		176.8	
Solvent Mass, g	106.9		80.3	
Date - Dessicator	5/6/24		5/6/24	
Time - Dessicator	12:00		12:00	
Date of Weighing	5/7/24	5/9/24	5/7/24	5/9/24
Time of Weighing	12:04	7:07	12:05	7:08
Weight, g	4.2396	4.2395	4.2412	4.2414
Measured Organic Mass, mg	**2.4**		**0.7**	
Organic Mass, mg*	**2.0**		**0.7**	
Inorganic Fraction Blanks				
	Field Train Blank		**Proof Blank**	
Lab ID	9667		9669	
Field ID	Field Train Blank		Proof Blank	
Beaker ID	G4233		G4234	
Beaker tare, g	44.4439		41.1444	
Field Vessel w/ Water, g	267.8		253.2	
Empty Field Vessel, g	178.2		178.1	
Water Mass, g	89.6		75.1	
Date - Dessicator	5/6/24		5/6/24	
Time - Dessicator	12:00		12:00	
Date of Weighing	5/7/24	5/9/24	5/7/24	5/9/24
Time of Weighing	12:09	7:12	12:10	7:13
Weight, g	44.4458	44.4455	41.1468	41.1465
Measured Inorganic Mass, mg	**1.8**		**2.3**	
Inorganic Mass, mg*	**1.8**		**2.0**	

Alliance SOURCE TESTING

Chain-Of-Custody

Version No. LT 2017-01_17.0

Alliance Source Testing, LLC - Lab Services
214 Central Circle, Decatur, AL 35603
Phone (256) 351-0121

Client Name: Kentucky Cooperage
City, State: Lebanon, KY
Source: EU-012
Project No.: 24-1515

Turn Around Time: [✔] Standard [ ] Expedited ____ days
Blank Manuf./Lot #:
Blank Manuf./Lot #:

Sample ID	Number of Containers	Date Collected	Time Recovered	Collector Initials	HOLD	Method/Media: Method 5: Filter Number - 83mm Quartz	Method 5: Filter Number - 83mm Teflon	Method 5: Probe Nozzle Rinse - Acetone	Method 5: Probe Nozzle Rinse - 1-bromopropane	Method 17: Filter Number - 47mm Quartz	Method 17: Nozzle Rinse - Acetone	Method 201A: PM 2.5 Filter Number- 47mm Quartz	Method 201A: PM 2.5 Rinse - Acetone	Method 201A: PM 10 Filter Number- 47mm Quartz	Method 201A: PM 10 Rinse - Acetone	Method 202: CPM Filter - 83mm Teflon	Method 202: Condensate Catch - DIUF	Method 202: Solvent Rinse - Acetone/Hexane
M5/202 - EU-012 - Run 1	5	5/1/24	8:45	NBG	✔	23908-A		✔								✔	✔	✔
M5/202 - EU-012 - Run 2	5	5/1/24	10:30	NBG		23909-A		✔								✔	✔	✔
M5/202 - EU-012 - Run 3	5	5/1/24	11:45	NBG		23905-A		✔								✔	✔	✔
M5/202 - EU-012 - Run 4	5	5/1/24	13:30	NBG		23910-A												
M202 FT Proof Blank	2	5/1/24		NBG													✔	✔
M202 FT Recovery Blank	3	5/1/24		NBG												✔	✔	✔
M202 Acetone Blank	1	5/1/24		NBG														✔
M202 Water Blank	1	5/1/24		NBG														
M202 Hexane Blank	1	5/1/24		NBG														✔

Relinquished By: [signature] Date: 5/3/24 Received By: [signature] Date: 5-3-24 Notes:

AST Office:DEC

Relinquished By: ____ Date: ____ Received By: ____ Date: ____

Relinquished By: ____ Date: ____ Received By: ____ Date: ____

Sample Container Recieved Temperature (°F): 70.1

Weigh-Tec
4615 Marsha Ave
Decatur, Al. 35603

Weigh-Tec
Scale Test / Calibration Report
ISO/IEC 17025:2017 Accredited

Rev: 8/1/19 Cal. Rep. 4
Accreditation# 74114

Report Number: AST-0623-001

Customer	Location	Cal. Date	Expiration Date
Alliance Source Testing	**214 Central Circle SW Decatur, AL 35603**	**6/29/2023**	**6/24**

ID	Manufactuer	Model	Serial	Description	Capacity	Min. Grad.
	Ohaus	PA214	B919636400	Balance Room	210 g	0.0001g

REPEATABILITY TEST

As Found				As Left			
Test Wt.	Tolerance	Indication	Error	Test Wt.	Tolerance	Indication	Error
0	0.0000	0.0000	0.0000	0	0.0000	0.0000	0.0000
5	0.0001	5.0000	0.0000	5	0.0001	5.0000	0.0000
0	0.0000	0.0000	0.0000	0	0.0000	0.0000	0.0000

SHIFT TEST

As Found				As Left			
Test Wt.	Tolerance	Indication	Error	Test Wt.	Tolerance	Indication	Error
5	0.0001	5.0000	0.0000	5	0.0001	5.0000	0.0000
5	0.0001	5.0000	0.0000	5	0.0001	5.0000	0.0000
5	0.0001	5.0000	0.0000	5	0.0001	5.0000	0.0000
5	0.0001	5.0000	0.0000	5	0.0001	5.0000	0.0000

STRAIN TEST

As Found				As Left			
Test Wt.	Tolerance	Indication	Error	Test Wt.	Tolerance	Indication	Error
0.2	0.0001	0.2000	0.0000	0.2	0.0001	0.2000	0.0000
1	0.0001	1.0000	0.0000	1	0.0001	1.0000	0.0000
5	0.0001	5.0000	0.0000	5	0.0001	5.0000	0.0000
50	0.0003	50.0000	0.0000	50	0.0003	50.0000	0.0000
150	0.0003	150.0000	0.0000	150	0.0003	150.0000	0.0000

DECREASING LOAD TEST | **COUNTING TEST**

TOLERANCE

Tolerance: NIST HB44		Class: I	
AS FOUND		**AS LEFT**	
In Tolerance	Out of Tolerance	In Tolerance	Out of Tolerance
YES		**YES**	

ENVIROMENT		
Enviromental Conditions Have Been Met?	**YES**	Exceptions and Conditions Needing Attention:

CALIBRATION STANDARDS USED		***Expanded uncertainty (U) expressed at approximatley 95% with K=2 factor**
Unit # (s)	Kits: 202002 LB / 2288 KG	N.I.S.T. Traceability (Exp 2/2024)	Measurement Uncertainty
50's (3-1 Thru 3-10), 1k's and 2k'sCast		02242306, GA24327, 02242304, 05132203, LA22-707	0.00011g

INVOLVED PARTIES

Technician(s)	License Number(s)	Customer Representative
	502908	**John Lawrence**
Test Method: Customer Stated Weight Increments	*Authorized by: Dawn Freeman QA Manager on 7-3-23*	

Weigh-Tec
4615 Marsha Ave
Decatur, Al. 35603

Weigh-Tec
Scale Test / Calibration Report
ISO/IEC 17025:2017 Accredited

Rev: 8/1/19 Cal. Rep. 4
Accreditation# 74114

Report Number: AST-0623-003

Customer	Location	Cal. Date	Expiration Date
Alliance Source Testing	**214 Central Circle SW Decatur, AL 35603**	**6/29/2023**	**6/24**

ID	Manufactuer	Model	Serial	Description	Capacity	Min. Grad.
	A&D	EJ-1500	5A2845843	LAB	1500 g	0.1g

REPEATABILITY TEST

As Found				As Left			
Test Wt.	Tolerance	Indication	Error	Test Wt.	Tolerance	Indication	Error
0	0.0	0.0	0.0	0	0.0	0.0	0.0
20	0.1	20.0	0.0	20	0.1	20.0	0.0
0	0.0	0.0	0.0	0	0.0	0.0	0.0

SHIFT TEST

As Found				As Left			
Test Wt.	Tolerance	Indication	Error	Test Wt.	Tolerance	Indication	Error
20	0.1	20.0	0.0	20	0.1	20.0	0.0
20	0.1	20.0	0.0	20	0.1	20.0	0.0
20	0.1	20.0	0.0	20	0.1	20.0	0.0
20	0.1	20.0	0.0	20	0.1	20.0	0.0

STRAIN TEST

As Found				As Left			
Test Wt.	Tolerance	Indication	Error	Test Wt.	Tolerance	Indication	Error
20	0.1	20.0	0.0	20	0.1	20.0	0.0
100	0.1	100.0	0.0	100	0.1	100.0	0.0
200	0.1	200.0	0.0	200	0.1	200.0	0.0
500	0.1	500.0	0.0	500	0.1	500.0	0.0
1000	0.1	1000.0	0.0	1000	0.1	1000.0	0.0

DECREASING LOAD TEST | **COUNTING TEST**

TOLERANCE

Tolerance: NIST HB-44		Class: I	
AS FOUND		**AS LEFT**	
In Tolerance	Out of Tolerance	In Tolerance	Out of Tolerance
YES		**YES**	

ENVIROMENT		
Enviromental Conditions Have Been Met?	**YES**	Exceptions and Conditions Needing Attention:

CALIBRATION STANDARDS USED		***Expanded uncertainty (U) expressed at approximatley 95% with K=2 factor**	
Unit # (s)	Kits: 202002 LB / 2288 KG	N.I.S.T. Traceability (Exp 2/2024)	Measurement Uncertainty
50's (3-1 Thru 3-10), 1k's and 2k'sCast		02242306, GA24327, 02242304, 05132203, LA22-707	0.11g

INVOLVED PARTIES

Technician(s)	License Number(s)	Customer Representative
	502908	**John Lawrence**
Test Method: Customer Stated Weight Increments	*Authorized by: Dawn Freeman QA Manager on 7-3-23*	

Filter ID	Weight 1 (g)	Date	Initials	Oven ID	Oven Temp	Thermometer
23880-A	0.5135	03/13/24	JRL	S/N G4-007640	105° C	378129
23881-A	0.5260	03/13/24	JRL	S/N G4-007640	105° C	378129
23882-A	0.5301	03/13/24	JRL	S/N G4-007640	105° C	378129
23883-A	0.5202	03/13/24	JRL	S/N G4-007640	105° C	378129
23884-A	0.5243	03/13/24	JRL	S/N G4-007640	105° C	378129
23885-A	0.5312	03/13/24	JRL	S/N G4-007640	105° C	378129
23886-A	0.5149	03/13/24	JRL	S/N G4-007640	105° C	378129
23887-A	0.4997	03/13/24	JRL	S/N G4-007640	105° C	378129
23888-A	0.5148	03/13/24	JRL	S/N G4-007640	105° C	378129
23889-A	0.5032	03/13/24	JRL	S/N G4-007640	105° C	378129
23890-A	0.5033	03/13/24	JRL	S/N G4-007640	105° C	378129
23891-A	0.5164	03/13/24	JRL	S/N G4-007640	105° C	378129
23892-A	0.5101	03/13/24	JRL	S/N G4-007640	105° C	378129
23893-A	0.4828	03/13/24	JRL	S/N G4-007640	105° C	378129
23894-A	0.5076	03/13/24	JRL	S/N G4-007640	105° C	378129
23895-A	0.5111	03/13/24	JRL	S/N G4-007640	105° C	378129
23896-A	0.5205	03/13/24	JRL	S/N G4-007640	105° C	378129
23897-A	0.4867	03/13/24	JRL	S/N G4-007640	105° C	378129
23898-A	0.5105	03/13/24	JRL	S/N G4-007640	105° C	378129
23899-A	0.5083	03/13/24	JRL	S/N G4-007640	105° C	378129
23900-A	0.5179	03/13/24	JRL	S/N G4-007640	105° C	378129
23901-A	0.5276	03/13/24	JRL	S/N G4-007640	105° C	378129
23902-A	0.5258	03/13/24	JRL	S/N G4-007640	105° C	378129
23903-A	0.5309	03/13/24	JRL	S/N G4-007640	105° C	378129
23904-A	0.5300	03/13/24	JRL	S/N G4-007640	105° C	378129
23905-A	0.5146	03/13/24	JRL	S/N G4-007640	105° C	378129
23906-A	0.5073	03/13/24	JRL	S/N G4-007640	105° C	378129
23907-A	0.5159	03/13/24	JRL	S/N G4-007640	105° C	378129
23908-A	0.5096	03/13/24	JRL	S/N G4-007640	105° C	378129
23909-A	0.5093	03/13/24	JRL	S/N G4-007640	105° C	378129
23910-A	0.5141	03/13/24	JRL	S/N G4-007640	105° C	378129
23911-A	0.5087	03/13/24	JRL	S/N G4-007640	105° C	378129
23912-A	0.5082	03/13/24	JRL	S/N G4-007640	105° C	378129
23913-A	0.4891	03/13/24	JRL	S/N G4-007640	105° C	378129
23914-A	0.5129	03/13/24	JRL	S/N G4-007640	105° C	378129
23915-A	0.5110	03/13/24	JRL	S/N G4-007640	105° C	378129
23916-A	0.5101	03/13/24	JRL	S/N G4-007640	105° C	378129
23917-A	0.4885	03/13/24	JRL	S/N G4-007640	105° C	378129
23918-A	0.5133	03/13/24	JRL	S/N G4-007640	105° C	378129
23919-A	0.5167	03/13/24	JRL	S/N G4-007640	105° C	378129

This is the last page of the report.

Appendix D

QA Data

Location Kentucky Cooperage - Lebanon, KY
Source Heading Char EU-011
Project No. AST-2024-1515
Parameter(s) VFR

Date	Pitot ID	Evidence of damage?	Evidence of mis-alignment?	Calibration or Repair required?	
5/2/24	PT-106-3	no	no	no	
Date	**Probe or Thermocouple ID**	**Reference Temp. (°F)**	**Indicated Temp. (°F)**	**Difference**	**Criteria**
5/2/24	PT-106-3	121.5	115.0	1.1%	± 1.5 % (absolute)
Field Balance Check					
Date	**05/02/24**				
Balance ID:	**5A2873720**				
Certified Weight ID:	**AU57**				
Certified Weight Expiration:	**1/2/25**				
Certified Weight (g):	**500.0**				
Measured Weight (g):	**500.0**				
Weight Difference (g):	**0.0**	**--**	**--**	**--**	**--**
Date	**Barometric Pressure**	**Evidence of damage?**	**Reading Verified**	**Calibration or Repair required?**	**Weather Station Location**
5/2/24	Weather Station	NA	NA	NA	Lebanon, KY
Date	**Meter Box ID**	**Positive Pressure Leak Check**			
5/2/24	1664	Pass			

QA/QC Data

Location Kentucky Cooperage - Lebanon, KY
Source Stave Char EU012
Project No. AST-2024-1515
Parameter PM,CPM

Date	Nozzle ID	Nozzle Diameter (in.) #1	#2	#3	Dn (Average)	Difference	Criteria	Material
4/30/24	S-414	0.241	0.241	0.241	0.241	0.000	≤ 0.004 in.	SS
5/1/24	S-302	0.231	0.231	0.231	0.231	0.000		SS

Date	Pitot ID	Evidence of damage?	Evidence of mis-alignment?	Calibration or Repair required?
4/30/24	PT-110	no	no	no

Date	Probe or Thermocouple ID	Reference Temp. (°F)	Indicated Temp. (°F)	Difference	Criteria	Probe Length
4/30/24	PR-104-0	752.8	755.0	0.2%	± 1.5 % (absolute)	4 '

Field Balance Check

Date	05/01/24					
Balance ID:	5A2873720					
Certified Weight ID:	AU57					
Certified Weight Expiration:	1/2/25					
Certified Weight (g):	500.0					
Measured Weight (g):	500.1					
Weight Difference (g):	-0.1	--	--	--	--	--

Date	Barometric Pressure	Evidence of damage?	Reading Verified	Calibration or Repair required?	Weather Station Location
4/30/24	Weather Station	NA	NA	NA	Lebanon, KY

Date	Meter Box ID	Positive Pressure Leak Check
4/30/24	1515	Pass

Reagent	Lot#	Field Prep performed	Field Lot	Date	By
Acetone	232839	No			
Hexane	197239	No			

QA/QC Data

Location Kentucky Cooperage - Lebanon, KY
Source G5 Process EU-013 (Outlet)
Project No. AST-2024-1515
Parameter PM

Date	Nozzle ID	Nozzle Diameter (in.) #1	#2	#3	Dn (Average)	Difference	Criteria	Material
4/29/24	SS-303	0.225	0.225	0.225	0.225	0.000	≤ 0.004 in.	SS

Date	Pitot ID	Evidence of damage?	Evidence of mis-alignment?	Calibration or Repair required?
4/29/24	PT-105	no	no	no

Date	Probe or Thermocouple ID	Reference Temp. (°F)	Indicated Temp. (°F)	Difference	Criteria	Probe Length
4/29/24	PR-105-1	76.3	77.0	0.1%	± 1.5 % (absolute)	5 '

Field Balance Check

Date	04/29/24	04/30/24	05/01/24			
Balance ID:	5A2873720	5A2873720	5A2873720			
Certified Weight ID:	AU57	AU57	AU57			
Certified Weight Expiration:	1/2/25	1/2/25	1/2/25			
Certified Weight (g):	500.0	500.0	500.0			
Measured Weight (g):	500.3	500.2	500.2			
Weight Difference (g):	-0.3	-0.2	-0.2	--	--	--

Date	Barometric Pressure	Evidence of damage?	Reading Verified	Calibration or Repair required?	Weather Station Location
4/29/24	Weather Station	NA	NA	NA	Lebanon, KY

Date	Meter Box ID	Positive Pressure Leak Check
4/29/24	1664	Pass

Reagent	Lot#	Field Prep performed	Field Lot	Date	By
Acetone	232829	No			

Alliance TECHNICAL GROUP	DGM Calibration-Orifices	Document ID	620.004
		Revision	23.1
		Effective Date	8/29/23
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Equipment Detail - Dry Gas Meter

Console ID: 1515
Meter S/N: 1695459
Critical Orifice S/N: 1481S

Calibration Detail

Initial Barometric Pressure, in. Hg	(Pb_I)	29.66					
Final Barometric Pressure, in. Hg	(Pb_F)	29.66					
Average Barometric Pressure, in. Hg	(Pb)	29.66					
Critifcal Orifice ID	(Y)	8	8	19	19	32	32
K' Factor, $ft^3 \cdot R^{1/2}$ / in. WC·min	(K')	0.2106	0.2106	0.5346	0.535	0.8769	0.877
Vacuum Pressure, in. Hg	(V_P)	22.0	22.0	19.0	19.0	14.5	14.5
Initial DGM Volume, ft^3	(Vm_I)	820.600	826.300	806.300	813.500	833.000	843.300
Final DGM Volume, ft^3	(Vm_F)	826.093	831.796	813.185	820.386	840.965	851.350
Total DGM Volume, ft^3	(Vm)	5.493	5.496	6.885	6.886	7.965	8.050
Ambient Temperature, °F	(Ta)	61	62	58	60	62	62
Initial DGM Temperature, °F	(Tm_I)	61	62	60	61	62	63
Final DGM Temperature, °F	(Tm_F)	62	62	61	61	63	64
Average DGM Temperature, °F	(Tm)	62	62	61	61	63	64
Elapsed Time	(Θ)	20.00	20.00	10.00	10.00	7.00	7.00
Meter Orifice Pressure, in. WC	(ΔH)	0.23	0.23	1.50	1.50	4.15	4.15
Standard Meter volume, ft^3	(Vmstd)	5.5174	5.5151	6.9506	6.9450	8.0625	8.1330
Standard Critical Orifice Volume, ft^3	(Vcr)	5.4748	5.4696	6.9689	6.9555	7.9710	7.9710
Meter Correction Factor	(Y)	0.992	0.992	1.003	1.002	0.989	0.980
Tolerance	--	0.001	0.001	0.010	0.009	0.004	0.013
Orifice Calibration Value	(ΔH @)	1.734	1.736	1.754	1.759	1.822	1.819
Tolerance	--	0.037	0.035	0.017	0.012	0.052	0.048
Orifice Cal Check	--	1.00		1.80		1.77	
Meter Correction Factor	**(Y)**	**0.993**					
Orifice Calibration Value	**(ΔH @)**	**1.771**					
Positive Pressure Leak Check		**Yes**					

Equipment Detail - Thermocouple Sensor

Reference Calibrator Make: Extech
Reference Calibrator Model: 42312
Reference Calibrator S/N: 55000154

Calibration Detail

Reference Temp.		Display Temp.		Accuracy	Absolute Difference
°F	°R	°F	°R	%	°F
0	460	2	462	-0.4	2
68	528	66	526	0.4	2
100	560	98	558	0.4	2
223	683	221	681	0.3	2
248	708	246	706	0.3	2
273	733	271	731	0.3	2
300	760	297	757	0.4	3
400	860	395	855	0.6	5
500	960	493	953	0.7	7
600	1,060	591	1,051	0.8	9
700	1,160	691	1,151	0.8	9
800	1,260	790	1,250	0.8	10
900	1,360	889	1,349	0.8	11
1,000	1,460	988	1,448	0.8	12
1,100	1,560	1,086	1,546	0.9	14
1,200	1,660	1,185	1,645	0.9	15

Personnel

Calibration By: Stacey Cunningham
Calibration Date: 1/2/2024
Reviewed By: Stacey Cunningham

Alliance TECHNICAL GROUP	DGM Calibration-Orifices	Document ID	620.004
		Revision	23.1
		Effective Date	8/29/23
Issuing Department	Tech Services	Page	1 of 1

Equipment Detail - Dry Gas Meter

Console ID: 1664
Meter S/N: 01217240
Critical Orifice S/N: 1481S

Calibration Detail

Initial Barometric Pressure, in. Hg	(Pb_I)	29.75					
Final Barometric Pressure, in. Hg	(Pb_F)	29.75					
Average Barometric Pressure, in. Hg	(Pb)	29.75					
Critifcal Orifice ID	(Y)	8	8	19	19	32	32
K' Factor, $ft^3 \cdot R^{1/2}$ / in. WC·min	(K')	0.2106	0.2106	0.5346	0.535	0.8769	0.877
Vacuum Pressure, in. Hg	(V_P)	23.0	23.0	19.0	19.0	16.0	16.0
Initial DGM Volume, ft^3	(Vm_I)	691.800	697.600	677.300	684.700	704.300	713.100
Final DGM Volume, ft^3	(Vm_F)	697.335	703.135	684.159	691.550	712.178	721.052
Total DGM Volume, ft^3	(Vm)	5.535	5.535	6.859	6.850	7.878	7.952
Ambient Temperature, °F	(Ta)	53	53	51	53	54	55
Initial DGM Temperature, °F	(Tm_I)	56	56	53	55	57	60
Final DGM Temperature, °F	(Tm_F)	56	57	55	56	60	62
Average DGM Temperature, °F	(Tm)	56	57	54	56	59	61
Elapsed Time	(Θ)	20.00	20.00	10.00	10.00	7.00	7.00
Meter Orifice Pressure, in. WC	(ΔH)	0.21	0.21	1.40	1.40	3.90	3.90
Standard Meter volume, ft^3	(Vmstd)	5.6356	5.6301	7.0315	7.0018	8.0552	8.0919
Standard Critical Orifice Volume, ft^3	(Vcr)	5.5341	5.5341	7.0378	7.0241	8.0572	8.0494
Meter Correction Factor	(Y)	0.982	0.983	1.001	1.003	1.000	0.995
Tolerance	--	0.012	0.011	0.007	0.009	0.006	0.001
Orifice Calibration Value	(ΔH @)	1.571	1.569	1.630	1.632	1.693	1.688
Tolerance	--	0.060	0.061	0.001	0.001	0.063	0.058
Orifice Cal Check	--	1.95		1.99		1.53	
Meter Correction Factor	**(Y)**	**0.994**					
Orifice Calibration Value	**(ΔH @)**	**1.630**					
Positive Pressure Leak Check		**Yes**					

Equipment Detail - Thermocouple Sensor

Reference Calibrator Make: Extech
Reference Calibrator Model: 42312
Reference Calibrator S/N: 55000154

Calibration Detail

Reference Temp.		Display Temp.		Accuracy	Absolute Difference
°F	°R	°F	°R	%	°F
0	460	2	462	-0.4	2
68	528	68	528	0.0	0
100	560	100	560	0.0	0
223	683	226	686	-0.4	3
248	708	250	710	-0.3	2
273	733	276	736	-0.4	3
300	760	303	763	-0.4	3
400	860	402	862	-0.2	2
500	960	502	962	-0.2	2
600	1,060	601	1,061	-0.1	1
700	1,160	703	1,163	-0.3	3
800	1,260	805	1,265	-0.4	5
900	1,360	905	1,365	-0.4	5
1,000	1,460	1,005	1,465	-0.3	5
1,100	1,560	1,106	1,566	-0.4	6
1,200	1,660	1,207	1,667	-0.4	7

Personnel

Calibration By: Stacey Cunningham
Calibration Date: 12/19/2023
Reviewed By: Stacey Cunningham

RICE LAKE Certificate of Weight Calibration

ISO/IEC 17025 & ANSI/NCSL-Z540-1-1994 ACCREDITED

Traceable Certificate Number: 3658672
Contractor: ULINE
12575 ULINE DR
PLEASANT PRAIRIE, WI 53158-3686

Purchase Order Number: 7967583
Client: ALLIANCE SOURCE TESTING
214 CENTRAL CIR SW
DECATUR, AL 35603

Date Received: 19 Dec 2023
Date Calibrated: 02 Jan 2024
Recalibration Date: 02 Jan 2025
NIST Certificate Number: 684/O-0000046697
If there are two NIST numbers, one or both may apply
Calibrated By: 28
Procedure: WI05-0023 Rev. K
Condition of Weights: New
Description of Weights: 500 g Satin Finish Weight, ASTM Class 5, S/N AU57
Comments:

Key Notes

Finish	Indicates the weight does not meet the finish requirements
Material	Indicates the weight does not meet the material requirements
New Wt	Indicates new weight
Missing Wt	Indicates replaced missing weight with new weight
Damaged Wt	Indicates replaced damaged weight
Replaced OOT	Indicates replaced out of tolerance weight
OOT	Indicates correction plus or minus Uncertainty greater than or equal to MPE
Magnetic Wt	Indicates replaced magnetic weight
Design	Indicates the weight does not meet the design or shape requirements
Repainted	Indicates the weight was repainted after As Found obtained
Other	See comments above

Cleaning Levels

A	Dusted with brush or cloth
B	Spot cleaned with ethyl alcohol
C	Full surface cleaned with ethyl alcohol
D	Spot cleaned with non-alcohol solvent followed by ethyl alcohol
E	Full surface cleaned with non-alcohol solvent followed by ethyl alcohol
F	No cleaning performed

Material Abbreviations

AL	Aluminum	TA	Tantalum
SS	Stainless Steel	BR	Brass
CI	Cast Iron	PL	Platinum
IR	Iron	NS	Nickel Silver
MS	Mild Steel	OR	Other/Unknown

Check with your local state agency for certification of compliance on Legal-for-Trade items. The weight accuracy class is referenced in the Description of Weights. Unless otherwise noted, the weights calibrated meet the requirements of the accuracy class. Results relate only to weights calibrated. The Surface Finishes of weights are evaluated visually. Weights are screened for magnetism using work instruction WI05-0035 when they are new, when requested by the customer or when weights are suspected of not meeting specifications. Density if measured is measured using OIML R111-1 (2004) method A2. Conventional Mass is reported based on a reference density of 8.0 g/cm^3. The Uncertainty of Measurement is included in the determination of Maximum Permissible Error (MPE) Pass/Fail Criteria. The specifications for Maximum Permissible Error (MPE) can be found in NIST Handbook 105-1 (2019), NIST Handbook 105-1 (1990), ASTM E617-18 or OIML R111-1 (2004), manufacturer specifications or customer specifications.

The Uncertainty assigned to the Conventional Mass values are the result of the root-sum-square of the type A and type B components, calculated in accordance with NIST SOP 29 and the Guide to the expression of uncertainty in measurement, with coverage factor (k=2), to express the expanded uncertainty with an approximate 95.45% confidence level. This report is not to be used to claim product certification, approval, or endorsement by NVLAP, NIST, A2LA, or any government agency.

Dan Demers, Metrologist

02 Jan 2024
Issued Date:

NVLAP CALIBRATION
NVLAP LAB CODE 105001-0

Prepared By:
Rice Lake Weighing Systems® ● PN 64784 ● 12/21
230 West Coleman Street ● Rice Lake, WI 54868 ● USA
TEL: 715-234-9171 ● FAX: 715-234-6967
Definitions: http://certs.ricelake.com/certs/DefinitionsV2.docx

A2LA ACCREDITED
Certificate #4363.01

QA Data

Location Kentucky Cooperage - Lebanon, KY
Source Heading Char EU-011
Project No. AST-2024-1515

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet
Make	CAI	Servomex	Thermo
Model	300	4900	48IQ
S/N	T04052	100593	12409233381
Operating Range	25	25	3000
Cylinder ID			
Zero	NA	NA	NA
Low	NA	NA	NA
Mid	DT0054057	DT0054057	CC114851
High	DT0054057	DT0054057	CC114851
Cylinder Certifed Values			
Zero	NA	NA	NA
Low	NA	NA	NA
Mid	21.49	19.6	4947
High	21.49	19.6	4947
Cylinder Expiration Date			
Zero	NA	NA	NA
Low	NA	NA	NA
Mid	1/5/32	1/5/32	4/25/31
High	1/5/32	1/5/32	4/25/31
Type of Sample Line	Unheated Sample Line		

Response Times

Location: Kentucky Cooperage - Lebanon, KY
Source: Heading Char EU-011
Project No.: AST-2024-1515

Response Times, seconds			
Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**
Zero	30	30	45
Low	NA	NA	NA
Mid	30	30	45
High	30	30	45
Average	30.0	30.0	45.0

Alliance TECHNICAL GROUP

Calibration Data

Location: Kentucky Cooperage - Lebanon, KY
Source: Heading Char EU-011
Project No.: AST-2024-1515
Date: 5/2/24

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet
Expected Average Concentration	20.00	1.00	350.00
Span Between			
Low	20.00	1.00	350.00
High	100.00	20.00	1750.00
Desired Span	21.49	10.00	1000.00
Low Range Gas			
Low	NA	NA	NA
High	NA	NA	NA
Mid Range Gas			
Low	8.60	4.00	400.00
High	12.89	6.00	600.00
High Range Gas			
Low	NA	NA	NA
High	NA	NA	NA
Actual Concentration (% or ppm)			
Zero	0.00	0.00	0.00
Low	NA	NA	NA
Mid	10.00	5.00	500.00
High	21.49	10.00	1000.00
Response Time (seconds)	30.00	30.00	45.00
Upscale Calibration Gas (C_{MA})	Mid	Mid	Mid
Instrument Response (% or ppm)			
Zero	0.01	0.00	-0.14
Low	NA	NA	NA
Mid	10.00	4.98	501.67
High	21.47	10.01	1001.25
Performance (% of Span or Cal. Gas Conc.)			
Zero	0.05	0.00	0.01
Low	NA	NA	NA
Mid	0.00	0.20	0.17
High	0.09	0.10	0.13
Status			
Zero	PASS	PASS	PASS
Low	NA	NA	NA
Mid	PASS	PASS	PASS
High	PASS	PASS	PASS

Alliance TECHNICAL GROUP

Bias/Drift Determinations

Location: Kentucky Cooperage - Lebanon, KY
Source: Heading Char EU-011
Project No.: AST-2024-1515

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet
Run 1 Date 5/2/24			
Span Value	21.49	10.00	1,000.00
Initial Instrument Zero Cal Response	0.01	0.00	-0.14
Initial Instrument Upscale Cal Response	10.00	4.98	501.67
Pretest System Zero Response	0.08	0.00	0.20
Posttest System Zero Response	0.09	0.01	-0.06
Pretest System Upscale Response	9.96	4.90	498.94
Posttest System Upscale Response	9.97	4.91	493.37
Bias (%)			
Pretest Zero	0.33	0.00	0.03
Posttest Zero	0.37	0.10	0.01
Pretest Span	-0.19	-0.80	-0.27
Posttest Span	-0.14	-0.70	-0.83
Drift (%)			
Zero	0.05	0.10	-0.03
Mid	0.05	0.10	-0.56
Run 2 Date 5/2/24			
Span Value	21.49	10.00	1,000.00
Instrument Zero Cal Response	0.01	0.00	-0.14
Instrument Upscale Cal Response	10.00	4.98	501.67
Pretest System Zero Response	0.09	0.01	-0.06
Posttest System Zero Response	0.08	0.00	0.68
Pretest System Upscale Response	9.97	4.91	493.37
Posttest System Upscale Response	9.96	4.91	494.72
Bias (%)			
Pretest Zero	0.37	0.10	0.01
Posttest Zero	0.33	0.00	0.08
Pretest Span	-0.14	-0.70	-0.83
Posttest Span	-0.19	-0.70	-0.69
Drift (%)			
Zero	-0.05	-0.10	0.07
Mid	-0.05	0.00	0.14
Run 3 Date 5/2/24			
Span Value	21.49	10.00	1,000.00
Instrument Zero Cal Response	0.01	0.00	-0.14
Instrument Upscale Cal Response	10.00	4.98	501.67
Pretest System Zero Response	0.08	0.00	0.68
Posttest System Zero Response	0.06	0.00	0.60
Pretest System Upscale Response	9.96	4.91	494.72
Posttest System Upscale Response	9.95	4.91	498.77
Bias (%)			
Pretest Zero	0.33	0.00	0.08
Posttest Zero	0.23	0.00	0.07
Pretest Span	-0.19	-0.70	-0.69
Posttest Span	-0.23	-0.70	-0.29
Drift (%)			
Zero	-0.09	0.00	-0.01
Mid	-0.05	0.00	0.40

QA Data

Location Kentucky Cooperage - Lebanon, KY
Source Stave Char EU-012
Project No. AST-2024-1515

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet
Make	CAI	Servomex	Thermo
Model	300	4900	48IQ
S/N	T04052	100593	12409233381
Operating Range	25	25	1000
Cylinder ID			
Zero	NA	NA	NA
Low	NA	NA	NA
Mid	DT0054057	DT0054057	SA16621
High	DT0054057	DT0054057	SA16621
Cylinder Certifed Values			
Zero	NA	NA	NA
Low	NA	NA	NA
Mid	21.49	19.6	510
High	21.49	19.6	510
Cylinder Expiration Date			
Zero	NA	NA	NA
Low	NA	NA	NA
Mid	1/5/32	1/5/32	1/31/31
High	1/5/32	1/5/32	1/31/31
Type of Sample Line	Unheated Sample Line		

Response Times

Location: Kentucky Cooperage - Lebanon, KY
Source: Stave Char EU-012
Project No.: AST-2024-1515

Response Times, seconds			
Parameter	**O_2 - Outlet**	**CO_2 - Outlet**	**CO - Outlet**
Zero	30	30	45
Low	NA	NA	NA
Mid	30	30	45
High	30	30	45
Average	30.0	30.0	45.0

Alliance TECHNICAL GROUP

Calibration Data

Location: Kentucky Cooperage - Lebanon, KY
Source: Stave Char EU-012
Project No.: AST-2024-1515
Date: 5/1/24

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet
Expected Average Concentration	18.00	2.00	50.00
Span Between			
Low	18.00	2.00	50.00
High	90.00	20.00	250.00
Desired Span	21.49	19.60	200.00
Low Range Gas			
Low	NA	NA	NA
High	NA	NA	NA
Mid Range Gas			
Low	8.60	7.84	80.00
High	12.89	11.76	120.00
High Range Gas			
Low	NA	NA	NA
High	NA	NA	NA
Actual Concentration (% or ppm)			
Zero	0.00	0.00	0.00
Low	NA	NA	NA
Mid	10.00	10.00	100.00
High	21.49	19.60	200.00
Response Time (seconds)	30.00	30.00	45.00
Upscale Calibration Gas (C_{MA})	Mid	Mid	Mid
Instrument Response (% or ppm)			
Zero	0.00	0.00	-0.04
Low	NA	NA	NA
Mid	9.99	10.01	100.31
High	21.47	19.62	200.00
Performance (% of Span or Cal. Gas Conc.)			
Zero	0.00	0.00	0.02
Low	NA	NA	NA
Mid	0.05	0.05	0.16
High	0.09	0.10	0.00
Status			
Zero	PASS	PASS	PASS
Low	NA	NA	NA
Mid	PASS	PASS	PASS
High	PASS	PASS	PASS

Bias/Drift Determinations

Location: Kentucky Cooperage - Lebanon, KY
Source: Stave Char EU-012
Project No.: AST-2024-1515

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet
Run 2 Date 5/1/24			
Span Value	21.49	19.60	200.00
Instrument Zero Cal Response	0.00	0.00	-0.04
Instrument Upscale Cal Response	9.99	10.01	100.31
Pretest System Zero Response	0.08	0.00	0.15
Posttest System Zero Response	0.10	0.02	-0.13
Pretest System Upscale Response	9.95	9.94	99.63
Posttest System Upscale Response	9.97	9.94	99.51
Bias (%)			
Pretest Zero	0.37	0.00	0.10
Posttest Zero	0.47	0.10	-0.05
Pretest Span	-0.19	-0.36	-0.34
Posttest Span	-0.09	-0.36	-0.40
Drift (%)			
Zero	0.09	0.10	-0.14
Mid	0.09	0.00	-0.06
Run 3 Date 5/1/24			
Span Value	21.49	19.60	200.00
Instrument Zero Cal Response	0.00	0.00	-0.04
Instrument Upscale Cal Response	9.99	10.01	100.31
Pretest System Zero Response	0.10	0.02	-0.13
Posttest System Zero Response	0.11	0.03	0.01
Pretest System Upscale Response	9.97	9.94	99.51
Posttest System Upscale Response	9.98	9.98	99.65
Bias (%)			
Pretest Zero	0.47	0.10	-0.05
Posttest Zero	0.51	0.15	0.03
Pretest Span	-0.09	-0.36	-0.40
Posttest Span	-0.05	-0.15	-0.33
Drift (%)			
Zero	0.05	0.05	0.07
Mid	0.05	0.20	0.07

Bias/Drift Determinations

Location: Kentucky Cooperage - Lebanon, KY
Source: Stave Char EU-012
Project No.: AST-2024-1515

Parameter	O_2 - Outlet	CO_2 - Outlet	CO - Outlet
Run 4 Date 5/1/24			
Span Value	21.49	19.60	200.00
Instrument Zero Cal Response	0.00	0.00	-0.04
Instrument Upscale Cal Response	9.99	10.01	100.31
Pretest System Zero Response	0.11	0.03	0.01
Posttest System Zero Response	0.09	0.01	-0.32
Pretest System Upscale Response	9.98	9.98	99.65
Posttest System Upscale Response	9.96	9.98	99.84
Bias (%)			
Pretest Zero	0.51	0.15	0.03
Posttest Zero	0.42	0.05	0.14
Pretest Span	0.05	0.15	0.33
Posttest Span	0.14	0.15	0.23
Drift (%)			
Zero	-0.09	-0.10	-0.17
Mid	-0.09	0.00	0.09

Method 3/3A Data

Location Kentucky Cooperage - Lebanon, KY
Source G5 Process EU-013 (Outlet)
Project No. AST-2024-1515

	O_2 Data			CO_2 Data		
	Date/Time	**4/30/24**	**9:20**	**Date/Time**	**4/30/24**	**9:20**
Make/Model/SN	CAI	300	T04052	CAI	300	T04052
Parameter	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**
Zero Gas		0.00	0.00		0.00	0.00
High Range Gas	DT0054057	21.49	21.49	DT0054057	19.60	19.60
Mid Range Gas	DT0055287	9.97	9.95	DT0055287	9.63	9.40
Concentration Span, %	21.5			19.6		
Required Accuracy, %	0.43			0.39		
	Date/Time	**4/30/24**	**12:20**	**Date/Time**	**4/30/24**	**12:20**
Make/Model/SN	CAI	300	T04052	CAI	300	T04052
Parameter	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**
Zero Gas		0.00	0.00		0.00	0.00
High Range Gas	DT0054057	21.49	21.49	DT0054057	19.60	19.60
Mid Range Gas	DT0055287	9.97	9.93	DT0055287	9.63	9.65
Concentration Span, %	21.5			19.6		
Required Accuracy, %	0.43			0.39		
	Date/Time	**4/30/24**	**15:25**	**Date/Time**	**4/30/24**	**15:25**
Make/Model/SN	CAI	300	T04052	CAI	300	T04052
Parameter	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**
Zero Gas		0.00	0.00		0.00	0.00
High Range Gas	DT0054057	21.49	21.49	DT0054057	19.60	19.60
Mid Range Gas	DT0055287	9.97	9.95	DT0055287	9.63	9.68
Concentration Span, %	21.5			19.6		
Required Accuracy, %	0.43			0.39		

The remaining consistuent is assumed to be nitrogen.

DocNumber: 558553

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PGVP ID: F12023

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information

NEXAIR
1385 CORPORATE AVE
MEMPHIS TN 38132-1723

Certificate Issuance Date: 10/10/2023
Linde Order Number: 17086170
Part Number: NI CD10O10E-AS
Customer PO Number: 1309557

Fill Date: 09/20/2023
Lot Number: 700013263F4
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure and Volume: 2000 psig 140 ft3

Certified Concentration

ProSpec EZ Cert

Expiration Date:	10/10/2031	NIST Traceable
Cylinder Number:	DT0055287	Expanded Uncertainty
9.63 %	Carbon dioxide	± 0.10 %
9.97 %	Oxygen	± 0.02 %
Balance	Nitrogen	

Certification Information:

Certification Date: 10/10/2023 *Term:* 96 Months *Expiration Date:* 10/10/2031

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Uncertainty above is expressed as absolute expanded uncertainty at a level of confidence of approximately 95% with a coverage factor k = 2. Do Not Use this Standard if Pressure is less than 100 PSIG.

O2 responses have been corrected for CO2 interference.

Analytical Data:

(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

1. ***Component:*** **Carbon dioxide**

Requested Concentration: 10.0 %
Certified Concentration: 9.63 %
Instrument Used: Horiba VA-5000
Analytical Method: NDIR
Last Multipoint Calibration: 10/06/2023

First Analysis Data:						Date	10/10/2023
Z:	0	R:	20.01	C:	9.64	Conc:	9.64
R:	20.03	Z:	0	C:	9.63	Conc:	9.63
Z:	0	C:	9.62	R:	20.01	Conc:	9.62
UOM:	%			Mean Test Assay:		9.63	%

Reference Standard: Type / Cylinder #: GMIS / DT0032871
Concentration / Uncertainty: 20.01 % ±0.04 %
Expiration Date: 01/02/2028
Traceable to: SRM # / Sample # / Cylinder #: PRM# FF276163 / PRM# FF276163 /
SRM Concentration / Uncertainty: 20.008% / ±0.028%
SRM Expiration Date: 04/01/2020

Second Analysis Data:						Date	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	%			Mean Test Assay:			%

2. ***Component:*** **Oxygen**

Requested Concentration: 10.0 %
Certified Concentration: 9.97 %
Instrument Used: Servomex 575
Analytical Method: Paramagnetic
Last Multipoint Calibration: 10/09/2023

First Analysis Data:						Date	10/10/2023
Z:	0	R:	22.59	C:	9.97	Conc:	9.97
R:	22.59	Z:	0	C:	9.97	Conc:	9.97
Z:	0	C:	9.96	R:	22.59	Conc:	9.96
UOM:	%			Mean Test Assay:		9.97	%

Reference Standard: Type / Cylinder #: GMIS / CC320467
Concentration / Uncertainty: 22.59 % ±0.05 %
Expiration Date: 07/26/2029
Traceable to: SRM # / Sample # / Cylinder #: 2659a / 71-D-04 / CAL015785
SRM Concentration / Uncertainty: 20.72% / ±0.043%
SRM Expiration Date: 08/23/2021

Second Analysis Data:						Date	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	%			Mean Test Assay:			%

Analyzed By: Lloyd Knapp

Certified By: Edward E Zucal

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DocNumber: 563549

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PGVP ID: F12024

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information

NEXAIR
1385 CORPORATE AVE
MEMPHIS TN 38132-1723

Certificate Issuance Date: 01/05/2024
Linde Order Number: 24061064
Part Number: NI CD19.75O1ZEAS
Customer PO Number: 1322349

Fill Date: 12/28/2023
Lot Number: 700013362D8
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure and Volume: 2000 psig 140 ft3

Certified Concentration

ProSpec EZ Cert

Expiration Date: 01/05/2032		NIST Traceable
Cylinder Number: DT0054057		Expanded Uncertainty
19.60 %	Carbon dioxide	± 0.10 %
21.49 %	Oxygen	± 0.05 %
Balance	Nitrogen	

Certification Information:

Certification Date: 01/05/2024 *Term:* 96 Months *Expiration Date:* 01/05/2032

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Uncertainty above is expressed as absolute expanded uncertainty at a level of confidence of approximately 95% with a coverage factor k = 2. Do Not Use this Standard if Pressure is less than 100 PSIG.

Analytical Data:

(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

1. ***Component:*** **Carbon dioxide**

Requested Concentration: 19.75 %
Certified Concentration: 19.60 %
Instrument Used: Horiba VA-5000
Analytical Method: NDIR
Last Multipoint Calibration: 12/07/2023

First Analysis Data: **Date** 01/05/2024

Z:	0	R:	20.01	C:	19.6	Conc:	19.6
R:	20.01	Z:	0	C:	19.6	Conc:	19.6
Z:	0	C:	19.6	R:	20.01	Conc:	19.6

UOM: % **Mean Test Assay:** 19.6 %

Reference Standard: Type / Cylinder #: GMIS / DT0032871
Concentration / Uncertainty: 20.01 % ±0.04 %
Expiration Date: 01/02/2028
Traceable to: SRM # / Sample # / Cylinder #: PRM# FF276163 / PRM# FF276163 /
SRM Concentration / Uncertainty: 20.008% / ±0.028%
SRM Expiration Date: 04/01/2020

Second Analysis Data: **Date**

Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0

UOM: % **Mean Test Assay:** %

2. ***Component:*** **Oxygen**

Requested Concentration: 21.45 %
Certified Concentration: 21.49 %
Instrument Used: Servomex 575
Analytical Method: Paramagnetic
Last Multipoint Calibration: 12/07/2023

First Analysis Data: **Date** 01/05/2024

Z:	0	R:	22.59	C:	21.5	Conc:	21.49
R:	22.6	Z:	0	C:	21.5	Conc:	21.49
Z:	0	C:	21.5	R:	22.6	Conc:	21.49

UOM: % **Mean Test Assay:** 21.49 %

Reference Standard: Type / Cylinder #: GMIS / CC320467
Concentration / Uncertainty: 22.59 % ±0.05 %
Expiration Date: 07/26/2029
Traceable to: SRM # / Sample # / Cylinder #: 2659a / 71-D-04 / CAL015785
SRM Concentration / Uncertainty: 20.72% / ±0.043%
SRM Expiration Date: 08/23/2021

Second Analysis Data: **Date**

Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0

UOM: % **Mean Test Assay:** %

Analyzed By **Mike Monnette**

Certified By **Lloyd Knapp**

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DocNumber: 533097

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PGVP ID: F12023

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information

NEXAIR
1385 CORPORATE AVE
MEMPHIS TN 38132-1723

Certificate Issuance Date: 01/31/2023
Linde Order Number: 89686234
Part Number: NI CO500E-AS
Customer PO Number: 1276690

Fill Date: 01/31/2023
Lot Number: 700013023D5
Cylinder Style & Outlet: AS CGA 350
Cylinder Pressure and Volume: 2000 psig 141 ft3

Certified Concentration

ProSpec EZ Cert

Expiration Date:	01/31/2031	NIST Traceable
Cylinder Number:	SA16621	Expanded Uncertainty
510 ppm	Carbon monoxide	± 3 ppm
Balance	Nitrogen	

Certification Information:

Certification Date: 01/31/2023 Term: 96 Months Expiration Date: 01/31/2031

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Uncertainty above is expressed as absolute expanded uncertainty at a level of confidence of approximately 95% with a coverage factor k = 2. Do Not Use this Standard if Pressure is less than 100 PSIG.

Analytical Data:

(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

1. **Component:** **Carbon monoxide**

Requested Concentration: 500 ppm
Certified Concentration: 510 ppm
Instrument Used: Horiba VA-3000
Analytical Method: NDIR
Last Multipoint Calibration: 11/28/2022

First Analysis Data: **Date** 01/31/2023

Z:	0	R:	1005	C:	510	Conc:	510
R:	1005	Z:	0	C:	510	Conc:	510
Z:	0	C:	510	R:	1005	Conc:	510

UOM: ppm **Mean Test Assay:** 510 ppm

Reference Standard: Type / Cylinder #: GMIS / ND19645
Concentration / Uncertainty: 1005 ppm ±3 ppm
Expiration Date: 02/01/2029
Traceable to: SRM # / Sample # / Cylinder #: 1681b / 1-K-42 / CAL015913
SRM Concentration / Uncertainty: 963.5 PPM / ±3.0 PPM
SRM Expiration Date: 09/26/2021

Second Analysis Data: **Date**

Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0

UOM: ppm **Mean Test Assay:** ppm

Analyzed By **Mike Monnette**

Certified By **Edward E Zucal**

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DocNumber: 538922

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Los Angeles CA 90058
Tel: 323-585-2154
Fax: 714-542-6689
PGVP ID: F22023

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information

NEXAIR
1385 CORPORATE AVE
MEMPHIS TN 38132-1723
Customer Reference: PO 1288451

Certificate Issuance Date: 04/25/2023
Linde Order Number: 96119465
Part Number: NI CO5000E-AS
Customer PO Number: 1288451

Fill Date: 04/18/2023
Lot Number: 70086310806
Cylinder Style & Outlet: AS CGA 350
Cylinder Pressure and Volume: 2000 psig 140 ft3

Certified Concentration

ProSpec EZ Cert

Expiration Date:	04/25/2031	NIST Traceable
Cylinder Number:	CC114851	Expanded Uncertainty
4947 ppm	Carbon monoxide	± 22 ppm
Balance	Nitrogen	

Certification Information:

Certification Date: 04/25/2023 *Term:* 96 Months *Expiration Date:* 04/25/2031

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Uncertainty above is expressed as absolute expanded uncertainty at a level of confidence of approximately 95% with a coverage factor k = 2. Do Not Use this Standard if Pressure is less than 100 PSIG.

Analytical Data:

(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

1. ***Component:*** **Carbon monoxide**

Requested Concentration: 5000 ppm
Certified Concentration: 4947 ppm
Instrument Used: Horiba VIA-510 S/N 576876015
Analytical Method: NDIR
Last Multipoint Calibration: 04/25/2023

Reference Standard: Type / Cylinder #: GMIS / CC118264
Concentration / Uncertainty: 4938 ppm ±20 ppm
Expiration Date: 03/29/2031
Traceable to: SRM # / Sample # / Cylinder #: SRM 2639a / 54-F-23 / FF10402
SRM Concentration / Uncertainty: 0.9904% / ±0.0033%
SRM Expiration Date: 06/05/2026

First Analysis Data:						Date	04/25/2023
Z:	0	R:	4938	C:	4951	Conc:	4948
R:	4941	Z:	0	C:	4950	Conc:	4947
Z:	0	C:	4951	R:	4945	Conc:	4948
UOM:	ppm				Mean Test Assay:		4947 ppm

Second Analysis Data:						Date	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	ppm				Mean Test Assay:		ppm

Analyzed By: Suchana Gurung

Certified By: Courtney Zielke

Location: Kentucky Cooperage - Lebanon, KY
Source: Stave Char EU-012
Project No.: AST-2024-1515
Date 4/30/24

Analyzer Make:	CAI
Analyzer Model:	300
Analyzer SN:	T04052
Environics ID:	6354
Component/Balance Gas:	O2/N2
Cylinder Gas ID (Dilution):	DT0054057
Cylinder Gas Concentration (Dilution), %:	21.49
Cylinder Gas ID (Mid-Level):	DT0055287
Cylinder Gas Concentration (Mid-Level), %:	9.97

Target Mass Flow Contollers	Target Dilution (%)	Target Flow Rate lpm	Target Concentration (%)	Actual Concentration (%)	Injection 1 Analyzer Concentration (%)	Injection 2 Analyzer Concentration (%)	Injection 3 Analyzer Concentration (%)	Average Analyzer Concentration (%)	Difference (%)	Average Error (±2%)
10L/5L	80.0	5.0	17.2	17.2	17.2	17.2	17.2	17.19	0.03	0.2%
10L/5L	50.0	5.0	10.7	10.7	10.7	10.7	10.6	10.64	-0.01	-0.1%
10L/1L	20.0	4.0	4.3	4.3	4.3	4.3	4.3	4.27	-0.01	-0.2%
10L/1L	10.0	4.0	2.1	2.1	2.1	2.1	2.0	2.05	-0.02	-1.1%

*Not all AST Environics Units have 2-10L Mass Flow Controllers. For these units the 90% @ 7lpm and 80% @ 7lpm injections will not be conducted.

Average Analyzer Concentration (%)	Injection 1 Error (±2%)	Injection 2 Error (±2%)	Injection 3 Error (±2%)
17.19	0.1%	0.0%	-0.1%
10.64	0.1%	0.1%	-0.1%
4.27	0.5%	-0.2%	-0.2%
2.05	0.2%	0.2%	-0.3%

Mid-Level Supply Gas Calibration Direct to Analyzer

Calibration Gas Concentration (%)	Injection 1 Analyzer Concentration (%)	Injection 2 Analyzer Concentration (%)	Injection 3 Analyzer Concentration (%)	Average Analyzer Concentration (%)	Difference (%)	Average Error (±2%)
9.97	9.9	9.9	9.9	9.90	-0.07	-0.7%

Alliance SOURCE TESTING	Mass Flow Controller Calibration	Document ID	620.009
		Revision	22.0
		Effective Date	12/16/22
Issuing Department	Tech Services	Page	1 of 1

Dilution System Make:	Environics
Dilution System Model:	4040
Dilution System S/N:	6354
Calibration Equipment Make:	Alicat Scientific
Calibration Equipment Model:	M-10SLPD/5MM-D/5M, M-1SLPM-D/5M
Flow Cell S/N:	272120
Flow Cell S/N:	272121
Calibration Gas:	Nitrogen
Barometric Pressure, mmHg:	732.79
Ambient Temperature, °F:	67

Mass Flow Controller ID	#1			# 2			# 3		
Size, ccm:	10,000			5,000			1,000		
Make:	Hasting			Hasting			Hasting		
Model:	EFC-202-10L			EFC-202-5L			EFC-202-1L		
S/N:	91723001			9607002			21800001		
	Set Flow cc/min	True Flow cc/min	Difference	Set Flow cc/min	True Flow cc/min	Difference	Set Flow cc/min	True Flow cc/min	Difference
5%	500	503	0.5%	250	251	0.2%	50	51	2.0%
10%	1,000	980	2.0%	500	502	0.3%	100	101	1.3%
20%	2,000	1,960	2.0%	1,000	1,010	1.0%	200	203	1.6%
30%	3,000	2,939	2.0%	1,500	1,517	1.1%	300	304	1.3%
40%	4,000	3,928	1.8%	2,000	2,023	1.2%	400	404	1.1%
50%	5,000	4,925	1.5%	2,500	2,526	1.0%	500	504	0.9%
60%	6,000	5,935	1.1%	3,000	3,031	1.0%	600	605	0.8%
70%	7,000	6,957	0.6%	3,500	3,535	1.0%	700	704	0.6%
80%	8,000	7,993	0.1%	4,000	4,045	1.1%	800	804	0.4%
90%	9,000	9,038	0.4%	4,500	4,557	1.3%	900	903	0.3%
100%	10,000	10,107	1.1%	5,000	5,078	1.6%	1,000	1,005	0.5%

Note: The mass flow controller's calibration values are used by the dilution system's operating software to improve accuracy. These calibrations are not necessarily indicative of the systems overall performance. Performance is verified by conducting a Method 205 prior to each field use.

Calibration Performed By: Stacey Cunningham

Date: 1/12/2024

Alliance TECHNICAL GROUP

Location: Kentucky Cooperage - Lebanon, KY
Source: Heading Char EU-011
Project No.: AST-2024-1515
Date: 5/2//24

Traverse Point	Time	O_2 (%)	CO_2 (%)	CO (ppm)
A-1	7:20	19.56	1.13	548.94
2	7:22	19.44	1.26	582.00
3	7:24	19.57	1.14	599.46
Average		19.5	1.2	576.8
Criteria Met		Single Point	Single Point	Single Point

Location: Kentucky Cooperage - Lebanon, KY
Source: Stave Char EU-012
Project No.: AST-2024-1515
Date: 5/1/2024

Traverse Point	Time	O_2 (%)	CO_2 (%)	CO (ppm)
A-1	7:09	15.57	4.45	55.20
2	7:11	15.82	4.15	55.19
3	7:13	15.95	4.32	56.91
Average		15.8	4.3	55.8
Criteria Met		Single Point	Single Point	Single Point

Appendix E

Testing times/Dates

EU-13 (G5 Process)

- 4/30/24
  - Run 1: 8:15 - 9:23 245 barrels
  - Run 2: 11:15 - 12:20 235 barrels
  - Run 3: 14:15 – 15:21 391 barrels
- 5/1/24
  - Run 4: 11:15 – 12:18 320 barrels

EU-012 (Barrel Char)

- 5/1/24
  - Run 1: 7:30 – 8:35 235 barrels
  - Run 2: 9:10 – 10:13 221 barrels
  - Run 3: 10:38 – 11:41 229 barrels
  - Run 4: 12:10 – 13:15 234 barrels

EU-011 (Head Char)

- 5/2/24
  - Run 1: 7:30 – 8:30 272 sets or 544 heads
  - Run 2: 8:41 – 9:41 272 sets or 544 heads
  - Run 3: 9:50 – 10:50 272 sets or 544 heads

Appendix F

Alliance TECHNICAL GROUP

Isokinetic Field Data

Location:	Kentucky Cooperage - Lebanon, KY		**Start Time:**	7:30	**Source:** Stave Char EU012
Date:	5/1/24	Run 1 VOID	**End Time:**	8:35	**Project No.:** AST-2024-1515 **Parameter:** PM,CPM

STACK DATA (EST)			EQUIPMENT			STACK DATA (EST)			FILTER NO.		STACK DATA (FINAL)			MOIST. DATA
Moisture:	7.0	% est.	Meter Box ID:	1515		Est. Tm:	75	°F	23908-A		Pb:	29.06	in. Hg	Vlc (ml)
Barometric:	29.10	in. Hg	Y:	0.993		Est. Ts:	530	°F			Pg:	-1.90	in. WC	--
Static Press:	-2.10	in. WC	ΔH @ (in.WC):	1.771		Est. ΔP:	1.15	in. WC			O_2:	17.91	%	K-FACTOR
Stack Press:	28.95	in. Hg	Probe ID:	PR-104-0		Est. Dn:	0.234	in.			CO_2:	2.63	%	1.697
CO_2:	2.0	%	Liner Material:	stainless steel		Target Rate:	0.75	scfm						
O_2:	19.0	%	Pitot ID:	PT-110		LEAK CHECKS	Pre	Mid 1	Mid 2	Mid 3	Post	Check Pt.	Initial	Final	Corr.
N_2/CO:	79.0	%	Pitot Cp/Type:	0.840	S-type	Leak Rate (cfm):	0.000	--	--	--	0.030	Mid 1 (cf)			--
Md:	29.08	lb/lb-mole	Nozzle ID:	S-414	SS	Vacuum (in Hg):	10	--	--	--	4	Mid 2 (cf)			--
Ms:	28.30	lb/lb-mole	Nozzle Dn (in.):	0.241		Pitot Tube:	Pass	--	--	--	Pass	Mid 3 (cf)			--
												Mid-Point Leak Check Vol (cf):			--

Sample Pt.	Sample Time (minutes)		Dry Gas Meter Reading (ft^3)	Pitot Tube ΔP (in WC)	Gas Temperatures (°F)		Orifice Press. ΔH (in. WC)		Pump Vac (in. Hg)	Gas Temperatures (°F)				% ISO	Vs (fps)
					DGM Average	Stack				Probe	Filter	Imp Exit	CPM		
	Begin	End			Amb.	Amb.	Ideal	Actual		Amb.	Amb.	Amb.	Amb.		
					64	70				64	64	64	70		
1a	0.00	2.50	295.370	1.60	64	800	2.09	2.10	3	230	248	64	70	104.0	112.63
2	2.50	5.00	297.515	1.30	70	755	1.78	1.80	3	232	250	44	78	101.8	99.70
3	5.00	7.50	299.465	1.80	71	700	2.58	2.60	4	230	251	44	75	96.9	114.63
4	7.50	10.00	301.700	1.60	72	950	1.89	1.90	4	243	250	44	75	97.5	119.15
5	10.00	12.50	303.630	1.70	73	1000	1.95	2.00	4	232	251	46	79	103.5	124.98
6	12.50	15.00	305.710	1.70	74	950	2.02	2.00	4	238	251	48	83	96.9	122.82
7	15.00	17.50	307.695	1.50	74	940	1.80	1.80	4	242	249	48	82	97.8	114.96
8	17.50	20.00	309.585	1.60	74	900	1.97	2.00	4	238	255	49	82	99.1	117.02
9	20.00	22.50	311.590	1.30	74	1000	1.49	1.50	4	238	256	49	83	100.2	109.29
10	22.50	25.00	313.355	1.20	74	926	1.45	1.50	4	230	250	50	83	100.4	102.31
11	25.00	27.50	315.100	1.20	74	900	1.48	1.50	4	233	254	50	82	105.7	101.34
12	27.50	30.00	316.955	1.10	74	845	1.41	1.40	4	234	254	49	82	104.4	95.04
1b	30.00	32.50	318.745	0.70	74	750	0.97	1.00	2	237	255	49	82	103.4	73.01
2	32.50	35.00	320.215	0.75	75	755	1.04	1.00	2	232	250	53	82	99.9	75.72
3	35.00	37.50	321.685	0.74	75	800	0.99	1.00	2	238	256	53	82	97.5	76.60
4	37.50	40.00	323.085	0.98	76	800	1.31	1.30	2	242	252	50	83	99.2	88.15
5	40.00	42.50	324.725	0.95	76	750	1.32	1.30	2	232	250	50	83	106.5	85.05
6	42.50	45.00	326.495	1.00	77	850	1.29	1.30	2	238	250	51	82	101.1	90.79
7	45.00	47.50	328.155	1.00	77	950	1.20	1.20	2	231	252	50	82	99.8	94.20
8	47.50	50.00	329.735	1.50	77	800	2.01	2.00	4	234	254	50	83	95.3	109.06
9	50.00	52.50	331.685	1.30	78	700	1.89	1.90	4	231	252	50	82	99.0	97.41
10	52.50	55.00	333.655	1.40	78	650	2.13	2.10	4	235	254	51	82	97.6	98.89
11	55.00	57.50	335.715	1.50	79	698	2.19	2.20	4	235	253	52	83	99.0	104.55
12	57.50	60.00	337.835	1.20	79	650	1.83	1.80	4	234	256	52	83	100.6	91.55
	Final DGM:		339.805												

RESULTS	Run Time		Vm		ΔP		Tm		Ts		Max Vac	ΔH		%ISO	BWS	Y_{qa}
	60.0	min	44.435	ft^3	1.28	in. WC	74.5	°F	825.8	°F	4	1.675	in. WC	--	--	--

Alliance TECHNICAL GROUP

Isokinetic Field Data

Location:	Kentucky Cooperage - Lebanon, KY			**Start Time:**	14:15	**Source:**	G5 Process EU-013 (Outlet)
Date:	4/30/24	**Run 3**	**VOID**	**End Time:**	15:21	**Project No.:**	AST-2024-1515 **Parameter:** PM

STACK DATA (EST)			EQUIPMENT			STACK DATA (EST)			FILTER NO.	STACK DATA (FINAL)		MOIST. DATA
Moisture:	3.0	% est.	Meter Box ID:	1664		Est. Tm:	67	°F	23911-A	Pb:	29.10 in. Hg	Vlc (ml)
Barometric:	29.09	in. Hg	Y:	0.994		Est. Ts:	84	°F		Pg:	-0.87 in. WC	--
Static Press:	-0.88	in. WC	ΔH @ (in.WC):	1.630		Est. ΔP:	0.58	in. WC		O_2:	20.65 %	K-FACTOR
Stack Press:	29.03	in. Hg	Probe ID:	PR-105-1		Est. Dn:	0.236	in.		CO_2:	0.28 %	2.284
CO_2:	1.0	%	Liner Material:	stainless steel		Target Rate:	0.75	scfm				
O_2:	20.0	%	Pitot ID:	PT-105		LEAK CHECKS	Pre	Mid 1	Mid 2	Mid 3	Post	
N_2/CO:	79.0	%	Pitot Cp/Type:	0.840	S-type	Leak Rate (cfm):	0.000	--	--	--	0.200	
Md:	28.96	lb/lb-mole	Nozzle ID:	SS-303	SS	Vacuum (in Hg):	10	--	--	--	3	
Ms:	28.63	lb/lb-mole	Nozzle Dn (in.):	0.225		Pitot Tube:	Pass	--	--	--	Pass	

Check Pt.	Initial	Final	Corr.
Mid 1 (cf)			--
Mid 2 (cf)			--
Mid 3 (cf)			--
Mid-Point Leak Check Vol (cf):			--

Sample Pt.	Sample Time (minutes)		Dry Gas Meter Reading (ft^3)	Pitot Tube ΔP (in WC)	Gas Temperatures (°F)		Orifice Press. ΔH (in. WC)		Pump Vac (in. Hg)	Gas Temperatures (°F)				% ISO	Vs (fps)
					DGM Average	Stack				Probe	Filter	Imp Exit	Aux		
	Begin	End			Amb. --	Amb. --	Ideal	Actual		Amb. --	Amb. --	Amb. --	Amb. --		
A	0.00	2.50	468.910	0.48	66	85	1.09	1.10	2	242	243	62	-	95.9	40.28
2	2.50	5.00	470.410	0.49	67	89	1.11	1.10	2	252	249	53	-	104.0	40.85
3	5.00	7.50	472.050	0.33	67	90	0.75	0.80	2	244	242	51	-	105.9	33.55
4	7.50	10.00	473.420	0.39	68	90	0.89	0.90	2	243	243	50	-	99.0	36.47
5	10.00	12.50	474.815	0.46	68	90	1.04	1.00	2	242	244	50	-	98.4	39.61
6	12.50	15.00	476.320	0.54	68	90	1.22	1.20	2	241	243	51	-	96.9	42.92
7	15.00	17.50	477.925	0.62	68	91	1.40	1.40	2	241	243	51	-	105.2	46.03
8	17.50	20.00	479.790	0.67	69	91	1.52	1.50	3	241	240	52	-	102.1	47.85
9	20.00	22.50	481.675	0.60	69	91	1.36	1.40	3	241	241	53	-	108.2	45.28
10	22.50	25.00	483.565	0.61	69	90	1.39	1.40	3	243	241	53	-	103.5	45.61
11	25.00	27.50	485.390	0.62	69	90	1.41	1.40	3	243	242	54	-	99.6	45.99
12	27.50	30.00	487.160	0.66	69	89	1.50	1.50	3	243	242	55	-	101.9	47.40
B	30.00	32.50	489.030	0.85	69	88	1.94	1.90	3	241	244	56	-	100.8	53.75
2	32.50	35.00	491.130	0.84	69	88	1.91	1.90	2	243	242	55	-	101.0	53.43
3	35.00	37.50	493.220	0.80	69	90	1.82	1.80	2	241	240	53	-	105.6	52.24
4	37.50	40.00	495.350	0.76	70	90	1.73	1.70	2	241	239	55	-	99.5	50.91
5	40.00	42.50	497.310	0.72	70	91	1.63	1.60	2	242	242	56	-	103.3	49.60
6	42.50	45.00	499.290	0.65	70	91	1.48	1.50	2	244	248	57	-	104.0	47.13
7	45.00	47.50	501.185	0.53	70	91	1.20	1.20	2	247	245	58	-	97.8	42.56
8	47.50	50.00	502.795	0.47	70	92	1.07	1.10	2	246	242	59	-	102.0	40.11
9	50.00	52.50	504.375	0.45	70	92	1.02	1.00	1	245	242	60	-	98.9	39.25
10	52.50	55.00	505.875	0.44	70	92	1.00	1.00	1	243	241	60	-	101.7	38.81
11	55.00	57.50	507.400	0.45	70	94	1.02	1.00	1	242	242	60	-	100.4	39.32
12	57.50	60.00	508.920	0.45	70	94	1.02	1.00	1	242	242	61	-	100.1	39.32
	Final DGM:		510.435												

RESULTS	Run Time		Vm		ΔP		Tm		Ts		Max Vac	ΔH		%ISO	BWS	Y_{qa}
	60.0	min	41.525	ft^3	0.58	in. WC	68.9	°F	90.4	°F	3	1.308	in. WC	--	--	--

Run 1 - RM Data

Location: Kentucky Cooperage - Lebanon, KY
Source: Stave Char EU-012
Project No.: AST-2024-1515
Date: 5/1/24

Time Unit Status	O_2 - Outlet % dry Void	CO_2 - Outlet % dry Void	CO - Outlet ppmvd Void
Uncorrected Run Average (C_{obs})	-	-	-
Cal Gas Concentration (C_{MA})	10.00	10.00	100.00
Pretest System Zero Response	0.01	0.00	0.11
Posttest System Zero Response	0.08	0.00	0.15
Average Zero Response (Co)	0.05	0.00	0.13
Pretest System Cal Response	9.92	9.94	100.04
Posttest System Cal Response	9.95	9.94	99.63
Average Cal Response (C_M)	9.94	9.94	99.84
Corrected Run Average (Corr)	-	-	-
7:30	19.66	0.65	84.59
7:31	16.91	3.59	130.2
7:32	16.52	3.34	37.37
7:33	19.88	1.14	135.39
7:34	15.93	4.14	100.05
7:35	20.58	0.17	73.66
7:36	16.08	4.06	102.52
7:37	15.47	4.55	87.13
7:38	20.25	0.36	124.25
7:39	15.43	4.78	113.95
7:40	17.72	2.21	59.06
7:41	18.06	2.53	142.19
7:42	16.16	4.26	128.46
7:43	17.31	2.60	49.91
7:44	18.61	2.32	153.90
7:45	15.51	4.52	62.08
7:46	19.33	0.87	108.54
7:47	16.99	3.70	142.97
7:48	15.84	4.23	51.87
7:49	20.35	0.30	117.34
7:50	16.44	3.89	120.35
7:51	19.31	0.97	53.47
7:52	17.82	2.81	132.13
7:53	15.93	4.22	62.33
7:54	18.73	1.40	113.27
7:55	17.65	3.15	140.41
7:56	15.64	4.42	51.37
7:57	20.42	0.25	123.02
7:58	16.20	3.98	110.59
7:59	15.63	4.17	65.69
8:00	20.20	0.87	147.79
8:01	15.27	4.76	80.23
8:02	17.41	2.50	106.13
8:03	18.60	2.29	145.40
8:04	15.24	4.75	80.76
8:05	20.63	0.16	103.51
8:06	15.73	4.41	95.61
8:07	17.11	2.77	85.86
8:08	19.43	1.60	134.88
8:09	15.81	4.32	75.22
8:10	18.04	2.04	93.44
8:11	18.44	2.43	146.37
8:12	16.37	3.75	47.55
8:13	20.57	0.19	119.78
8:14	16.20	3.93	98.82
8:15	17.75	2.23	73.36
8:16	18.93	1.96	138.39
8:17	15.94	4.13	43.73
8:18	20.65	0.17	125.66
8:19	16.10	4.04	55.00
8:20	20.66	0.16	114.30
8:21	16.09	3.98	63.78
8:22	20.66	0.16	115.50
8:23	16.46	3.66	46.43
8:24	19.76	0.65	120.15
8:25	17.38	3.13	132.11
8:26	18.44	1.63	28.21
8:27	18.43	2.39	136.69
8:28	17.04	2.92	26.83
8:29	19.82	1.16	127.97

Appendix G

Commonwealth of Kentucky
Energy and Environment Protection Cabinet
Department for Environmental Protection
Division for Air Quality
300 Sower Blvd., 2nd Floor
Frankfort, Kentucky 40601

COMPLIANCE TEST PROTOCOL

Material Incorporated By Reference
401 KAR 50:045
Filed March 15, 2005

I: CERTIFICATION

I am authorized to make this submission on behalf of the owners and operators of the affected source or affected units for which this submission is made. I have personally examined and am familiar with the statements and information submitted in this document and all its attachments and certify that to the best of my knowledge, they are true, accurate and complete.

SIGNATURE Joshua Luna DATE 2/28/2024

AFFILIATION AND TITLE GM, Kentucky Cooperage

Please submit completed Protocol to:

Kentucky Division for Air Quality
300 Sower Blvd, 2nd Floor
Frankfort, KY 40601
Attention: Source Sampling Section

Agency Use Only:

Date Received: _____ Date Approved: _____

Reviewed by: _____

Comments: _____

II. AGENCY OF INTEREST INFORMATION

A. General Information:

Facility Name Kentucky Cooperage
Facility ID# 2899
Permit ID# F-20-032
Facility Address 712 Main Street
Lebanon, KY 40033
Facility Contact John Mealey
Telephone #: (270) 692-4674

Subject Items to be tested: G5 Processing (EU-013)

Purpose of the test: To establish a Particulate Matter (PM) emission factor.

Tentative test date: April 30, 2024

B. Process Information:

Maximum rated Capacity: EU 13-1: 19.35 tons/hr, EU13-2: 18.86 tons/hr, EU 13-3: 16.84 tons/hr, EU13-4: 1.04 tons/hr

Rate to be run during the test: Normal Operating
(Permitted rate will be no more than 110% of average test rate.)

Normal operating cycles *(e.g. 8 hrs/day, soot blowing, etc.)*
2 shifts at 10 hours per shift

Operating conditions that tend to cause worse case pollution emissions:
baghouse issue or clog in pipe

Normal maintenance schedule for equipment affecting emissions:
Baghouse Maintenance according to manufacturers specs

INCLUDE A SIMPLIFIED PROCESS FLOW DIAGRAM

There ave 24 G5 Jointing Machines all goins Into
Main Dust pipe goins out To Bashouse The Return Air back

C. Control Equipment Data:

List the type and manufacturer of the control equipment: N/A

List the data to be monitored and recorded to ensure representative operation during the test and their optimum values: Wood Usage
Number of Barrel Heads Processed

Describe the operational cycles: NA

List continuous monitors: None

List the normal maintenance schedule on the control equipment and the date the last time this maintenance was performed: Baghouse maintenance according to manufacturer's specs

III. SAMPLING DATA

Name of Testing Firm: Alliance Technical Group LLC
Address of Testing Firm: 214 Central Circle, Decatur, AL 35603
Testing Firm Contact: Andy Roth Telephone #: 256-221-9457

List all of the Subject Items to be sampled and give the information required below:

Subject Item	Pollutants	Total Time Per Test	No. of Tests minimum of 3	Test Methods To be Used
EU-013	VFR	1 hour	3	US EPA Method 1-2
EU-013	O_2/CO_2	1 hour	3	US EPA Method 3A
EU-013	BWS	1 hour	3	US EPA Method 4
EU-013	PM	1 hour	3	US EPA Method 5

Include a diagram of the sampling location with dimensions, port locations, number and location of traverse points, distances from flow disturbances, and any other physical obstacles in or around the stack.

A. Sampling Train Information:

Provide a detailed description of any sampling or sample recovery and transport procedures that do not comply with the specified procedures listed in the method and provide justification for the deviation: NA

Length of the sampling probe: 5- 6 feet

Probe liner material of construction: Stainless-steel

Manufacturer(s) of the sampling equipment: Environmental Supply or Apex

List the clean-up and/or analysis to be done on-site: All cleanup will be conducted on-site

Stack temperature: TBD %Moisture in Stack: TBD
Stack gas velocity: TBD
Stack gas composition including the approximate concentration of organics: TBD.

For instrumental methods list the expected concentrations, the allowable concentrations, the instrument span values, and the calibration gas concentrations: TBD

B. **Laboratory Analysis:**

Give a detailed description of any analytical procedure and/or equipment that does not comply with the specified procedures and provide a justification for the deviation: N/A

List your chain-of-custody procedures and the method(s) of documentation:
Chain of custody forms are completed for each sample at the time of testing by the field team leader. The samples will remain in the possession of the field team leader until they are relinquished to the analytical laboratory. Upon receipt of samples, the laboratory will complete the chain of custody.

ALL LABORATORY PROCEDURES SHALL HAVE PERTINENT QUALITY ASSURANCE DATA SUBMITTED WHETHER OR NOT THE WORK IS PERFORMED IN-HOUSE OR BY A THIRD PARTY:

Have you participated in any EPA inter-lab source audits in the last year? ºyes √ no
If so list the type of audit, the date, and the result(s):

C. **Data Sheets:**

Submit examples of all data sheets to be used. Attached.

Continuous Emissions Monitoring Systems (CEMS)
General Information Form
To be used to request certification testing of CEMS

No CEMS Certification testing to be performed

Date: _____

Facility Name _____
Facility ID# _____
Permit ID# _____
Facility Address _____
Facility Contact _____
Telephone #: _____

Unit #	Parameter	Instrument	Model #	Serial #	Range	Date Installed

Provide the date(s) the Performance Specification Test (PST) is to be conducted: _____

Is the CEM In-Situ or Extractive? _____

If the CEM is In-Situ what is the path length? _____

For Opacity Monitors Only:
What is the emissions outlet path length? _____
How is the optical path length ratio (OPLR) converted? _____

For all CEMS
How is the data recorded? _____
What are the units? _____Unit conversion? _____

List data to be reported to the Federal or State Agency: _____
_____

How is the monitor(s) calibrated? _____

_____

How often are calibration(s) performed? _____

Is a drawing of the monitor location included? ○ Yes ○ No

Accessibility of the monitor:

○ In-stack ○ Duct ○ Elevator ○ Ladder ○ Stairway ○ Other

If the monitor is capable of being calibrated with certified gas cylinders, briefly describe the provisions for cylinder hook-up.

_____

_____

Are logbooks kept on site? ○ Yes ○ No

If yes, what information is recorded? _____

_____

If no, how is documentation on monitor performance kept? _____

_____

Provide the name of the person responsible for the operation of the CEM(s)

Name: _____ Phone #: _____

Provide the name of the on-site contact for the CEM(s) if different than above:

Name: _____ Phone#: _____

AGENCY USE ONLY:

Date Certified: _____ Pass or Fail: _____

Date Report was received: _____

Date Review was completed: _____

Date Review report approved: _____

Comments:

_____

_____

_____

_____

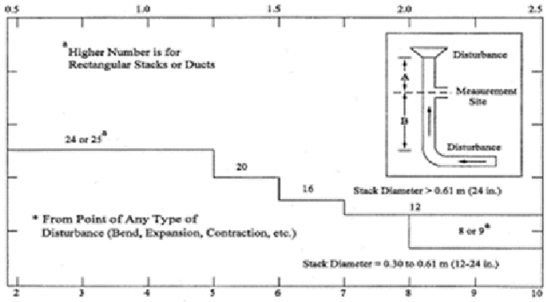
_____

Method 1 Data

Location --
Source --
Project No. --
Date:

Stack Parameters

Duct Orientation:
Duct Design:
Distance from Far Wall to Outside of Port: in
Nipple Length: in
Depth of Duct: 0.00 in
Cross Sectional Area of Duct: -- ft^2
No. of Test Ports:
Distance A: ft
Distance A Duct Diameters: -- (must be > 0.5)
Distance B: ft
Distance B Duct Diameters: -- (must be > 2)
Minimum Number of Traverse Points: --
Actual Number of Traverse Points:
Number of Readings per Point:
Measurer (Initial and Date):
Reviewer (Initial and Date):



DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

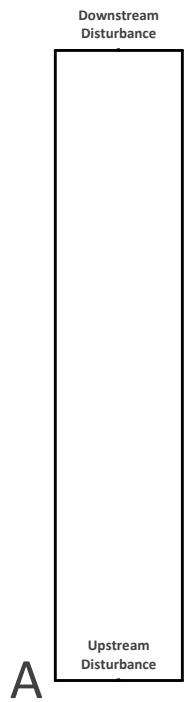
	2	3	4	5	6	7	8	9	10	11	12
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3	--	83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	31.8	20.8
4	--	--	87.5	70.0	58.3	50.0	43.8	38.9	35.0	22.7	29.2
5	--	--	--	90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6	--	--	--	--	91.7	78.6	68.8	61.1	55.0	50.0	45.8
7	--	--	--	--	--	92.9	81.3	72.2	65.0	59.1	54.2
8	--	--	--	--	--	--	93.8	83.3	75.0	68.2	62.5
9	--	--	--	--	--	--	--	94.4	85.0	77.3	70.8
10	--	--	--	--	--	--	--	--	95.0	86.4	79.2
11	--	--	--	--	--	--	--	--	--	95.5	87.5
12	--	--	--	--	--	--	--	--	--	--	95.8

**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	--	--	--
2	--	--	--
3	--	--	--
4	--	--	--
5	--	--	--
6	--	--	--
7	--	--	--
8	--	--	--
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = ft.
B = ft.
Depth of Duct = 0 in.

Cross Sectional Area



Alliance SOURCE TESTING

Cyclonic Flow Check

Location --

Source --

Project No. --

Date

Sample Point	Angle (ΔP=0)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
Average	--

Alliance SOURCE TESTING

Method 3 Data

Location --

Source --

Project No. --

Analysis Type	Assumed Ambient			
Cylinder IDs	**Cylinder Concentrations**		**Analyzer Response**	
	O_2 %	**CO_2 %**	**O_2 %**	**CO_2 %**
--	--	--	--	--
--	--	--	--	--

Run No.	**Run 1**		**Run 2**		**Run 3**	
Parameter	**O_2 %**	**CO_2 %**	**O_2 %**	**CO_2 %**	**O_2 %**	**CO_2 %**
Date	--		--		--	
Analysis #1	--	--	--	--	--	--
Analysis #2	--	--	--	--	--	--
Analysis #3	--	--	--	--	--	--
Average	--	--	--	--	--	--

Run No.	**Run 4**		**Run 5**		**Run 6**	
Parameter	**O_2 %**	**CO_2 %**	**O_2 %**	**CO_2 %**	**O_2 %**	**CO_2 %**
Date	--		--		--	
Analysis #1	--	--	--	--	--	--
Analysis #2	--	--	--	--	--	--
Analysis #3	--	--	--	--	--	--
Average	--	--	--	--	--	--

Run No.	**Run 7**		**Run 8**	
Parameter	**O_2 %**	**CO_2 %**	**O_2 %**	**CO_2 %**
Date	--		--	
Analysis #1	--	--	--	--
Analysis #2	--	--	--	--
Analysis #3	--	--	--	--
Average	--	--	--	--

The remaining consistuent is assumed to be nitrogen.

Alliance SOURCE TESTING

Method 3/3A Data

Location -- _____

Source -- _____

Project No. -- _____

	O_2 Data			CO_2 Data		
	Date/Time	**--**	**--**	**Date/Time**	**--**	**--**
Make/Model/SN	--	--	--	--	--	--
Parameter	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**
Zero Gas		--	--		--	--
High Range Gas	--	--	--	--	--	--
Mid Range Gas	--	--	--	--	--	--
Concentration Span, %	--			--		
Required Accuracy, %	--			--		
	Date/Time	**--**	**--**	**Date/Time**	**--**	**--**
Make/Model/SN	--	--	--	--	--	--
Parameter	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**
Zero Gas		--	--		--	--
High Range Gas	--	--	--	--	--	--
Mid Range Gas	--	--	--	--	--	--
Concentration Span, %	--			--		
Required Accuracy, %	--			--		
	Date/Time	**--**	**--**	**Date/Time**	**--**	**--**
Make/Model/SN	--	--	--	--	--	--
Parameter	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**
Zero Gas		--			--	
High Range Gas	--	--		--	--	
Mid Range Gas	--	--		--	--	
Concentration Span, %	--			--		
Required Accuracy, %	--			--		

Alliance SOURCE TESTING

Method 4 Data

Location --
Source --
Project No. --
Parameter --
Analysis Gravimetric

Run 1	**Date:**	--			
Impinger No.	**1**	**2**	**3**	**4**	**Total**
Contents	H2O	H2O	Empty	Silica	--
Initial Mass, g					--
Final Mass, g					--
Gain	--	--	--	--	--
Run 2	**Date:**	--			
Impinger No.	**1**	**2**	**3**	**4**	**Total**
Contents	H2O	H2O	Empty	Silica	--
Initial Mass, g					--
Final Mass, g					--
Gain	--	--	--	--	--
Run 3	**Date:**	--			
Impinger No.	**1**	**2**	**3**	**4**	**Total**
Contents	H2O	H2O	Empty	Silica	--
Initial Mass, g					--
Final Mass, g					--
Gain	--	--	--	--	--

Alliance
SOURCE TESTING

Isokinetic Field Data

Location: --		**Start Time:** --		**Source:** --	
Date: --	**Run 1** VALID	**End Time:** --		**Project No.:** --	**Parameter:** --

STACK DATA (EST)			**EQUIPMENT**			**STACK DATA (EST)**			**FILTER NO.**	**STACK DATA (FINAL)**			**MOIST. DATA**
Moisture:		% est.	**Meter Box ID:**	--		**Est. Tm:**		°F		**Pb:**	--	in. Hg	**Vlc (ml)**
Barometric:	--	in. Hg	**Y:**	--		**Est. Ts:**	--	°F		**Pg:**	--	in. WC	--
Static Press:	--	in. WC	**ΔH @ (in.WC):**	--		**Est. ΔP:**	--	in. WC		**O_2:**	--	%	**K-FACTOR**
Stack Press:	--	in. Hg	**Probe ID:**	--		**Est. Dn:**	--	in.		**CO_2:**	--	%	--
CO_2:	--	%	**Liner Material:**	--		**Target Rate:**	--	scfm					
O_2:	--	%	**Pitot ID:**	--									
N_2/CO:	--	%	**Pitot Cp/Type:**	--	--								
Md:	--	lb/lb-mole	**Nozzle ID:**	--	--								
Ms:	--	lb/lb-mole	**Nozzle Dn (in.):**	--									

LEAK CHECKS	**Pre**	**Mid 1**	**Mid 2**	**Mid 3**	**Post**
Leak Rate (cfm):		--	--	--	
Vacuum (in Hg):		--	--	--	
Pitot Tube:		--	--	--	

Check Pt.	**Initial**	**Final**	**Corr.**
Mid 1 (cf)			--
Mid 2 (cf)			--
Mid 3 (cf)			--
Mid-Point Leak Check Vol (cf):			--

Sample Pt.	**Sample Time (minutes)**		**Dry Gas Meter Reading (ft^3)**	**Pitot Tube ΔP (in WC)**	**Gas Temperatures (°F)**		**Orifice Press. ΔH (in. WC)**		**Pump Vac (in. Hg)**	**Gas Temperatures (°F)**				**% ISO**	**Vs (fps)**
					DGM Average	**Stack**				**Probe**	**Filter**	**Imp Exit**	**Aux**		
					Amb.	Amb.				Amb.	Amb.	Amb.	Amb.		
	Begin	**End**					**Ideal**	**Actual**					-		
	0.00	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
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	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--

Final DGM: --

RESULTS	**Run Time**	**Vm**	**ΔP**	**Tm**	**Ts**	**Max Vac**	**ΔH**	**%ISO**	**BWS**	**Y_{qa}**
	60.0 min	0.000 ft^3	-- in. WC	-- °F	-- °F	--	-- in. WC	--	--	--

QA/QC Data

Location --
Source --
Project No. --
Parameter --

Date	Nozzle ID	Nozzle Diameter (in.) #1	#2	#3	Dn (Average)	Difference	Criteria	Material
					--	--	≤ 0.004 in.	--

Date	Pitot ID	Evidence of damage?	Evidence of mis-alignment?	Calibration or Repair required?

Date	Probe ID	Reference Temp. (°F)	Indicated Temp. (°F)	Difference	Criteria	Probe Length
	--			--	± 1.5 % (absolute)	--

Field Balance Check

Date						
Balance ID:						
Test Weight ID:						
Certifieid Weight (g):						
Measured Weight (g):						
Weight Difference (g):	--	--	--	--	--	--

Date	Barometric Pressure	Evidence of damage?	Reading Verified	Calibration or Repair required?	Weather Station Location

Date	Meter Box ID	Positive Pressure Leak Check
	--	Pass

Reagent	Lot#	Field Prep performed	Field Lot	Date	By

Posttest Purge

Run 1		Run 1		Run 1	
Flow Rate (lpm):		Flow Rate (lpm):		Flow Rate (lpm):	
Clock Time	Temperature	Clock Time	Temperature	Clock Time	Temperature
-	--	--	--	--	--
-	--	--	--	--	--
-	--	--	--	--	--
-	--	--	--	--	--
-	--	--	--	--	--

Alliance SOURCE TESTING

Location: --
Source: --
Project No.: --
Run No.: 1
Parameter: --

Meter Pressure (Pm), in. Hg

$$Pm = Pb + \frac{\Delta H}{13.6}$$

where,

Pb	--	= barometric pressure, in. Hg
ΔH	--	= pressure differential of orifice, in H_2O
Pm	--	= in. Hg

Absolute Stack Gas Pressure (Ps), in. Hg

$$Ps = Pb + \frac{Pg}{13.6}$$

where,

Pb	--	= barometric pressure, in. Hg
Pg	--	= static pressure, in. H_2O
Ps	--	= in. Hg

Standard Meter Volume (Vmstd), dscf

$$Vmstd = \frac{17.647 \times Y \times Vm \times Pm}{Tm}$$

where,

Y	--	= meter correction factor
Vm	0.000	= meter volume, cf
Pm	--	= absolute meter pressure, in. Hg
Tm	--	= absolute meter temperature, ^oR
Vmstd	--	= dscf

Standard Wet Volume (Vwstd), scf

$$Vwstd = 0.04707 \times Vlc$$

where,

Vlc	--	= volume of H_2O collected, ml
Vwstd	--	= scf

Moisture Fraction (BWSsat), dimensionless (theoretical at saturated conditions)

$$BWSsat = \frac{10^{6.37-\left(\frac{2,827}{Ts+365}\right)}}{Ps}$$

where,

Ts	--	= stack temperature, °F
Ps	--	= absolute stack gas pressure, in. Hg
BWSsat	--	= dimensionless

Moisture Fraction (BWS), dimensionless (measured)

$$BWS = \frac{Vwstd}{(Vwstd + Vmstd)}$$

where,

Vwstd	--	= standard wet volume, scf
Vmstd	--	= standard meter volume, dscf
BWS	--	= dimensionless

Alliance SOURCE TESTING

Location: --
Source: --
Project No.: --
Run No.: 1
Parameter: --

Moisture Fraction (BWS), dimensionless

$$BWS = BWSmsd \text{ unless } BWSsat < BWSmsd$$

where,

BWSsat	--	= moisture fraction (theoretical at saturated conditions)
BWSmsd	--	= moisture fraction (measured)
BWS	--	

Molecular Weight (DRY) (Md), lb/lb-mole

$$Md = (0.44 \times \%\,CO_2) + (0.32 \times \%\,O2) + (0.28\,(100 - \%\,CO_2 - \%\,O2))$$

where,

CO_2	--	= carbon dioxide concentration, %
O_2	--	= oxygen concentration, %
Md	--	= lb/lb mol

Molecular Weight (WET) (Ms), lb/lb-mole

$$Ms = Md\ (1 - BWS) + 18\,(BWS)$$

where,

Md	--	= molecular weight (DRY), lb/lb mol
BWS	--	= moisture fraction, dimensionless
Ms	--	= lb/lb mol

Average Velocity (Vs), ft/sec

$$Vs = 85.49 \times Cp \times (\Delta P^{1/2})\,avg \times \sqrt{\frac{Ts}{Ps \times Ms}}$$

where,

Cp	--	= pitot tube coefficient
$\Delta P^{1/2}$	--	= velocity head of stack gas, $(\text{in. } H_2O)^{1/2}$
Ts	--	= absolute stack temperature, °R
Ps	--	= absolute stack gas pressure, in. Hg
Ms	--	= molecular weight of stack gas, lb/lb mol
Vs	--	= ft/sec

Average Stack Gas Flow at Stack Conditions (Qa), acfm

$$Qa = 60 \times Vs \times As$$

where,

Vs	--	= stack gas velocity, ft/sec
As	--	= cross-sectional area of stack, ft^2
Qa	--	= acfm

Average Stack Gas Flow at Standard Conditions (Qs), dscfm

$$Qs = 17.647 \times Qa \times (1 - BWS) \times \frac{Ps}{Ts}$$

where,

Qa	--	= average stack gas flow at stack conditions, acfm
BWS	--	= moisture fraction, dimensionless
Ps	--	= absolute stack gas pressure, in. Hg
Ts	--	= absolute stack temperature, °R
Qs	--	= dscfm

Alliance SOURCE TESTING

Location: --
Source: --
Project No.: --
Run No.: 1
Parameter: --

Dry Gas Meter Calibration Check (Yqa), dimensionless

$$Yqa = \frac{Y - \left(\frac{\Theta}{Vm} \sqrt{\frac{0.0319 \times Tm \times 29}{\Delta H@ \times \left(Pb + \frac{\Delta Havg.}{13.6} \right) \times Md}} \sqrt{\Delta H}\ avg. \right)}{Y} \times 100$$

where,

Y	--	= meter correction factor, dimensionless
Θ	60	= run time, min.
Vm	0	= total meter volume, dcf
Tm	--	= absolute meter temperature, °R
ΔH@	--	= orifice meter calibration coefficient, in. H_2O
Pb	--	= barometric pressure, in. Hg
ΔH avg	--	= average pressure differential of orifice, in H_2O
Md	--	= molecular weight (DRY), lb/lb mol
$(\Delta H)^{1/2}$	--	= average squareroot pressure differential of orifice, $(in. H2O)^{1/2}$
Yqa	--	= dimensionless

Volume of Nozzle (Vn), ft^3

$$Vn = \frac{Ts}{Ps} \left(0.002669 \times Vlc + \frac{Vm \times Pm \times Y}{Tm} \right)$$

where,

Ts	--	= absolute stack temperature, °R
Ps	--	= absolute stack gas pressure, in. Hg
Vlc	--	= volume of H_2O collected, ml
Vm	0.000	= meter volume, cf
Pm	--	= absolute meter pressure, in. Hg
Y	--	= meter correction factor, unitless
Tm	--	= absolute meter temperature, °R
Vn	--	= volume of nozzle, ft^3

Isokinetic Sampling Rate (I), %

$$I = \left(\frac{Vn}{\theta \times 60 \times An \times Vs} \right) \times 100$$

where,

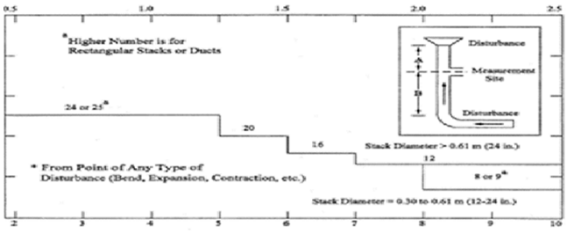
Vn	--	= nozzle volume, ft^3
θ	60.0	= run time, minutes
An	--	= area of nozzle, ft^2
Vs	--	= average velocity, ft/sec
I	--	= %

Method 1 Data

Location --
Source --
Project No. --
Date:

Stack Parameters

Duct Orientation:
Duct Design:
Distance from Far Wall to Outside of Port: in
Nipple Length: in
Depth of Duct: 0.00 in
Cross Sectional Area of Duct: -- ft^2
No. of Test Ports:
Distance A: ft
Distance A Duct Diameters: -- **(must be > 0.5)**
Distance B: ft
Distance B Duct Diameters: -- **(must be > 2)**



DUCT

LOCATION OF STRATIFICATION POINTS

Number of traverse points on a diameter

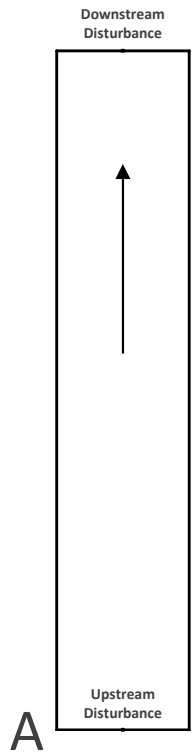
	2	3	4	5	6	7	8	9	10	11	12
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3	--	83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	31.8	20.8
4	--	--	87.5	70.0	58.3	50.0	43.8	38.9	35.0	22.7	29.2
5	--	--	--	90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6	--	--	--	--	91.7	78.6	68.8	61.1	55.0	50.0	45.8
7	--	--	--	--	--	92.9	81.3	72.2	65.0	59.1	54.2
8	--	--	--	--	--	--	93.8	83.3	75.0	68.2	62.5
9	--	--	--	--	--	--	--	94.4	85.0	77.3	70.8
10	--	--	--	--	--	--	--	--	95.0	86.4	79.2
11	--	--	--	--	--	--	--	--	--	95.5	87.5
12	--	--	--	--	--	--	--	--	--	--	95.8

**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	16.7	0.00	0.00
2	50.0	0.00	0.00
3	83.3	0.00	0.00
4	--	--	--
5	--	--	--
6	--	--	--
7	--	--	--
8	--	--	--
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = ft.
B = ft.
Depth of Duct = 0 in.

Cross Sectional Area



Alliance SOURCE TESTING

QA Data

Location --
Source --
Project No. --

Parameter	O_2	CO_2	CO	NOx	THC	SO_2	TRS
Make	--	--	--	--	--	--	--
Model	--	--	--	--	--	--	--
S/N							
Operating Range							
Cylinder ID							
Zero	NA	NA	NA	NA	NA	NA	NA
Low	NA	NA	NA	NA		NA	NA
Mid							
High							
Cylinder Certified Values							
Low	NA	NA	NA	NA		NA	NA
Mid							
High							
Cylinder Expiration Date							
Zero	NA	NA	NA	NA	NA	NA	NA
Low	NA	NA	NA	NA		NA	NA
Mid							
High							

Location: _____

Source: _____

Project No.: _____

Parameter	O2	CO2	CO	NOx	THC	SO2	TRS
Zero Calibration							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Low Calibration							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
Mid Calibration							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
High Calibration							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
Run 1 Zero Pre-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Run 1 Mid Pre-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
Run 1 Zero Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Run 1 Mid Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
Run 2 Zero Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Run 2 Mid Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
Run 3 Zero Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Run 3 Mid Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA

Alliance SOURCE TESTING

Calibration Data

Location --
Source --
Project No. --
Date

Parameter	O_2	CO_2	CO	NOx	THC	SO_2	TRS
Expected Average Concentration							
Span Between							
Low	-	-	-	-	-	-	-
High	-	-	-	-	-	-	-
Desired Span							
Low Range Gas							
Low	NA	NA	NA	NA	-	NA	NA
High	NA	NA	NA	NA	-	NA	NA
Mid Range Gas							
Low	-	-	-	-	-	-	-
High	-	-	-	-	-	-	-
High Range Gas							
Low	NA	NA	NA	NA	-	NA	NA
High	NA	NA	NA	NA	-	NA	NA
Actual Concentration (% or ppm)							
Zero	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA		NA	NA
Mid							
High	-	-	-	-		-	-
Response Time (seconds)							
Instrument Response (% or ppm)							
Zero							
Low	NA	NA	NA	NA		NA	NA
Mid							
High							
Performance (% of Span or Cal. Gas Conc.)					.		
Zero	-	-	-	-	-	-	-
Low	NA	NA	NA	NA	-	NA	NA
Mid	-	-	-	-	-	-	-
High	-	-	-	-	-	-	-
Status							
Zero	-	-	-	-	-	-	-
Low	NA	NA	NA	NA	-	NA	NA
Mid	-	-	-	-	-	-	-
High	-	-	-	-	-	-	-

Alliance SOURCE TESTING

Bias/Drift Determinations

Location: --
Source: --
Project No.: --

Parameter		O_2	CO_2	CO	NOx	THC	SO_2
Run 1 Date --							
Span Value		-	-	-	-	-	-
Instrument Zero Cal Response		-	-	-	-	-	-
Instrument Mid Cal Response		-	-	-	-	-	-
Pretest System Zero Response		-	-	-	-	-	-
Posttest System Zero Response		-	-	-	-	-	-
Pretest System Mid Response		-	-	-	-	-	-
Posttest System Mid Response		-	-	-	-	-	-
Bias (%)							
	Pretest Zero	-	-	-	-	NA	-
	Posttest Zero	-	-	-	-	NA	-
	Pretest Span	-	-	-	-	NA	-
	Posttest Span	-	-	-	-	NA	-
Drift (%)							
	Zero	-	-	-	-	-	-
	Mid	-	-	-	-	-	-
Run 2 Date --							
Span Value		-	-	-	-	-	-
Instrument Zero Cal Response		-	-	-	-	-	-
Instrument Mid Cal Response		-	-	-	-	-	-
Pretest System Zero Response		-	-	-	-	-	-
Posttest System Zero Response		-	-	-	-	-	-
Pretest System Mid Response		-	-	-	-	-	-
Posttest System Mid Response		-	-	-	-	-	-
Bias (%)							
	Pretest Zero	-	-	-	-	NA	-
	Posttest Zero	-	-	-	-	NA	-
	Pretest Span	-	-	-	-	NA	-
	Posttest Span	-	-	-	-	NA	-
Drift (%)							
	Zero	-	-	-	-	-	-
	Mid	-	-	-	-	-	-
Run 3 Date --							
Span Value		-	-	-	-	-	-
Instrument Zero Cal Response		-	-	-	-	-	-
Instrument Mid Cal Response		-	-	-	-	-	-
Pretest System Zero Response		-	-	-	-	-	-
Posttest System Zero Response		-	-	-	-	-	-
Pretest System Mid Response		-	-	-	-	-	-
Posttest System Mid Response		-	-	-	-	-	-
Bias (%)							
	Pretest Zero	-	-	-	-	NA	-
	Posttest Zero	-	-	-	-	NA	-
	Pretest Span	-	-	-	-	NA	-
	Posttest Span	-	-	-	-	NA	-
Drift (%)							
	Zero	-	-	-	-	-	-
	Mid	-	-	-	-	-	-

Alliance SOURCE TESTING

Post Test Calibration Drift Data

Location: 0
Source: 0
Project No.: 0
Date:

Parameter		TRS (w SO2 gas)
Actual Concentration (ppm)		
Zero		0.0
Mid		0.0
High		0.0
Instrument Response (ppm)		
Mid	**Initial**	0.0
	Post Test	
Performance (% of Calibration Gas)		
Mid		-
Status		
Mid		-

Note: TRS calibrations were conducted using SO2/N2 calibration gas. Analyzer calibration drift was calculated by evaluating the initial instrument response versus the final instrument response. Performance is acceptable if this value is less than or equal to 3% or 0.5 ppmv.

Alliance SOURCE TESTING

System Performance Determinations

Location: 0
Source: 0
Project No.: 0
Date: --

Parameter	TRS
Span Value, ppm	-
H2S Gas Concentration, ppm	
Cylinder Certification Number	
Run 1	
Pretest System Response, ppm	
Posttest System Response, ppm	
Pretest System Performance (%)	-
Posttest System Performance (%)	-
Run 2	
Posttest System Response, ppm	
Posttest System Performance (%)	-
Run 3	
Posttest System Response, ppm	
Posttest System Performance (%)	-
Run 4	
Posttest System Response, ppm	
Posttest System Performance (%)	-
Run 5	
Posttest System Response, ppm	
Posttest System Performance (%)	-
Run 6	
Posttest System Response, ppm	
Posttest System Performance (%)	-

EPA Method 205
Field Calibration of Dilution System

Location: --
Source: --
Project No.: --
Date

Analyzer Make: --
Analyzer Model: --
Analyzer SN:
Environics ID: --
Component/Balance Gas: --
Cylinder Gas ID (Dilution):
Cylinder Gas Concentration (Dilution), ppm:
Cylinder Gas ID (Mid-Level):
Cylinder Gas Concentration (Mid-Level), ppm:

Target Mass Flow Contollers	Target Dilution (%)	Target Flow Rate lpm	Target Concentration (ppm)	Actual Concentration (ppm)	Injection 1 Analyzer Concentration (ppm)	Injection 2 Analyzer Concentration (ppm)	Injection 3 Analyzer Concentration (ppm)	Average Analyzer Concentration (ppm)	Difference (ppm)	Average Error (± 2 %)
10L/10L*	90.0	7.0	-					-	-	-
10L/10L*	80.0	7.0	-					-	-	-
10L/5L	80.0	5.0	-					-	-	-
10L/5L	50.0	5.0	-					-	-	-
10L/1L	20.0	4.0	-					-	-	-
10L/1L	10.0	4.0	-					-	-	-

*Not all AST Environics Units have 2-10L Mass Flow Controllers. For these units the 90% @ 7lpm and 80% @ 7lpm injections will not be conducted.

Average Analyzer Concentration (ppm)	Injection 1 Error (± 2 %)	Injection 2 Error (± 2 %)	Injection 3 Error (± 2 %)
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

Mid-Level Supply Gas Calibration Direct to Analyzer

Calibration Gas Concentration (ppm)	Injection 1 Analyzer Concentration (ppm)	Injection 2 Analyzer Concentration (ppm)	Injection 3 Analyzer Concentration (ppm)	Average Analyzer Concentration (ppm)	Difference (ppm)	Average Error (± 2 %)
-				-	-	-

Alliance SOURCE TESTING

QA Data
Stratification Check

Location: --
Source: --
Project No.: --
Date:

Traverse Point	Time	NOx (ppm)	CO (ppm)	SO_2 (ppm)	O_2 (%)	CO_2 (%)
A-1						
2	0:00					
3	0:00					
Average		--	--	--	--	--
Status		Single	Single	Single	Single	Single

Location 0

Source 0

Project No. 0

Run Number	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6
Date	--	--	--	--	--	--
Start Time	--	--	--	--	--	--
Stop Time	--	--	--	--	--	--
Sample System Operational Data						
Sample Line Temperature, °F						
Time, 0 min						
Time, 15 min						
Time, 30 min						
Time, 45 min						
Time, 60 min						
Average	--	--	--	--	--	--

Alliance SOURCE TESTING

NOx Converter Efficiency Check

Location: --
Source: --
Project No.: --

Converter Check				
Analyzer Make	--	**Pre-Test Date**	**Time**	
Analyzer Model	--	**Pre-Test Concentration, ppm**		
Gas Type	NO_2	**Pre-Test Efficiency, %**		-
Cylinder ID #		**Post-Test Date**	**Time**	
Cylinder Exp. Date		**Post-Test Concentration, ppm**		
Cylinder Concentration, ppm		**Post-Test Efficiency, %**		-

**Efficiency must be ≥ 90 %*

Alliance SOURCE TESTING

Location: --
Source: --
Project No.: --
Date: -

Time	O_2	CO_2	CO	NOx	THC	SO_2	TRS
Unit	% dry	% dry	ppmvd	ppmvd	ppmvw	ppmvd	ppmvd
Status	Valid	Valid	Valid	Valid	Valid	Valid	Valid
-							
-							
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Parameter	O_2	CO_2	CO	NOx	THC	SO_2	TRS
Uncorrected Run Average (C_{obs})	-	-	-	-	-	-	-
Cal Gas Concentration (C_{MA})	-	-	-	-	-	-	NA
Pretest System Zero Response							NA
Posttest System Zero Response							NA
Average Zero Response (Co)	-	-	-	-	-	-	NA
Pretest System Cal Response							NA
Posttest System Cal Response							NA
Average Cal Response (C_M)	-	-	-	-	-	-	NA
Corrected Run Average (Corr)	--	--	--	--	NA	--	--

Commonwealth of Kentucky
Energy and Environment Protection Cabinet
Department for Environmental Protection
Division for Air Quality
300 Sower Blvd., 2nd Floor
Frankfort, Kentucky 40601

COMPLIANCE TEST PROTOCOL

Material Incorporated By Reference
401 KAR 50:045
Filed March 15, 2005

I: CERTIFICATION

I am authorized to make this submission on behalf of the owners and operators of the affected source or affected units for which this submission is made. I have personally examined and am familiar with the statements and information submitted in this document and all its attachments and certify that to the best of my knowledge, they are true, accurate and complete.

SIGNATURE Joshua Luna DATE 2/28/2024

AFFILIATION AND TITLE GM, Kentucky Cooperage

Please submit completed Protocol to:

Kentucky Division for Air Quality
300 Sower Blvd, 2nd Floor
Frankfort, KY 40601
Attention: Source Sampling Section

Agency Use Only:

Date Received: _____ Date Approved: _____

Reviewed by: _____

Comments: _____

II. AGENCY OF INTEREST INFORMATION

A. **General Information**:

Facility Name	Kentucky Cooperage
Facility ID#	2899
Permit ID#	F-20-032
Facility Address	712 Main Street
	Lebanon, KY 40033
Facility Contact	John Mealey
Telephone #:	(270) 692-4674

Subject Items to be tested: Stave Char (EU-012)

Purpose of the test: To establish a Carbon Monoxide (CO) and Particulate Matter (PM) emission factor.

Tentative test date: May 1, 2024

B. Process Information:

Maximum rated Capacity: Wood – 7.02 MMBtu/hr, NG – 6.0 MMBtu/hr, Staves – 188 barrels/hr

Rate to be run during the test: Normal Operating
(Permitted rate will be no more than 110% of average test rate.)

Normal operating cycles *(e.g. 8 hrs/day, soot blowing, etc.)*
2 shifts at 10 hours per shift

Operating conditions that tend to cause worse case pollution emissions: None

Normal maintenance schedule for equipment affecting emissions:
Annual burner inspections done by third party

INCLUDE A SIMPLIFIED PROCESS FLOW DIAGRAM

6- Barrels are charred at a Time of 36 seconds to 42 seconds per cycle

C. Control Equipment Data:

List the type and manufacturer of the control equipment: _____

List the data to be monitored and recorded to ensure representative operation during the test and their optimum values: _____
Wood Usage
Number of Barrel Heads Processed

Describe the operational cycles: _____

List continuous monitors: _____
None

List the normal maintenance schedule on the control equipment and the date the last time this maintenance was performed: _____
TBD

III. SAMPLING DATA

Name of Testing Firm: Alliance Technical Group LLC
Address of Testing Firm: 214 Central Circle, Decatur, AL 35603
Testing Firm Contact: Andy Roth Telephone #: 256-221-9457

List all of the Subject Items to be sampled and give the information required below:

Subject Item	Pollutants	Total Time Per Test	No. of Tests minimum of 3	Test Methods To be Used
EU-012	VFR	1 hour	3	US EPA Method 1-2
EU-012	O_2/CO_2	1 hour	3	US EPA Method 3A
EU-012	BWS	1 hour	3	US EPA Method 4
EU-012	PM	1 hour	3	US EPA Method 5/202
EU-012	CO	1 hour	3	US EPA Method 10

Include a diagram of the sampling location with dimensions, port locations, number and location of traverse points, distances from flow disturbances, and any other physical obstacles in or around the stack.

A. Sampling Train Information:

Provide a detailed description of any sampling or sample recovery and transport procedures that do not comply with the specified procedures listed in the method and provide justification for the deviation: NA

Length of the sampling probe: 5- 6 feet

Probe liner material of construction: Teflon and/or stainless-steel

Manufacturer(s) of the sampling equipment: Environmental Supply or Apex

List the clean-up and/or analysis to be done on-site: All cleanup will be conducted on-site

Stack temperature: TBD %Moisture in Stack: TBD
Stack gas velocity: TBD
Stack gas composition including the approximate concentration of organics: TBD.

For instrumental methods list the expected concentrations, the allowable concentrations, the instrument span values, and the calibration gas concentrations: TBD

B. **Laboratory Analysis:**

Give a detailed description of any analytical procedure and/or equipment that does not comply with the specified procedures and provide a justification for the deviation: N/A

List your chain-of-custody procedures and the method(s) of documentation:
Chain of custody forms are completed for each sample at the time of testing by the field team leader. The samples will remain in the possession of the field team leader until they are relinquished to the analytical laboratory. Upon receipt of samples, the laboratory will complete the chain of custody.

ALL LABORATORY PROCEDURES SHALL HAVE PERTINENT QUALITY ASSURANCE DATA SUBMITTED WHETHER OR NOT THE WORK IS PERFORMED IN-HOUSE OR BY A THIRD PARTY:

Have you participated in any EPA inter-lab source audits in the last year? ºyes √ no
If so list the type of audit, the date, and the result(s):

C. **Data Sheets:**

Submit examples of all data sheets to be used. Attached.

Continuous Emissions Monitoring Systems (CEMS)
General Information Form
To be used to request certification testing of CEMS

No CEMS Certification testing to be performed

Date: _____

Facility Name _____
Facility ID# _____
Permit ID# _____
Facility Address _____
Facility Contact _____
Telephone #: _____

Unit #	Parameter	Instrument	Model #	Serial #	Range	Date Installed

Provide the date(s) the Performance Specification Test (PST) is to be conducted: _____

Is the CEM In-Situ or Extractive? _____

If the CEM is In-Situ what is the path length? _____

For Opacity Monitors Only:
What is the emissions outlet path length? _____
How is the optical path length ratio (OPLR) converted? _____

For all CEMS
How is the data recorded? _____
What are the units? _____Unit conversion? _____

List data to be reported to the Federal or State Agency: _____
_____

How is the monitor(s) calibrated? _____

_____

How often are calibration(s) performed? _____

Is a drawing of the monitor location included? ○ Yes ○ No

Accessibility of the monitor:

○ In-stack ○ Duct ○ Elevator ○ Ladder ○ Stairway ○ Other

If the monitor is capable of being calibrated with certified gas cylinders, briefly describe the provisions for cylinder hook-up.

_____

_____

Are logbooks kept on site? ○ Yes ○ No

If yes, what information is recorded? _____

_____

If no, how is documentation on monitor performance kept? _____

_____

Provide the name of the person responsible for the operation of the CEM(s)

Name: _____ Phone #: _____

Provide the name of the on-site contact for the CEM(s) if different than above:

Name: _____ Phone#: _____

AGENCY USE ONLY:

Date Certified: _____ Pass or Fail: _____

Date Report was received: _____

Date Review was completed: _____

Date Review report approved: _____

Comments:

_____

_____

_____

_____

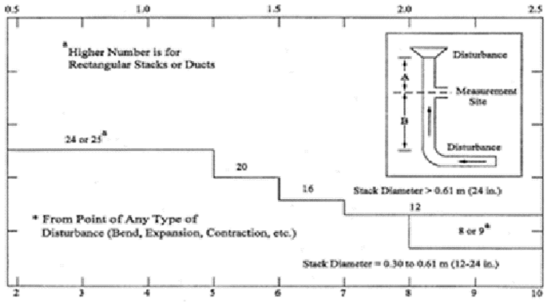
_____

Method 1 Data

Location --
Source --
Project No. --
Date:

Stack Parameters

Duct Orientation:
Duct Design:
Distance from Far Wall to Outside of Port: in
Nipple Length: in
Depth of Duct: 0.00 in
Cross Sectional Area of Duct: -- ft^2
No. of Test Ports:
Distance A: ft
Distance A Duct Diameters: -- (must be > 0.5)
Distance B: ft
Distance B Duct Diameters: -- (must be > 2)
Minimum Number of Traverse Points: --
Actual Number of Traverse Points:
Number of Readings per Point:
Measurer (Initial and Date):
Reviewer (Initial and Date):



DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

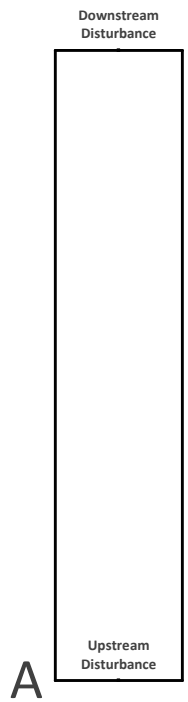
	2	3	4	5	6	7	8	9	10	11	12
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3	--	83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	31.8	20.8
4	--	--	87.5	70.0	58.3	50.0	43.8	38.9	35.0	22.7	29.2
5	--	--	--	90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6	--	--	--	--	91.7	78.6	68.8	61.1	55.0	50.0	45.8
7	--	--	--	--	--	92.9	81.3	72.2	65.0	59.1	54.2
8	--	--	--	--	--	--	93.8	83.3	75.0	68.2	62.5
9	--	--	--	--	--	--	--	94.4	85.0	77.3	70.8
10	--	--	--	--	--	--	--	--	95.0	86.4	79.2
11	--	--	--	--	--	--	--	--	--	95.5	87.5
12	--	--	--	--	--	--	--	--	--	--	95.8

**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	--	--	--
2	--	--	--
3	--	--	--
4	--	--	--
5	--	--	--
6	--	--	--
7	--	--	--
8	--	--	--
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = ft.
B = ft.
Depth of Duct = 0 in.

Cross Sectional Area



Alliance SOURCE TESTING

Cyclonic Flow Check

Location --

Source --

Project No. --

Date

Sample Point	Angle (ΔP=0)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
Average	--

Alliance SOURCE TESTING

Method 3 Data

Location --

Source --

Project No. --

Analysis Type	Assumed Ambient			
Cylinder IDs	**Cylinder Concentrations**		**Analyzer Response**	
	O_2 %	**CO_2 %**	**O_2 %**	**CO_2 %**
--	--	--	--	--
--	--	--	--	--

Run No.	**Run 1**		**Run 2**		**Run 3**	
Parameter	**O_2 %**	**CO_2 %**	**O_2 %**	**CO_2 %**	**O_2 %**	**CO_2 %**
Date	--		--		--	
Analysis #1	--	--	--	--	--	--
Analysis #2	--	--	--	--	--	--
Analysis #3	--	--	--	--	--	--
Average	--	--	--	--	--	--

Run No.	**Run 4**		**Run 5**		**Run 6**	
Parameter	**O_2 %**	**CO_2 %**	**O_2 %**	**CO_2 %**	**O_2 %**	**CO_2 %**
Date	--		--		--	
Analysis #1	--	--	--	--	--	--
Analysis #2	--	--	--	--	--	--
Analysis #3	--	--	--	--	--	--
Average	--	--	--	--	--	--

Run No.	**Run 7**		**Run 8**	
Parameter	**O_2 %**	**CO_2 %**	**O_2 %**	**CO_2 %**
Date	--		--	
Analysis #1	--	--	--	--
Analysis #2	--	--	--	--
Analysis #3	--	--	--	--
Average	--	--	--	--

The remaining consistuent is assumed to be nitrogen.

Alliance SOURCE TESTING

Method 3/3A Data

Location -- _____

Source -- _____

Project No. -- _____

	O_2 Data			CO_2 Data		
	Date/Time	**--**	**--**	**Date/Time**	**--**	**--**
Make/Model/SN	--	--	--	--	--	--
Parameter	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**
Zero Gas		--	--		--	--
High Range Gas	--	--	--	--	--	--
Mid Range Gas	--	--	--	--	--	--
Concentration Span, %	--			--		
Required Accuracy, %	--			--		
	Date/Time	**--**	**--**	**Date/Time**	**--**	**--**
Make/Model/SN	--	--	--	--	--	--
Parameter	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**
Zero Gas		--	--		--	--
High Range Gas	--	--	--	--	--	--
Mid Range Gas	--	--	--	--	--	--
Concentration Span, %	--			--		
Required Accuracy, %	--			--		
	Date/Time	**--**	**--**	**Date/Time**	**--**	**--**
Make/Model/SN	--	--	--	--	--	--
Parameter	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**
Zero Gas		--			--	
High Range Gas	--	--		--	--	
Mid Range Gas	--	--		--	--	
Concentration Span, %	--			--		
Required Accuracy, %	--			--		

Alliance SOURCE TESTING

Method 4 Data

Location --
Source --
Project No. --
Parameter --
Analysis Gravimetric

Run 1	**Date:**	--			
Impinger No.	**1**	**2**	**3**	**4**	**Total**
Contents	H2O	H2O	Empty	Silica	--
Initial Mass, g					--
Final Mass, g					--
Gain	--	--	--	--	--
Run 2	**Date:**	--			
Impinger No.	**1**	**2**	**3**	**4**	**Total**
Contents	H2O	H2O	Empty	Silica	--
Initial Mass, g					--
Final Mass, g					--
Gain	--	--	--	--	--
Run 3	**Date:**	--			
Impinger No.	**1**	**2**	**3**	**4**	**Total**
Contents	H2O	H2O	Empty	Silica	--
Initial Mass, g					--
Final Mass, g					--
Gain	--	--	--	--	--

Alliance SOURCE TESTING

Isokinetic Field Data

Location: --			Start Time: --		Source: --	
Date: --	Run 1	VALID	End Time: --		Project No.: --	Parameter: --

STACK DATA (EST)			EQUIPMENT			STACK DATA (EST)			FILTER NO.	STACK DATA (FINAL)			MOIST. DATA
Moisture:		% est.	Meter Box ID:	--		Est. Tm:		°F		Pb:	--	in. Hg	Vlc (ml)
Barometric:	--	in. Hg	Y:	--		Est. Ts:	--	°F		Pg:	--	in. WC	--
Static Press:	--	in. WC	ΔH @ (in.WC):	--		Est. ΔP:	--	in. WC		O_2:	--	%	K-FACTOR
Stack Press:	--	in. Hg	Probe ID:	--		Est. Dn:	--	in.		CO_2:	--	%	--
CO_2:	--	%	Liner Material:	--		Target Rate:	--	scfm					
O_2:	--	%	Pitot ID:	--									
N_2/CO:	--	%	Pitot Cp/Type:	--	--								
Md:	--	lb/lb-mole	Nozzle ID:	--	--								
Ms:	--	lb/lb-mole	Nozzle Dn (in.):	--									

LEAK CHECKS	Pre	Mid 1	Mid 2	Mid 3	Post
Leak Rate (cfm):		--	--	--	
Vacuum (in Hg):		--	--	--	
Pitot Tube:		--	--	--	

Check Pt.	Initial	Final	Corr.
Mid 1 (cf)			--
Mid 2 (cf)			--
Mid 3 (cf)			--
Mid-Point Leak Check Vol (cf):			--

Sample Pt.	Sample Time (minutes)		Dry Gas Meter Reading (ft^3)	Pitot Tube ΔP (in WC)	Gas Temperatures (°F)		Orifice Press. ΔH (in. WC)		Pump Vac (in. Hg)	Gas Temperatures (°F)				% ISO	Vs (fps)
					DGM Average	Stack				Probe	Filter	Imp Exit	Aux		
					Amb.	Amb.				Amb.	Amb.	Amb.	Amb.		
	Begin	End					Ideal	Actual					-		
	0.00	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
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	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--

Final DGM: --

RESULTS	Run Time	Vm	ΔP	Tm	Ts	Max Vac	ΔH	%ISO	BWS	Y_{qa}
	60.0 min	0.000 ft^3	-- in. WC	-- °F	-- °F	--	-- in. WC	--	--	--

QA/QC Data

Location --
Source --
Project No. --
Parameter --

Date	Nozzle ID	Nozzle Diameter (in.) #1	#2	#3	Dn (Average)	Difference	Criteria	Material
					--	--	≤ 0.004 in.	--

Date	Pitot ID	Evidence of damage?	Evidence of mis-alignment?	Calibration or Repair required?

Date	Probe ID	Reference Temp. (°F)	Indicated Temp. (°F)	Difference	Criteria	Probe Length
	--			--	± 1.5 % (absolute)	--

Field Balance Check

Date						
Balance ID:						
Test Weight ID:						
Certifieid Weight (g):						
Measured Weight (g):						
Weight Difference (g):	--	--	--	--	--	--

Date	Barometric Pressure	Evidence of damage?	Reading Verified	Calibration or Repair required?	Weather Station Location

Date	Meter Box ID	Positive Pressure Leak Check
	--	Pass

Reagent	Lot#	Field Prep performed	Field Lot	Date	By

Posttest Purge

Run 1		Run 1		Run 1	
Flow Rate (lpm):		Flow Rate (lpm):		Flow Rate (lpm):	
Clock Time	Temperature	Clock Time	Temperature	Clock Time	Temperature
-	--	--	--	--	--
-	--	--	--	--	--
-	--	--	--	--	--
-	--	--	--	--	--
-	--	--	--	--	--

Alliance SOURCE TESTING

Location: --
Source: --
Project No.: --
Run No.: 1
Parameter: --

Meter Pressure (Pm), in. Hg

$$Pm = Pb + \frac{\Delta H}{13.6}$$

where,

Pb	--	= barometric pressure, in. Hg
ΔH	--	= pressure differential of orifice, in H_2O
Pm	--	= in. Hg

Absolute Stack Gas Pressure (Ps), in. Hg

$$Ps = Pb + \frac{Pg}{13.6}$$

where,

Pb	--	= barometric pressure, in. Hg
Pg	--	= static pressure, in. H_2O
Ps	--	= in. Hg

Standard Meter Volume (Vmstd), dscf

$$Vmstd = \frac{17.647 \times Y \times Vm \times Pm}{Tm}$$

where,

Y	--	= meter correction factor
Vm	0.000	= meter volume, cf
Pm	--	= absolute meter pressure, in. Hg
Tm	--	= absolute meter temperature, ^oR
Vmstd	--	= dscf

Standard Wet Volume (Vwstd), scf

$$Vwstd = 0.04707 \times Vlc$$

where,

Vlc	--	= volume of H_2O collected, ml
Vwstd	--	= scf

Moisture Fraction (BWSsat), dimensionless (theoretical at saturated conditions)

$$BWSsat = \frac{10^{6.37-\left(\frac{2,827}{Ts+365}\right)}}{Ps}$$

where,

Ts	--	= stack temperature, °F
Ps	--	= absolute stack gas pressure, in. Hg
BWSsat	--	= dimensionless

Moisture Fraction (BWS), dimensionless (measured)

$$BWS = \frac{Vwstd}{(Vwstd + Vmstd)}$$

where,

Vwstd	--	= standard wet volume, scf
Vmstd	--	= standard meter volume, dscf
BWS	--	= dimensionless

Alliance SOURCE TESTING

Location: --
Source: --
Project No.: --
Run No.: 1
Parameter: --

Moisture Fraction (BWS), dimensionless

$$BWS = BWSmsd \text{ unless } BWSsat < BWSmsd$$

where,

BWSsat	--	= moisture fraction (theoretical at saturated conditions)
BWSmsd	--	= moisture fraction (measured)
BWS	--	

Molecular Weight (DRY) (Md), lb/lb-mole

$$Md = (0.44 \times \%\,CO_2) + (0.32 \times \%\,O2) + (0.28\,(100 - \%\,CO_2 - \%\,O2))$$

where,

CO_2	--	= carbon dioxide concentration, %
O_2	--	= oxygen concentration, %
Md	--	= lb/lb mol

Molecular Weight (WET) (Ms), lb/lb-mole

$$Ms = Md\ (1 - BWS) + 18\,(BWS)$$

where,

Md	--	= molecular weight (DRY), lb/lb mol
BWS	--	= moisture fraction, dimensionless
Ms	--	= lb/lb mol

Average Velocity (Vs), ft/sec

$$Vs = 85.49 \times Cp \times (\Delta P^{1/2})\,avg \times \sqrt{\frac{Ts}{Ps \times Ms}}$$

where,

Cp	--	= pitot tube coefficient
$\Delta P^{1/2}$	--	= velocity head of stack gas, $(\text{in. } H_2O)^{1/2}$
Ts	--	= absolute stack temperature, °R
Ps	--	= absolute stack gas pressure, in. Hg
Ms	--	= molecular weight of stack gas, lb/lb mol
Vs	--	= ft/sec

Average Stack Gas Flow at Stack Conditions (Qa), acfm

$$Qa = 60 \times Vs \times As$$

where,

Vs	--	= stack gas velocity, ft/sec
As	--	= cross-sectional area of stack, ft^2
Qa	--	= acfm

Average Stack Gas Flow at Standard Conditions (Qs), dscfm

$$Qs = 17.647 \times Qa \times (1 - BWS) \times \frac{Ps}{Ts}$$

where,

Qa	--	= average stack gas flow at stack conditions, acfm
BWS	--	= moisture fraction, dimensionless
Ps	--	= absolute stack gas pressure, in. Hg
Ts	--	= absolute stack temperature, °R
Qs	--	= dscfm

Alliance SOURCE TESTING

Location: --
Source: --
Project No.: --
Run No.: 1
Parameter: --

Dry Gas Meter Calibration Check (Yqa), dimensionless

$$Yqa = \frac{Y - \left(\frac{\Theta}{Vm} \sqrt{\frac{0.0319 \times Tm \times 29}{\Delta H@ \times \left(Pb + \frac{\Delta Havg.}{13.6} \right) \times Md}} \sqrt{\Delta H}\ avg. \right)}{Y} \times 100$$

where,

Y	--	= meter correction factor, dimensionless
Θ	60	= run time, min.
Vm	0	= total meter volume, dcf
Tm	--	= absolute meter temperature, °R
ΔH@	--	= orifice meter calibration coefficient, in. H_2O
Pb	--	= barometric pressure, in. Hg
ΔH avg	--	= average pressure differential of orifice, in H_2O
Md	--	= molecular weight (DRY), lb/lb mol
$(\Delta H)^{1/2}$	--	= average squareroot pressure differential of orifice, $(in. H2O)^{1/2}$
Yqa	--	= dimensionless

Volume of Nozzle (Vn), ft^3

$$Vn = \frac{Ts}{Ps} \left(0.002669 \times Vlc + \frac{Vm \times Pm \times Y}{Tm} \right)$$

where,

Ts	--	= absolute stack temperature, °R
Ps	--	= absolute stack gas pressure, in. Hg
Vlc	--	= volume of H_2O collected, ml
Vm	0.000	= meter volume, cf
Pm	--	= absolute meter pressure, in. Hg
Y	--	= meter correction factor, unitless
Tm	--	= absolute meter temperature, °R
Vn	--	= volume of nozzle, ft^3

Isokinetic Sampling Rate (I), %

$$I = \left(\frac{Vn}{\theta \times 60 \times An \times Vs} \right) \times 100$$

where,

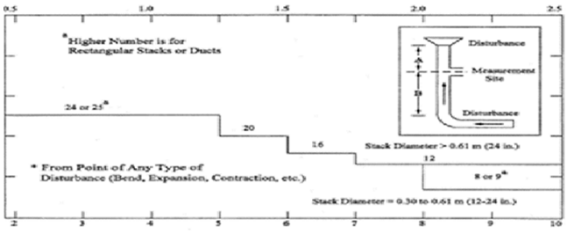
Vn	--	= nozzle volume, ft^3
θ	60.0	= run time, minutes
An	--	= area of nozzle, ft^2
Vs	--	= average velocity, ft/sec
I	--	= %

Method 1 Data

Location --
Source --
Project No. --
Date:

Stack Parameters

Duct Orientation:
Duct Design:
Distance from Far Wall to Outside of Port: in
Nipple Length: in
Depth of Duct: 0.00 in
Cross Sectional Area of Duct: -- ft^2
No. of Test Ports:
Distance A: ft
Distance A Duct Diameters: -- **(must be > 0.5)**
Distance B: ft
Distance B Duct Diameters: -- **(must be > 2)**



DUCT

LOCATION OF STRATIFICATION POINTS

Number of traverse points on a diameter

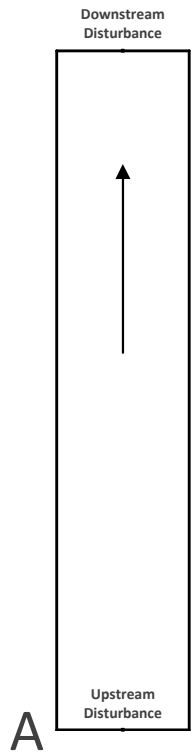
	2	3	4	5	6	7	8	9	10	11	12
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3	--	83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	31.8	20.8
4	--	--	87.5	70.0	58.3	50.0	43.8	38.9	35.0	22.7	29.2
5	--	--	--	90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6	--	--	--	--	91.7	78.6	68.8	61.1	55.0	50.0	45.8
7	--	--	--	--	--	92.9	81.3	72.2	65.0	59.1	54.2
8	--	--	--	--	--	--	93.8	83.3	75.0	68.2	62.5
9	--	--	--	--	--	--	--	94.4	85.0	77.3	70.8
10	--	--	--	--	--	--	--	--	95.0	86.4	79.2
11	--	--	--	--	--	--	--	--	--	95.5	87.5
12	--	--	--	--	--	--	--	--	--	--	95.8

**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	16.7	0.00	0.00
2	50.0	0.00	0.00
3	83.3	0.00	0.00
4	--	--	--
5	--	--	--
6	--	--	--
7	--	--	--
8	--	--	--
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = ft.
B = ft.
Depth of Duct = 0 in.

Cross Sectional Area



Alliance SOURCE TESTING

QA Data

Location --
Source --
Project No. --

Parameter	O_2	CO_2	CO	NOx	THC	SO_2	TRS
Make	--	--	--	--	--	--	--
Model	--	--	--	--	--	--	--
S/N							
Operating Range							
Cylinder ID							
Zero	NA	NA	NA	NA	NA	NA	NA
Low	NA	NA	NA	NA		NA	NA
Mid							
High							
Cylinder Certified Values							
Low	NA	NA	NA	NA		NA	NA
Mid							
High							
Cylinder Expiration Date							
Zero	NA	NA	NA	NA	NA	NA	NA
Low	NA	NA	NA	NA		NA	NA
Mid							
High							

Location: _____

Source: _____

Project No.: _____

Parameter	O2	CO2	CO	NOx	THC	SO2	TRS
Zero Calibration							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Low Calibration							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
Mid Calibration							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
High Calibration							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
Run 1 Zero Pre-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Run 1 Mid Pre-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
Run 1 Zero Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Run 1 Mid Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
Run 2 Zero Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Run 2 Mid Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
Run 3 Zero Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Run 3 Mid Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA

Alliance SOURCE TESTING

Calibration Data

Location --
Source --
Project No. --
Date

Parameter	O_2	CO_2	CO	NOx	THC	SO_2	TRS
Expected Average Concentration							
Span Between							
Low	-	-	-	-	-	-	-
High	-	-	-	-	-	-	-
Desired Span							
Low Range Gas							
Low	NA	NA	NA	NA	-	NA	NA
High	NA	NA	NA	NA	-	NA	NA
Mid Range Gas							
Low	-	-	-	-	-	-	-
High	-	-	-	-	-	-	-
High Range Gas							
Low	NA	NA	NA	NA	-	NA	NA
High	NA	NA	NA	NA	-	NA	NA
Actual Concentration (% or ppm)							
Zero	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA		NA	NA
Mid							
High	-	-	-	-		-	-
Response Time (seconds)							
Instrument Response (% or ppm)							
Zero							
Low	NA	NA	NA	NA		NA	NA
Mid							
High							
Performance (% of Span or Cal. Gas Conc.)					.		
Zero	-	-	-	-	-	-	-
Low	NA	NA	NA	NA	-	NA	NA
Mid	-	-	-	-	-	-	-
High	-	-	-	-	-	-	-
Status							
Zero	-	-	-	-	-	-	-
Low	NA	NA	NA	NA	-	NA	NA
Mid	-	-	-	-	-	-	-
High	-	-	-	-	-	-	-

Alliance SOURCE TESTING

Bias/Drift Determinations

Location: --
Source: --
Project No.: --

Parameter		O_2	CO_2	CO	NOx	THC	SO_2
Run 1 Date --							
Span Value		-	-	-	-	-	-
Instrument Zero Cal Response		-	-	-	-	-	-
Instrument Mid Cal Response		-	-	-	-	-	-
Pretest System Zero Response		-	-	-	-	-	-
Posttest System Zero Response		-	-	-	-	-	-
Pretest System Mid Response		-	-	-	-	-	-
Posttest System Mid Response		-	-	-	-	-	-
Bias (%)							
	Pretest Zero	-	-	-	-	NA	-
	Posttest Zero	-	-	-	-	NA	-
	Pretest Span	-	-	-	-	NA	-
	Posttest Span	-	-	-	-	NA	-
Drift (%)							
	Zero	-	-	-	-	-	-
	Mid	-	-	-	-	-	-
Run 2 Date --							
Span Value		-	-	-	-	-	-
Instrument Zero Cal Response		-	-	-	-	-	-
Instrument Mid Cal Response		-	-	-	-	-	-
Pretest System Zero Response		-	-	-	-	-	-
Posttest System Zero Response		-	-	-	-	-	-
Pretest System Mid Response		-	-	-	-	-	-
Posttest System Mid Response		-	-	-	-	-	-
Bias (%)							
	Pretest Zero	-	-	-	-	NA	-
	Posttest Zero	-	-	-	-	NA	-
	Pretest Span	-	-	-	-	NA	-
	Posttest Span	-	-	-	-	NA	-
Drift (%)							
	Zero	-	-	-	-	-	-
	Mid	-	-	-	-	-	-
Run 3 Date --							
Span Value		-	-	-	-	-	-
Instrument Zero Cal Response		-	-	-	-	-	-
Instrument Mid Cal Response		-	-	-	-	-	-
Pretest System Zero Response		-	-	-	-	-	-
Posttest System Zero Response		-	-	-	-	-	-
Pretest System Mid Response		-	-	-	-	-	-
Posttest System Mid Response		-	-	-	-	-	-
Bias (%)							
	Pretest Zero	-	-	-	-	NA	-
	Posttest Zero	-	-	-	-	NA	-
	Pretest Span	-	-	-	-	NA	-
	Posttest Span	-	-	-	-	NA	-
Drift (%)							
	Zero	-	-	-	-	-	-
	Mid	-	-	-	-	-	-

Alliance SOURCE TESTING

Post Test Calibration Drift Data

Location: 0
Source: 0
Project No.: 0
Date:

Parameter		TRS (w SO2 gas)
Actual Concentration (ppm)		
Zero		0.0
Mid		0.0
High		0.0
Instrument Response (ppm)		
Mid	**Initial**	0.0
	Post Test	
Performance (% of Calibration Gas)		
Mid		-
Status		
Mid		-

Note: TRS calibrations were conducted using SO2/N2 calibration gas. Analyzer calibration drift was calculated by evaluating the initial instrument response versus the final instrument response. Performance is acceptable if this value is less than or equal to 3% or 0.5 ppmv.

Alliance SOURCE TESTING

System Performance Determinations

Location: 0
Source: 0
Project No.: 0
Date: --

Parameter	TRS
Span Value, ppm	-
H2S Gas Concentration, ppm	
Cylinder Certification Number	
Run 1	
Pretest System Response, ppm	
Posttest System Response, ppm	
Pretest System Performance (%)	-
Posttest System Performance (%)	-
Run 2	
Posttest System Response, ppm	
Posttest System Performance (%)	-
Run 3	
Posttest System Response, ppm	
Posttest System Performance (%)	-
Run 4	
Posttest System Response, ppm	
Posttest System Performance (%)	-
Run 5	
Posttest System Response, ppm	
Posttest System Performance (%)	-
Run 6	
Posttest System Response, ppm	
Posttest System Performance (%)	-

EPA Method 205
Field Calibration of Dilution System

Location: --
Source: --
Project No.: --
Date

Analyzer Make: --
Analyzer Model: --
Analyzer SN:
Environics ID: --
Component/Balance Gas: --
Cylinder Gas ID (Dilution):
Cylinder Gas Concentration (Dilution), ppm:
Cylinder Gas ID (Mid-Level):
Cylinder Gas Concentration (Mid-Level), ppm:

Target Mass Flow Contollers	Target Dilution (%)	Target Flow Rate lpm	Target Concentration (ppm)	Actual Concentration (ppm)	Injection 1 Analyzer Concentration (ppm)	Injection 2 Analyzer Concentration (ppm)	Injection 3 Analyzer Concentration (ppm)	Average Analyzer Concentration (ppm)	Difference (ppm)	Average Error (± 2 %)
10L/10L*	90.0	7.0	-					-	-	-
10L/10L*	80.0	7.0	-					-	-	-
10L/5L	80.0	5.0	-					-	-	-
10L/5L	50.0	5.0	-					-	-	-
10L/1L	20.0	4.0	-					-	-	-
10L/1L	10.0	4.0	-					-	-	-

*Not all AST Environics Units have 2-10L Mass Flow Controllers. For these units the 90% @ 7lpm and 80% @ 7lpm injections will not be conducted.

Average Analyzer Concentration (ppm)	Injection 1 Error (± 2 %)	Injection 2 Error (± 2 %)	Injection 3 Error (± 2 %)
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

Mid-Level Supply Gas Calibration Direct to Analyzer

Calibration Gas Concentration (ppm)	Injection 1 Analyzer Concentration (ppm)	Injection 2 Analyzer Concentration (ppm)	Injection 3 Analyzer Concentration (ppm)	Average Analyzer Concentration (ppm)	Difference (ppm)	Average Error (± 2 %)
-				-	-	-

Alliance SOURCE TESTING

QA Data
Stratification Check

Location: --
Source: --
Project No.: --
Date:

Traverse Point	Time	NOx (ppm)	CO (ppm)	SO_2 (ppm)	O_2 (%)	CO_2 (%)
A-1						
2	0:00					
3	0:00					
Average		--	--	--	--	--
Status		Single	Single	Single	Single	Single

Location 0

Source 0

Project No. 0

Run Number	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6
Date	--	--	--	--	--	--
Start Time	--	--	--	--	--	--
Stop Time	--	--	--	--	--	--
Sample System Operational Data						
Sample Line Temperature, °F						
Time, 0 min						
Time, 15 min						
Time, 30 min						
Time, 45 min						
Time, 60 min						
Average	--	--	--	--	--	--

Alliance SOURCE TESTING

NOx Converter Efficiency Check

Location: --
Source: --
Project No.: --

Converter Check				
Analyzer Make	--	**Pre-Test Date**	**Time**	
Analyzer Model	--	**Pre-Test Concentration, ppm**		
Gas Type	NO_2	**Pre-Test Efficiency, %**		-
Cylinder ID #		**Post-Test Date**	**Time**	
Cylinder Exp. Date		**Post-Test Concentration, ppm**		
Cylinder Concentration, ppm		**Post-Test Efficiency, %**		-

**Efficiency must be ≥ 90 %*

Run 1 Data

Location: --
Source: --
Project No.: --
Date: -

Time	O_2	CO_2	CO	NOx	THC	SO_2	TRS
Unit	**% dry**	**% dry**	**ppmvd**	**ppmvd**	**ppmvw**	**ppmvd**	**ppmvd**
Status	Valid	Valid	Valid	Valid	Valid	Valid	Valid
-							
-							
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Parameter	O_2	CO_2	CO	NOx	THC	SO_2	TRS
Uncorrected Run Average (C_{obs})	-	-	-	-	-	-	-
Cal Gas Concentration (C_{MA})	-	-	-	-	-	-	NA
Pretest System Zero Response							NA
Posttest System Zero Response							NA
Average Zero Response (Co)	-	-	-	-	-	-	NA
Pretest System Cal Response							NA
Posttest System Cal Response							NA
Average Cal Response (C_M)	-	-	-	-	-	-	NA
Corrected Run Average (Corr)	--	--	--	--	NA	--	--

Commonwealth of Kentucky
Energy and Environment Protection Cabinet
Department for Environmental Protection
Division for Air Quality
300 Sower Blvd., 2nd Floor
Frankfort, Kentucky 40601

COMPLIANCE TEST PROTOCOL

Material Incorporated By Reference
401 KAR 50:045
Filed March 15, 2005

I: CERTIFICATION

I am authorized to make this submission on behalf of the owners and operators of the affected source or affected units for which this submission is made. I have personally examined and am familiar with the statements and information submitted in this document and all its attachments and certify that to the best of my knowledge, they are true, accurate and complete.

SIGNATURE Joshua Luna DATE 2/28/2024

AFFILIATION AND TITLE GM, Kentucky Cooperage

Please submit completed Protocol to:

Kentucky Division for Air Quality
300 Sower Blvd, 2nd Floor
Frankfort, KY 40601
Attention: Source Sampling Section

Agency Use Only:

Date Received: _____ Date Approved: _____

Reviewed by: _____

Comments: _____

II. AGENCY OF INTEREST INFORMATION

A. **General Information**:

Facility Name	Kentucky Cooperage
Facility ID#	2899
Permit ID#	F-20-032
Facility Address	712 Main Street
	Lebanon, KY 40033
Facility Contact	John Mealey
Telephone #:	(270) 692-4674

Subject Items to be tested: Heading Char (EU-011)

Purpose of the test: Establish a Carbon Monoxide (CO) emission factor.

Tentative test date: May 2, 2024

B. Process Information:

Maximum rated Capacity: 4.68 MMBtu/hr

Rate to be run during the test: Normal Operating
(Permitted rate will be no more than 110% of average test rate.)

Normal operating cycles *(e.g. 8 hrs/day, soot blowing, etc.)*
2 shifts at 10 hours per shift

Operating conditions that tend to cause worse case pollution emissions:

Normal maintenance schedule for equipment affecting emissions:
complete quarterly box clean out

INCLUDE A SIMPLIFIED PROCESS FLOW DIAGRAM

Heads are conveyed over a wood fire at a Rate of 20 seconds per head continuasly moving. wood is Manully Fed To Keep Fire HoT.

C. Control Equipment Data:

List the type and manufacturer of the control equipment: ____N/A_____

List the data to be monitored and recorded to ensure representative operation during the test and their optimum values: _____
_____Wood Usage: 0.30 tons/hr_____
_____Number of Barrel Heads Processed: 376 heads/hr_____

Describe the operational cycles: _____
heads continuously move across the fire and each head is over the for ~ 20 seconds

List continuous monitors: _____
_____None_____

List the normal maintenance schedule on the control equipment and the date the last time this maintenance was performed: _____
_____ TBD_____

III. SAMPLING DATA

Name of Testing Firm: Alliance Technical Group LLC
Address of Testing Firm: 214 Central Circle, Decatur, AL 35603
Testing Firm Contact: Andy Roth Telephone #: 256-221-9457

List all of the Subject Items to be sampled and give the information required below:

Subject Item	Pollutants	Total Time Per Test	No. of Tests minimum of 3	Test Methods To be Used
EU-011	VFR	1 hour	3	US EPA Method 1-2
EU-011	O_2/CO_2	1 hour	3	US EPA Method 3A
EU-011	BWS	1 hour	3	US EPA Method 4
EU-011	CO	1 hour	3	US EPA Method 10

Include a diagram of the sampling location with dimensions, port locations, number and location of traverse points, distances from flow disturbances, and any other physical obstacles in or around the stack.

A. Sampling Train Information:

Provide a detailed description of any sampling or sample recovery and transport procedures that do not comply with the specified procedures listed in the method and provide justification for the deviation: NA

Length of the sampling probe: 5- 6 feet

Probe liner material of construction: Teflon

Manufacturer(s) of the sampling equipment: Environmental Supply or Apex

List the clean-up and/or analysis to be done on-site: All cleanup will be conducted on-site

Stack temperature: TBD %Moisture in Stack: TBD
Stack gas velocity: TBD
Stack gas composition including the approximate concentration of organics: TBD.

For instrumental methods list the expected concentrations, the allowable concentrations, the instrument span values, and the calibration gas concentrations: TBD

B. **Laboratory Analysis:**

Give a detailed description of any analytical procedure and/or equipment that does not comply with the specified procedures and provide a justification for the deviation: N/A

List your chain-of-custody procedures and the method(s) of documentation:
Chain of custody forms are completed for each sample at the time of testing by the field team leader. The samples will remain in the possession of the field team leader until they are relinquished to the analytical laboratory. Upon receipt of samples, the laboratory will complete the chain of custody.

ALL LABORATORY PROCEDURES SHALL HAVE PERTINENT QUALITY ASSURANCE DATA SUBMITTED WHETHER OR NOT THE WORK IS PERFORMED IN-HOUSE OR BY A THIRD PARTY:

Have you participated in any EPA inter-lab source audits in the last year? ºyes √ no
If so list the type of audit, the date, and the result(s):

C. **Data Sheets:**

Submit examples of all data sheets to be used. Attached.

Continuous Emissions Monitoring Systems (CEMS)
General Information Form
To be used to request certification testing of CEMS

No CEMS Certification testing to be performed

Date: _____

Facility Name _____
Facility ID# _____
Permit ID# _____
Facility Address _____
Facility Contact _____
Telephone #: _____

Unit #	Parameter	Instrument	Model #	Serial #	Range	Date Installed

Provide the date(s) the Performance Specification Test (PST) is to be conducted: _____

Is the CEM In-Situ or Extractive? _____

If the CEM is In-Situ what is the path length? _____

For Opacity Monitors Only:
What is the emissions outlet path length? _____
How is the optical path length ratio (OPLR) converted? _____

For all CEMS
How is the data recorded? _____
What are the units? _____Unit conversion? _____

List data to be reported to the Federal or State Agency: _____
_____

How is the monitor(s) calibrated? _____

_____

How often are calibration(s) performed? _____

Is a drawing of the monitor location included? ○ Yes ○ No

Accessibility of the monitor:

○ In-stack ○ Duct ○ Elevator ○ Ladder ○ Stairway ○ Other

If the monitor is capable of being calibrated with certified gas cylinders, briefly describe the provisions for cylinder hook-up.

_____

_____

Are logbooks kept on site? ○ Yes ○ No

If yes, what information is recorded? _____

_____

If no, how is documentation on monitor performance kept? _____

_____

Provide the name of the person responsible for the operation of the CEM(s)

Name: _____ Phone #: _____

Provide the name of the on-site contact for the CEM(s) if different than above:

Name: _____ Phone#: _____

AGENCY USE ONLY:

Date Certified: _____ Pass or Fail: _____

Date Report was received: _____

Date Review was completed: _____

Date Review report approved: _____

Comments:

_____

_____

_____

_____

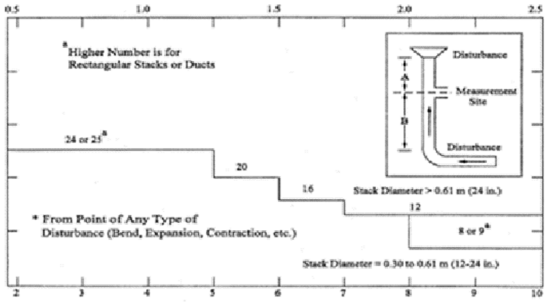
_____

Method 1 Data

Location --
Source --
Project No. --
Date:

Stack Parameters

Duct Orientation:
Duct Design:
Distance from Far Wall to Outside of Port: in
Nipple Length: in
Depth of Duct: 0.00 in
Cross Sectional Area of Duct: -- ft^2
No. of Test Ports:
Distance A: ft
Distance A Duct Diameters: -- (must be > 0.5)
Distance B: ft
Distance B Duct Diameters: -- (must be > 2)
Minimum Number of Traverse Points: --
Actual Number of Traverse Points:
Number of Readings per Point:
Measurer (Initial and Date):
Reviewer (Initial and Date):



DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

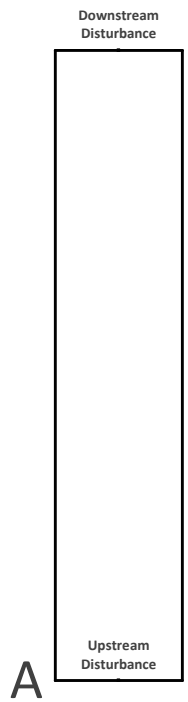
	2	3	4	5	6	7	8	9	10	11	12
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3	--	83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	31.8	20.8
4	--	--	87.5	70.0	58.3	50.0	43.8	38.9	35.0	22.7	29.2
5	--	--	--	90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6	--	--	--	--	91.7	78.6	68.8	61.1	55.0	50.0	45.8
7	--	--	--	--	--	92.9	81.3	72.2	65.0	59.1	54.2
8	--	--	--	--	--	--	93.8	83.3	75.0	68.2	62.5
9	--	--	--	--	--	--	--	94.4	85.0	77.3	70.8
10	--	--	--	--	--	--	--	--	95.0	86.4	79.2
11	--	--	--	--	--	--	--	--	--	95.5	87.5
12	--	--	--	--	--	--	--	--	--	--	95.8

**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	--	--	--
2	--	--	--
3	--	--	--
4	--	--	--
5	--	--	--
6	--	--	--
7	--	--	--
8	--	--	--
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = ft.
B = ft.
Depth of Duct = 0 in.

Cross Sectional Area



Alliance SOURCE TESTING

Cyclonic Flow Check

Location --

Source --

Project No. --

Date

Sample Point	Angle (ΔP=0)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
Average	--

Alliance SOURCE TESTING

Method 3 Data

Location --

Source --

Project No. --

Analysis Type	Assumed Ambient			
Cylinder IDs	**Cylinder Concentrations**		**Analyzer Response**	
	O_2 %	**CO_2 %**	**O_2 %**	**CO_2 %**
--	--	--	--	--
--	--	--	--	--

Run No.	**Run 1**		**Run 2**		**Run 3**	
Parameter	**O_2 %**	**CO_2 %**	**O_2 %**	**CO_2 %**	**O_2 %**	**CO_2 %**
Date	--		--		--	
Analysis #1	--	--	--	--	--	--
Analysis #2	--	--	--	--	--	--
Analysis #3	--	--	--	--	--	--
Average	--	--	--	--	--	--

Run No.	**Run 4**		**Run 5**		**Run 6**	
Parameter	**O_2 %**	**CO_2 %**	**O_2 %**	**CO_2 %**	**O_2 %**	**CO_2 %**
Date	--		--		--	
Analysis #1	--	--	--	--	--	--
Analysis #2	--	--	--	--	--	--
Analysis #3	--	--	--	--	--	--
Average	--	--	--	--	--	--

Run No.	**Run 7**		**Run 8**	
Parameter	**O_2 %**	**CO_2 %**	**O_2 %**	**CO_2 %**
Date	--		--	
Analysis #1	--	--	--	--
Analysis #2	--	--	--	--
Analysis #3	--	--	--	--
Average	--	--	--	--

The remaining consistuent is assumed to be nitrogen.

Alliance SOURCE TESTING

Method 3/3A Data

Location -- _____

Source -- _____

Project No. -- _____

	O_2 Data			CO_2 Data		
	Date/Time	**--**	**--**	**Date/Time**	**--**	**--**
Make/Model/SN	--	--	--	--	--	--
Parameter	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**
Zero Gas		--	--		--	--
High Range Gas	--	--	--	--	--	--
Mid Range Gas	--	--	--	--	--	--
Concentration Span, %	--			--		
Required Accuracy, %	--			--		
	Date/Time	**--**	**--**	**Date/Time**	**--**	**--**
Make/Model/SN	--	--	--	--	--	--
Parameter	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**
Zero Gas		--	--		--	--
High Range Gas	--	--	--	--	--	--
Mid Range Gas	--	--	--	--	--	--
Concentration Span, %	--			--		
Required Accuracy, %	--			--		
	Date/Time	**--**	**--**	**Date/Time**	**--**	**--**
Make/Model/SN	--	--	--	--	--	--
Parameter	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**	**Cylinder ID**	**Cylinder Concentration, %**	**Analyzer Concentration, %**
Zero Gas		--			--	
High Range Gas	--	--		--	--	
Mid Range Gas	--	--		--	--	
Concentration Span, %	--			--		
Required Accuracy, %	--			--		

Alliance SOURCE TESTING

Method 4 Data

Location --
Source --
Project No. --
Parameter --
Analysis Gravimetric

Run 1	**Date:**	--			
Impinger No.	**1**	**2**	**3**	**4**	**Total**
Contents	H2O	H2O	Empty	Silica	--
Initial Mass, g					--
Final Mass, g					--
Gain	--	--	--	--	--
Run 2	**Date:**	--			
Impinger No.	**1**	**2**	**3**	**4**	**Total**
Contents	H2O	H2O	Empty	Silica	--
Initial Mass, g					--
Final Mass, g					--
Gain	--	--	--	--	--
Run 3	**Date:**	--			
Impinger No.	**1**	**2**	**3**	**4**	**Total**
Contents	H2O	H2O	Empty	Silica	--
Initial Mass, g					--
Final Mass, g					--
Gain	--	--	--	--	--

Alliance SOURCE TESTING

Isokinetic Field Data

Location: -- **Start Time:** -- **Source:** --

Date: -- | Run 1 | VALID | **End Time:** -- **Project No.:** -- **Parameter:** --

STACK DATA (EST)			EQUIPMENT		STACK DATA (EST)			FILTER NO.	STACK DATA (FINAL)			MOIST. DATA
Moisture:		% est.	Meter Box ID:	--	Est. Tm:		°F		Pb:	--	in. Hg	Vlc (ml)
Barometric:	--	in. Hg	Y:	--	Est. Ts:	--	°F		Pg:	--	in. WC	--
Static Press:	--	in. WC	ΔH @ (in.WC):	--	Est. ΔP:	--	in. WC		O_2:	--	%	K-FACTOR
Stack Press:	--	in. Hg	Probe ID:	--	Est. Dn:	--	in.		CO_2:	--	%	--
CO_2:	--	%	Liner Material:	--	Target Rate:	--	scfm					
O_2:	--	%	Pitot ID:	--								
N_2/CO:	--	%	Pitot Cp/Type:	-- --								
Md:	--	lb/lb-mole	Nozzle ID:	-- --								
Ms:	--	lb/lb-mole	Nozzle Dn (in.):	--								

LEAK CHECKS	Pre	Mid 1	Mid 2	Mid 3	Post
Leak Rate (cfm):		--	--	--	
Vacuum (in Hg):		--	--	--	
Pitot Tube:		--	--	--	

Check Pt.	Initial	Final	Corr.
Mid 1 (cf)			--
Mid 2 (cf)			--
Mid 3 (cf)			--
Mid-Point Leak Check Vol (cf):			--

Sample Pt.	Sample Time (minutes)		Dry Gas Meter Reading (ft³)	Pitot Tube ΔP (in WC)	Gas Temperatures (°F)		Orifice Press. ΔH (in. WC)		Pump Vac (in. Hg)	Gas Temperatures (°F)				% ISO	Vs (fps)
					DGM Average	Stack				Probe	Filter	Imp Exit	Aux		
					Amb.	Amb.				Amb.	Amb.	Amb.	Amb.		
	Begin	End					Ideal	Actual					-		
	0.00	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
	#DIV/0!	#DIV/0!											-		--
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Final DGM: --

RESULTS

Run Time	Vm	ΔP	Tm	Ts	Max Vac	ΔH	%ISO	BWS	Y_{qa}
60.0 min	0.000 ft³	-- in. WC	-- °F	-- °F	--	-- in. WC	--	--	--

QA/QC Data

Location --
Source --
Project No. --
Parameter --

Date	Nozzle ID	Nozzle Diameter (in.) #1	#2	#3	Dn (Average)	Difference	Criteria	Material
					--	--	≤ 0.004 in.	--

Date	Pitot ID	Evidence of damage?	Evidence of mis-alignment?	Calibration or Repair required?

Date	Probe ID	Reference Temp. (°F)	Indicated Temp. (°F)	Difference	Criteria	Probe Length
	--			--	± 1.5 % (absolute)	--

Field Balance Check

Date						
Balance ID:						
Test Weight ID:						
Certifieid Weight (g):						
Measured Weight (g):						
Weight Difference (g):	--	--	--	--	--	--

Date	Barometric Pressure	Evidence of damage?	Reading Verified	Calibration or Repair required?	Weather Station Location

Date	Meter Box ID	Positive Pressure Leak Check
	--	Pass

Reagent	Lot#	Field Prep performed	Field Lot	Date	By

Posttest Purge

Run 1		Run 1		Run 1	
Flow Rate (lpm):		Flow Rate (lpm):		Flow Rate (lpm):	
Clock Time	Temperature	Clock Time	Temperature	Clock Time	Temperature
-	--	--	--	--	--
-	--	--	--	--	--
-	--	--	--	--	--
-	--	--	--	--	--
-	--	--	--	--	--

Alliance SOURCE TESTING

Location: --
Source: --
Project No.: --
Run No.: 1
Parameter: --

Meter Pressure (Pm), in. Hg

$$Pm = Pb + \frac{\Delta H}{13.6}$$

where,

Pb	--	= barometric pressure, in. Hg
ΔH	--	= pressure differential of orifice, in H_2O
Pm	--	= in. Hg

Absolute Stack Gas Pressure (Ps), in. Hg

$$Ps = Pb + \frac{Pg}{13.6}$$

where,

Pb	--	= barometric pressure, in. Hg
Pg	--	= static pressure, in. H_2O
Ps	--	= in. Hg

Standard Meter Volume (Vmstd), dscf

$$Vmstd = \frac{17.647 \times Y \times Vm \times Pm}{Tm}$$

where,

Y	--	= meter correction factor
Vm	0.000	= meter volume, cf
Pm	--	= absolute meter pressure, in. Hg
Tm	--	= absolute meter temperature, ^oR
Vmstd	--	= dscf

Standard Wet Volume (Vwstd), scf

$$Vwstd = 0.04707 \times Vlc$$

where,

Vlc	--	= volume of H_2O collected, ml
Vwstd	--	= scf

Moisture Fraction (BWSsat), dimensionless (theoretical at saturated conditions)

$$BWSsat = \frac{10^{6.37-\left(\frac{2,827}{Ts+365}\right)}}{Ps}$$

where,

Ts	--	= stack temperature, °F
Ps	--	= absolute stack gas pressure, in. Hg
BWSsat	--	= dimensionless

Moisture Fraction (BWS), dimensionless (measured)

$$BWS = \frac{Vwstd}{(Vwstd + Vmstd)}$$

where,

Vwstd	--	= standard wet volume, scf
Vmstd	--	= standard meter volume, dscf
BWS	--	= dimensionless

Alliance SOURCE TESTING

Location: --
Source: --
Project No.: --
Run No.: 1
Parameter: --

Moisture Fraction (BWS), dimensionless

$$BWS = BWSmsd \text{ unless } BWSsat < BWSmsd$$

where,

BWSsat	--	= moisture fraction (theoretical at saturated conditions)
BWSmsd	--	= moisture fraction (measured)
BWS	--	

Molecular Weight (DRY) (Md), lb/lb-mole

$$Md = (0.44 \times \%\,CO_2) + (0.32 \times \%\,O2) + (0.28\,(100 - \%\,CO_2 - \%\,O2))$$

where,

CO_2	--	= carbon dioxide concentration, %
O_2	--	= oxygen concentration, %
Md	--	= lb/lb mol

Molecular Weight (WET) (Ms), lb/lb-mole

$$Ms = Md\ (1 - BWS) + 18\,(BWS)$$

where,

Md	--	= molecular weight (DRY), lb/lb mol
BWS	--	= moisture fraction, dimensionless
Ms	--	= lb/lb mol

Average Velocity (Vs), ft/sec

$$Vs = 85.49 \times Cp \times (\Delta P^{1/2})\,avg \times \sqrt{\frac{Ts}{Ps \times Ms}}$$

where,

Cp	--	= pitot tube coefficient
$\Delta P^{1/2}$	--	= velocity head of stack gas, $(\text{in. } H_2O)^{1/2}$
Ts	--	= absolute stack temperature, °R
Ps	--	= absolute stack gas pressure, in. Hg
Ms	--	= molecular weight of stack gas, lb/lb mol
Vs	--	= ft/sec

Average Stack Gas Flow at Stack Conditions (Qa), acfm

$$Qa = 60 \times Vs \times As$$

where,

Vs	--	= stack gas velocity, ft/sec
As	--	= cross-sectional area of stack, ft^2
Qa	--	= acfm

Average Stack Gas Flow at Standard Conditions (Qs), dscfm

$$Qs = 17.647 \times Qa \times (1 - BWS) \times \frac{Ps}{Ts}$$

where,

Qa	--	= average stack gas flow at stack conditions, acfm
BWS	--	= moisture fraction, dimensionless
Ps	--	= absolute stack gas pressure, in. Hg
Ts	--	= absolute stack temperature, °R
Qs	--	= dscfm

Alliance SOURCE TESTING

Location: --
Source: --
Project No.: --
Run No.: 1
Parameter: --

Dry Gas Meter Calibration Check (Yqa), dimensionless

$$Yqa = \frac{Y - \left(\frac{\Theta}{Vm} \sqrt{\frac{0.0319 \times Tm \times 29}{\Delta H@ \times \left(Pb + \frac{\Delta Havg.}{13.6} \right) \times Md}} \sqrt{\Delta H}\ avg. \right)}{Y} \times 100$$

where,

Y	--	= meter correction factor, dimensionless
Θ	60	= run time, min.
Vm	0	= total meter volume, dcf
Tm	--	= absolute meter temperature, °R
ΔH@	--	= orifice meter calibration coefficient, in. H_2O
Pb	--	= barometric pressure, in. Hg
ΔH avg	--	= average pressure differential of orifice, in H_2O
Md	--	= molecular weight (DRY), lb/lb mol
$(\Delta H)^{1/2}$	--	= average squareroot pressure differential of orifice, $(in. H2O)^{1/2}$
Yqa	--	= dimensionless

Volume of Nozzle (Vn), ft^3

$$Vn = \frac{Ts}{Ps} \left(0.002669 \times Vlc + \frac{Vm \times Pm \times Y}{Tm} \right)$$

where,

Ts	--	= absolute stack temperature, °R
Ps	--	= absolute stack gas pressure, in. Hg
Vlc	--	= volume of H_2O collected, ml
Vm	0.000	= meter volume, cf
Pm	--	= absolute meter pressure, in. Hg
Y	--	= meter correction factor, unitless
Tm	--	= absolute meter temperature, °R
Vn	--	= volume of nozzle, ft^3

Isokinetic Sampling Rate (I), %

$$I = \left(\frac{Vn}{\theta \times 60 \times An \times Vs} \right) \times 100$$

where,

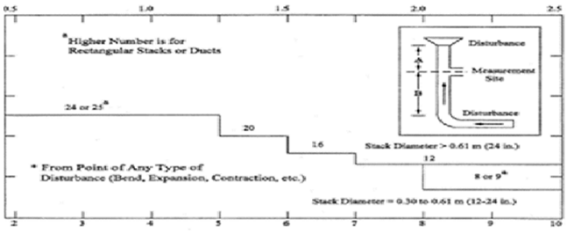
Vn	--	= nozzle volume, ft^3
θ	60.0	= run time, minutes
An	--	= area of nozzle, ft^2
Vs	--	= average velocity, ft/sec
I	--	= %

Method 1 Data

Location --
Source --
Project No. --
Date:

Stack Parameters

Duct Orientation:
Duct Design:
Distance from Far Wall to Outside of Port: in
Nipple Length: in
Depth of Duct: 0.00 in
Cross Sectional Area of Duct: -- ft^2
No. of Test Ports:
Distance A: ft
Distance A Duct Diameters: -- **(must be > 0.5)**
Distance B: ft
Distance B Duct Diameters: -- **(must be > 2)**



DUCT

LOCATION OF STRATIFICATION POINTS

Number of traverse points on a diameter

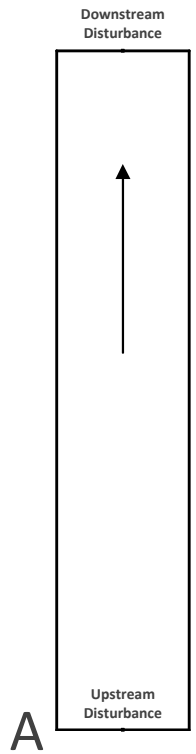
	2	3	4	5	6	7	8	9	10	11	12
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3	--	83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	31.8	20.8
4	--	--	87.5	70.0	58.3	50.0	43.8	38.9	35.0	22.7	29.2
5	--	--	--	90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6	--	--	--	--	91.7	78.6	68.8	61.1	55.0	50.0	45.8
7	--	--	--	--	--	92.9	81.3	72.2	65.0	59.1	54.2
8	--	--	--	--	--	--	93.8	83.3	75.0	68.2	62.5
9	--	--	--	--	--	--	--	94.4	85.0	77.3	70.8
10	--	--	--	--	--	--	--	--	95.0	86.4	79.2
11	--	--	--	--	--	--	--	--	--	95.5	87.5
12	--	--	--	--	--	--	--	--	--	--	95.8

**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	16.7	0.00	0.00
2	50.0	0.00	0.00
3	83.3	0.00	0.00
4	--	--	--
5	--	--	--
6	--	--	--
7	--	--	--
8	--	--	--
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = ft.
B = ft.
Depth of Duct = 0 in.

Cross Sectional Area



Alliance SOURCE TESTING

QA Data

Location --
Source --
Project No. --

Parameter	O_2	CO_2	CO	NOx	THC	SO_2	TRS
Make	--	--	--	--	--	--	--
Model	--	--	--	--	--	--	--
S/N							
Operating Range							
Cylinder ID							
Zero	NA	NA	NA	NA	NA	NA	NA
Low	NA	NA	NA	NA		NA	NA
Mid							
High							
Cylinder Certified Values							
Low	NA	NA	NA	NA		NA	NA
Mid							
High							
Cylinder Expiration Date							
Zero	NA	NA	NA	NA	NA	NA	NA
Low	NA	NA	NA	NA		NA	NA
Mid							
High							

Location: _____

Source: _____

Project No.: _____

Parameter	O2	CO2	CO	NOx	THC	SO2	TRS
Zero Calibration							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Low Calibration							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
Mid Calibration							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
High Calibration							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
Run 1 Zero Pre-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Run 1 Mid Pre-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
Run 1 Zero Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Run 1 Mid Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
Run 2 Zero Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Run 2 Mid Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA
Run 3 Zero Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Run 3 Mid Post-bias							
Flow Rate, lpm	--	--	--	--	--	--	--
Balance Gas Ma	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1	MFC #1
Target Gas Mas	NA	NA	NA	NA	NA	NA	NA

Alliance SOURCE TESTING

Calibration Data

Location --
Source --
Project No. --
Date

Parameter	O_2	CO_2	CO	NOx	THC	SO_2	TRS
Expected Average Concentration							
Span Between							
Low	-	-	-	-	-	-	-
High	-	-	-	-	-	-	-
Desired Span							
Low Range Gas							
Low	NA	NA	NA	NA	-	NA	NA
High	NA	NA	NA	NA	-	NA	NA
Mid Range Gas							
Low	-	-	-	-	-	-	-
High	-	-	-	-	-	-	-
High Range Gas							
Low	NA	NA	NA	NA	-	NA	NA
High	NA	NA	NA	NA	-	NA	NA
Actual Concentration (% or ppm)							
Zero	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low	NA	NA	NA	NA		NA	NA
Mid							
High	-	-	-	-		-	-
Response Time (seconds)							
Instrument Response (% or ppm)							
Zero							
Low	NA	NA	NA	NA		NA	NA
Mid							
High							
Performance (% of Span or Cal. Gas Conc.)					.		
Zero	-	-	-	-	-	-	-
Low	NA	NA	NA	NA	-	NA	NA
Mid	-	-	-	-	-	-	-
High	-	-	-	-	-	-	-
Status							
Zero	-	-	-	-	-	-	-
Low	NA	NA	NA	NA	-	NA	NA
Mid	-	-	-	-	-	-	-
High	-	-	-	-	-	-	-

Alliance SOURCE TESTING

Bias/Drift Determinations

Location: --
Source: --
Project No.: --

Parameter		O_2	CO_2	CO	NOx	THC	SO_2
Run 1 Date --							
Span Value		-	-	-	-	-	-
Instrument Zero Cal Response		-	-	-	-	-	-
Instrument Mid Cal Response		-	-	-	-	-	-
Pretest System Zero Response		-	-	-	-	-	-
Posttest System Zero Response		-	-	-	-	-	-
Pretest System Mid Response		-	-	-	-	-	-
Posttest System Mid Response		-	-	-	-	-	-
Bias (%)							
	Pretest Zero	-	-	-	-	NA	-
	Posttest Zero	-	-	-	-	NA	-
	Pretest Span	-	-	-	-	NA	-
	Posttest Span	-	-	-	-	NA	-
Drift (%)							
	Zero	-	-	-	-	-	-
	Mid	-	-	-	-	-	-
Run 2 Date --							
Span Value		-	-	-	-	-	-
Instrument Zero Cal Response		-	-	-	-	-	-
Instrument Mid Cal Response		-	-	-	-	-	-
Pretest System Zero Response		-	-	-	-	-	-
Posttest System Zero Response		-	-	-	-	-	-
Pretest System Mid Response		-	-	-	-	-	-
Posttest System Mid Response		-	-	-	-	-	-
Bias (%)							
	Pretest Zero	-	-	-	-	NA	-
	Posttest Zero	-	-	-	-	NA	-
	Pretest Span	-	-	-	-	NA	-
	Posttest Span	-	-	-	-	NA	-
Drift (%)							
	Zero	-	-	-	-	-	-
	Mid	-	-	-	-	-	-
Run 3 Date --							
Span Value		-	-	-	-	-	-
Instrument Zero Cal Response		-	-	-	-	-	-
Instrument Mid Cal Response		-	-	-	-	-	-
Pretest System Zero Response		-	-	-	-	-	-
Posttest System Zero Response		-	-	-	-	-	-
Pretest System Mid Response		-	-	-	-	-	-
Posttest System Mid Response		-	-	-	-	-	-
Bias (%)							
	Pretest Zero	-	-	-	-	NA	-
	Posttest Zero	-	-	-	-	NA	-
	Pretest Span	-	-	-	-	NA	-
	Posttest Span	-	-	-	-	NA	-
Drift (%)							
	Zero	-	-	-	-	-	-
	Mid	-	-	-	-	-	-

Alliance SOURCE TESTING

Post Test Calibration Drift Data

Location: 0
Source: 0
Project No.: 0
Date:

Parameter		TRS (w SO2 gas)
Actual Concentration (ppm)		
Zero		0.0
Mid		0.0
High		0.0
Instrument Response (ppm)		
Mid	**Initial**	0.0
	Post Test	
Performance (% of Calibration Gas)		
Mid		-
Status		
Mid		-

Note: TRS calibrations were conducted using SO2/N2 calibration gas. Analyzer calibration drift was calculated by evaluating the initial instrument response versus the final instrument response. Performance is acceptable if this value is less than or equal to 3% or 0.5 ppmv.

Alliance SOURCE TESTING

System Performance Determinations

Location: 0
Source: 0
Project No.: 0
Date: --

Parameter	TRS
Span Value, ppm	-
H2S Gas Concentration, ppm	
Cylinder Certification Number	
Run 1	
Pretest System Response, ppm	
Posttest System Response, ppm	
Pretest System Performance (%)	-
Posttest System Performance (%)	-
Run 2	
Posttest System Response, ppm	
Posttest System Performance (%)	-
Run 3	
Posttest System Response, ppm	
Posttest System Performance (%)	-
Run 4	
Posttest System Response, ppm	
Posttest System Performance (%)	-
Run 5	
Posttest System Response, ppm	
Posttest System Performance (%)	-
Run 6	
Posttest System Response, ppm	
Posttest System Performance (%)	-

EPA Method 205
Field Calibration of Dilution System

Location: --
Source: --
Project No.: --
Date

Analyzer Make: --
Analyzer Model: --
Analyzer SN:
Environics ID: --
Component/Balance Gas: --
Cylinder Gas ID (Dilution):
Cylinder Gas Concentration (Dilution), ppm:
Cylinder Gas ID (Mid-Level):
Cylinder Gas Concentration (Mid-Level), ppm:

Target Mass Flow Contollers	Target Dilution (%)	Target Flow Rate lpm	Target Concentration (ppm)	Actual Concentration (ppm)	Injection 1 Analyzer Concentration (ppm)	Injection 2 Analyzer Concentration (ppm)	Injection 3 Analyzer Concentration (ppm)	Average Analyzer Concentration (ppm)	Difference (ppm)	Average Error (± 2 %)
10L/10L*	90.0	7.0	-					-	-	-
10L/10L*	80.0	7.0	-					-	-	-
10L/5L	80.0	5.0	-					-	-	-
10L/5L	50.0	5.0	-					-	-	-
10L/1L	20.0	4.0	-					-	-	-
10L/1L	10.0	4.0	-					-	-	-

*Not all AST Environics Units have 2-10L Mass Flow Controllers. For these units the 90% @ 7lpm and 80% @ 7lpm injections will not be conducted.

Average Analyzer Concentration (ppm)	Injection 1 Error (± 2 %)	Injection 2 Error (± 2 %)	Injection 3 Error (± 2 %)
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

Mid-Level Supply Gas Calibration Direct to Analyzer

Calibration Gas Concentration (ppm)	Injection 1 Analyzer Concentration (ppm)	Injection 2 Analyzer Concentration (ppm)	Injection 3 Analyzer Concentration (ppm)	Average Analyzer Concentration (ppm)	Difference (ppm)	Average Error (± 2 %)
-				-	-	-

Alliance SOURCE TESTING

QA Data
Stratification Check

Location: --
Source: --
Project No.: --
Date:

Traverse Point	Time	NOx (ppm)	CO (ppm)	SO_2 (ppm)	O_2 (%)	CO_2 (%)
A-1						
2	0:00					
3	0:00					
Average		--	--	--	--	--
Status		Single	Single	Single	Single	Single

Location 0

Source 0

Project No. 0

Run Number	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6
Date	--	--	--	--	--	--
Start Time	--	--	--	--	--	--
Stop Time	--	--	--	--	--	--
Sample System Operational Data						
Sample Line Temperature, °F						
Time, 0 min						
Time, 15 min						
Time, 30 min						
Time, 45 min						
Time, 60 min						
Average	--	--	--	--	--	--

Alliance SOURCE TESTING

NOx Converter Efficiency Check

Location: --
Source: --
Project No.: --

Converter Check				
Analyzer Make	--	**Pre-Test Date**	**Time**	
Analyzer Model	--	**Pre-Test Concentration, ppm**		
Gas Type	NO_2	**Pre-Test Efficiency, %**		-
Cylinder ID #		**Post-Test Date**	**Time**	
Cylinder Exp. Date		**Post-Test Concentration, ppm**		
Cylinder Concentration, ppm		**Post-Test Efficiency, %**		-

**Efficiency must be ≥ 90 %*

Run 1 Data

Location: --
Source: --
Project No.: --
Date: -

Time	O_2	CO_2	CO	NOx	THC	SO_2	TRS
Unit	**% dry**	**% dry**	**ppmvd**	**ppmvd**	**ppmvw**	**ppmvd**	**ppmvd**
Status	Valid	Valid	Valid	Valid	Valid	Valid	Valid
-							
-							
-							
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Parameter	O_2	CO_2	CO	NOx	THC	SO_2	TRS
Uncorrected Run Average (C_{obs})	-	-	-	-	-	-	-
Cal Gas Concentration (C_{MA})	-	-	-	-	-	-	NA
Pretest System Zero Response							NA
Posttest System Zero Response							NA
Average Zero Response (Co)	-	-	-	-	-	-	NA
Pretest System Cal Response							NA
Posttest System Cal Response							NA
Average Cal Response (C_M)	-	-	-	-	-	-	NA
Corrected Run Average (Corr)	--	--	--	--	NA	--	--

Last Page of Report

APPENDIX D. SUGGESTED PERMIT CHANGES

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS

Emission Unit EU01/02 **Two Indirect Heat Exchangers**

Description:

Equipment:	Two Wood-Fired Boilers that share a vent stack
Fuel:	Wood
Construction Commenced:	1960
Heat Input Capacity:	12.3 MMBtu/hr, Each

APPLICABLE REGULATIONS:

401 KAR 61:015, *Existing indirect heat exchangers*

401 KAR 63:002, Section 2(4)(jjjjj), 40 C.F.R. 63.11193 to 63.11237, Tables 1 to 8 (**Subpart JJJJJJ**), *National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Source*

1. **Operating Limitations**:
   a. During a startup period or a shutdown period, the permittee shall comply with the work practice standards established in 401 KAR 61:015, Section 9. The permittee shall meet the work practice standards established in 40 CFR Part 63, Table 2 to Subpart JJJJJJ, established in 401 KAR 63:002, Section 2(4)(jjjjj). [401 KAR 61:015, Section 9(2)(c)]

   b. At all times, the permittee shall operate and maintain any affected source, including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for minimizing emissions. The general duty to minimize emissions does not require the permittee to make any further efforts to reduce emissions if levels required by the standards of 40 CFR 63, Subpart JJJJJJ have been achieved. Determination of whether such operation and maintenance procedures are being used will be based on information available to the Administrator that may include, but is not limited to, monitoring results, review of operation and maintenance procedures, review of operation and maintenance records, and inspection of the source. [40 CFR 63.11205(a)]

   c. The permittee shall conduct a tune-up of each boiler biennially to demonstrate continuous compliance as specified in 40 CFR 63.11223(b)(1) through (7). Each biennial tune-up shall be conducted no more than 25 months after the previous tune-up. [401 KAR 61:015, Section 9(2)(c), 40 CFR 63.11201(b), 40 CFR 63.11214(b), and 40 CFR 63.11223(b)]

      i. As applicable, inspect the burner, and clean or replace any components of the burner as necessary (the permittee may delay the burner inspection until the next scheduled unit shutdown, not to exceed 36 months from the previous inspection). Units that produce electricity for sale may delay the burner inspection until the first outage, not to exceed 36 months from the previous inspection; [40 CFR 63.11223(b)(1)]

      ii. Inspect the flame pattern, as applicable, and adjust the burner as necessary to optimize the flame pattern. The adjustment should be consistent with the manufacturer's specifications, if available; [40 CFR 63.11223(b)(2)]

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

iii. Inspect the system controlling the air-to-fuel ratio, as applicable, and ensure that it is correctly calibrated and functioning properly (the permittee may delay the inspection until the next scheduled unit shutdown, not to exceed 36 months from the previous inspection). Units that produce electricity for sale may delay the inspection until the first outage, not to exceed 36 months from the previous inspection; [40 CFR 63.11223(b)(3)]

iv. Optimize total emissions of CO. This optimization should be consistent with the manufacturer's specifications, if available, and with any nitrogen oxide requirement to which the unit is subject; [40 CFR 63.11223(b)(4)]

v. Measure the concentrations in the effluent stream of CO in parts per million, by volume, and oxygen in volume percent, before and after the adjustments are made (measurements may be either on a dry or wet basis, as long as it is the same basis before and after the adjustments are made). Measurements may be taken using a portable CO analyzer; and [40 CFR 63.11223(b)(5)]

vi. If the unit is not operating on the required date for a tune-up, the tune-up shall be conducted within 30 days of startup. [40 CFR 63.11223(b)(7)]

Compliance Demonstration Method:
Compliance shall be demonstrated according to **5. Specific Recordkeeping Requirements d.**

d. If the permittee has switched fuels or made a physical change to the boiler and the fuel switch or change resulted in the applicability of a different subcategory within 40 CFR 63, Subpart JJJJJJ, in the boiler becoming subject to 40 CFR 63, Subpart JJJJJJ, or in the boiler switching out of 40 CFR 63, Subpart JJJJJJ due to a fuel change that results in the boiler meeting the definition of gas-fired boiler, as defined in 40 CFR 63.11237, or the permittee has taken a permit limit that resulted in becoming subject to 40 CFR 63, Subpart JJJJJJ or no longer being subject to 40 CFR 63, Subpart JJJJJJ, the permittee shall provide notice of the date upon which they switched fuel, made the physical change, or took a permit limit within 30 days of the change. The notification shall identify: [40 CFR 63.11225(g)]

i. The name of the owner or operator of the affected source, the location of the source, the boiler(s) that have switched fuels, were physically changed, or took a permit limit, and the date of the notice. [40 CFR 63.11225(g)(1)]

ii. The date upon which the fuel switch, physical change, or permit limit occurred. [40 CFR 63.11225(g)(2)]

2. Emission Limitations:

a. Particulate matter (PM) emissions shall not exceed 0.61 lbs/MMBtu. [401 KAR 61:015, Section 4(1)(a), Referencing Appendix A, Priority II Region]

Compliance Demonstration Method:
Compliance with the applicable 401 KAR 61:015 PM emission limitations shall be

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

demonstrated according to **4. Specific Monitoring Requirements a.** and **5. Specific Recordkeeping Requirements a.**

b. Opacity shall not exceed forty (40) percent in regions classified as Priority II or III with respect to particulate matter, except that, for: [401 KAR 61:015, Section 4(1)(c)]

i. A maximum of sixty (60) percent opacity shall be permissible for not more than six (6) consecutive minutes in any sixty (60) consecutive minutes during cleaning the fire box or blowing soot and, a maximum of sixty (60) percent opacity shall be permissible during cleaning of the grates for not more than three (3) consecutive minutes in any sixty (60) consecutive minutes for each section of grates that are cleaned; and [401 KAR 61:015, Section 4(1)(c)2.]

ii. During building a new fire for the period required to bring the boiler up to operating conditions if the method used is that recommended by the manufacturer and the time does not exceed the manufacturer's recommendations. [401 KAR 61:015, Section 4(1)(c)3.]

Compliance Demonstration Method:
Compliance with the applicable 401 KAR 61:015 opacity limitations shall be demonstrated according to **4. Specific Monitoring Requirements b.** and **5. Specific Recordkeeping Requirements b.**

c. Sulfur dioxide (SO_2) emissions shall not exceed 8.03 lbs/MMBtu based on a 24-hour average. [401 KAR 61:015, Section 5(1), Referencing Appendix B, County Class V, Solid Fuel]

Compliance Demonstration Method:
These units are assumed to be in compliance with the applicable 401 KAR 61:015 SO_2 emission limitations while combusting wood.

d. See **Section D – Source Emission Limitations and Testing Requirements** for source-wide emission limitations of nitrogen oxides (NOx) ~~carbon monoxide (CO) and PM.~~

3. Testing Requirements:
Testing shall be conducted at such times as may be requested by the Cabinet. [401 KAR 50:045, Section 1]

4. Specific Monitoring Requirements:

a. The permittee shall monitor the hours of operation and amount of wood fuel combusted (in tons) on a monthly basis. [401 KAR 52:030, Section 10]

b. The permittee shall perform a qualitative visual observation of the opacity of emissions at the stack no less than weekly while the affected facility is operating. If visible emissions from the stack are observed (not including condensed water in the plume), the permittee shall determine the opacity using Reference Method 9. In lieu of determining the opacity using U.S. EPA Method 9, the permittee shall immediately perform a corrective action which results in no visible emissions (not including condensed water in the plume). [401 KAR 52:030, Section 10]

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

5. Specific Recordkeeping Requirements:

a. The permittee shall maintain record of the hours of operation and amount of wood fuel combusted (in tons) on a monthly basis. [401 KAR 52:030, Section 10]

b. The permittee shall maintain records of the weekly qualitative visual observations, any U.S. EPA Reference Method 9 readings performed, and any corrective actions taken. [401 KAR 52:030, Section 10]

c. Maintain on-site and submit, if requested by the Cabinet, a report containing the following information: [40 CFR 63.11223(b)(6)]

i. The concentrations of CO in the effluent stream in parts per million, by volume, and oxygen in volume percent, measured at high fire or typical operating load, before and after the tune-up of the boiler; [40 CFR 63.11223(b)(6)(i)]

ii. A description of any corrective actions taken as part of the tune-up of the boiler; and [40 CFR 63.11223(b)(6)(ii)]

iii. The type and amount of fuel used over the 12 months prior to the tune-up of the boiler, but only if the unit was physically and legally capable of using more than one type of fuel during that period. Units sharing a fuel meter may estimate the fuel use by each unit. [40 CFR 63.11223(b)(6)(iii)]

d. The permittee shall maintain the following records: [40 CFR 63.11225(c)]

i. As required in 40 CFR 63.10(b)(2)(xiv), the permittee shall keep a copy of each notification and report that is submitted to comply with 40 CFR 63, Subpart JJJJJJ and all documentation supporting any initial Notification or Notification of Compliance Status that was submitted; [40 CFR 63.11225(c)(1)]

ii. The permittee shall keep records to document conformance with the work practices, emission reduction measures, and management practices required by 40 CFR 63.11214 and 40 CFR 63.11223. Records shall identify each boiler, the date of tune-up, the procedures followed for tune-up, and the manufacturer's specifications to which the boiler was tuned; [40 CFR 63.11225(c)(2)(i)]

iii. Records of the occurrence and duration of each malfunction of the boiler, or of the associated air pollution control and monitoring equipment; and [40 CFR 63.11225(c)(4)]

iv. Records of actions taken during periods of malfunction to minimize emissions in accordance with the general duty to minimize emissions in 40 CFR 63.11205(a), including corrective actions to restore the malfunctioning boiler, air pollution control, or monitoring equipment to its normal or usual manner of operation. [40 CFR 63.11225(c)(5)]

e. Records shall be in a form suitable and readily available for expeditious review. The permittee shall keep each record for 5 years following the date of each recorded action. The permittee shall keep each record on-site or be accessible from a central location by

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

computer or other means that instantly provide access at the site for at least 2 years after the date of each recorded action. The permittee may keep the records off site for the remaining 3 years. [40 CFR 63.11225(d)]

6. Specific Reporting Requirements:

a. The permittee shall submit the Notification of Compliance Status in accordance with 40 CFR 63.11225(a)(4)(vi). The Notification of Compliance Status shall be signed by a responsible official and include the following information and certification(s) of compliance: [40 CFR 63.11214(b) and 40 CFR 63.11225(a)(4)]

i. "This facility complies with the requirements of 40 CFR 63.11214 to conduct an initial tune-up of the boiler." [40 CFR 63.11225(a)(4)(ii)]

ii. For units that do not qualify for a statutory exemption as provided in section 129(g)(1) of the Clean Air Act: "No secondary materials that are solid waste were combusted in any affected unit." [40 CFR 63.11225(a)(4)(v)]

iii. The notification shall be submitted electronically using the Compliance and Emissions Data Reporting Interface (CEDRI) that is accessed through EPA's Central Data Exchange (CDX) (www.epa.gov/cdx). However, if the reporting form specific to 40 CFR 63, Subpart JJJJJJ is not available in CEDRI at the time that the report is due, the written Notification of Compliance Status shall be submitted to the Administrator at the appropriate address listed in 40 CFR 63.13. [40 CFR 63.11225(a)(4)(vi)]

b. The permittee shall prepare, by March 1 of each year, and submit to the delegated authority upon request, an annual compliance certification report for the previous calendar year containing the information specified below. The permittee shall submit the report by March 15 if there is any instance described in 40 CFR 63.11225(b)(3). For boilers that are subject only to conduct a biennial tune-up according to 40 CFR 63.11223(a) and not subject to emission limits or operating limits, the permittee may prepare only a biennial or 5-year compliance report as specified in 40 CFR 63.11225(b)(1) and (2). [40 CFR 63.11225(b)]

i. Company name and address. [40 CFR 63.11225(b)(1)]

ii. Statement by a responsible official, with the official's name, title, phone number, email address, and signature, certifying the truth, accuracy and completeness of the notification and a statement of whether the source has complied with all the relevant standards and other requirements of 40 CFR 63, Subpart JJJJJJ. The notification shall include the following certification(s) of compliance, as applicable, and be signed by a responsible official: [40 CFR 63.11225(b)(2)]

A. "This facility complies with the requirements in 40 CFR 63.11223 to conduct a biennial tune-up of each boiler." [40 CFR 63.11225(b)(2)(i)]

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

B. For units that do not qualify for a statutory exemption as provided in section 129(g)(1) of the Clean Air Act: "No secondary materials that are solid waste were combusted in any affected unit." [40 CFR 63.11225(b)(2)(ii)]

C. "This facility complies with the requirements in 401 KAR 61:015, Section (9)(1) to minimize the boiler's time spent during startup and shutdown and to conduct startups and shutdowns according to the manufacturer's recommended procedures or procedures specified for a boiler of similar design if manufacturer's recommended procedures are not available." [40 CFR 63.11225(b)(2)(iii)

iii. If the source experiences any deviations from the applicable requirements during the reporting period, include a description of deviations, the time periods during which the deviations occurred, and the corrective actions taken. [40 CFR 63.11225(b)(3)]

c. See **Section F – Monitoring, Recordkeeping, and Reporting Requirements** for additional requirements.

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

Emission Units: Existing Silos and Stave/Heading Processes EU-03A, EU-03C, EU03E, EU-04 and EU-07

Description:

Emission Unit	Description	Construction Commenced	Capacity (tons/hr)	Control Device	Control Efficiency
EU-03A-3	Stave Rip Saws -2	1960	2.0	Stave Dust Collector System Process Cyclones and Baghouses	PM = 99% PM_{10} = 99% $PM_{2.5}$ = 95%
~~*EU-03C-1~~	~~Heading Jointers - 15~~	~~1960~~	~~4.28~~	Heading Dust Collector System Process Cyclones and Baghouses	
~~*EU-03C-2~~	~~Heading Rounders - 3~~	~~1960~~	~~4.28~~		
EU-03C-3	Heading Rip Saws - 2	1960	2.0		
EU-03E-1	Wood Hog to Trailer Loadout	July 1969	5.3	Baghouse	
EU-03E-2	Wood Hog to Silos	July 1969	5.3	Baghouse	
EU-04-1	Barrel Sander	1960	6.7	Barrel Dust Collection System Cyclone	PM = 95% PM_{10} = 95% $PM_{2.5}$ = 80%
EU-04-2	Head Sander	1960	3.4		
EU-04-3	Crozier (Router)	1960	6.7		
EU-07-1	Silo 1	1960	5.3	Baghouse	PM = 99% PM_{10} = 99% $PM_{2.5}$ = 95%
EU-07-2	Silo 2	1960	5.3	Baghouse	

~~*EU-03C-1 and EU-03C-2 shall be operated only for the purposes of completing the "transitional stage" required to bring EU-03D-6 and EU-03D-7 online and fully operational without the assistance of EU-03C-1 and EU-03C-2. Once the transitional stage is complete and EU-03C-1 and EU-03C-2 are removed from the facility, the units shall be removed from the permit.~~

APPLICABLE REGULATION:

401 KAR 61:020 *Existing process operations*

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

1. **Operating Limitations:**
   N/A

2. **Emission Limitations:**
   a. No person shall cause, suffer, allow or permit any continuous emission into the open air from a control device or stack associated with any affected facility which is equal to or greater than forty (40) percent opacity. [401 KAR 61:020, Section 3(1)(a)]

      Compliance Demonstration Method:
      Compliance with the applicable 401 KAR 61:020 opacity limitations shall be demonstrated according to **4. Specific Monitoring Requirements a.** and **5. Specific Recordkeeping Requirements a.**

   b. Particulate matter (PM) emissions shall not exceed the limitations as determined by the following table: [401 KAR 61:020 Section 3(2)(a)]

P = Process Rate (tons/hr)	E = PM Emission Rate (lbs/hr)
$P \leq 0.50$	$E = 2.58$
$0.50 < P < 30$	$E = 4.10P^{0.67}$

      Compliance Demonstration Method:
      Compliance with the applicable 401 KAR 61:020 PM emission limitations shall be demonstrated according to **4. Specific Monitoring Requirements b.**, **5. Specific Recordkeeping Requirements b.**, and **7. Specific Control Equipment Operating Conditions a.**

   ~~c. See **Section D – Source Emission Limitations and Testing Requirements** for source-wide emission limitations of PM.~~

3. **Testing Requirements:**
   Testing shall be conducted at such times as may be requested by the Cabinet. [401 KAR 50:045, Section 1]

4. **Specific Monitoring Requirements:**
   a. The permittee shall perform a qualitative visual observation of the opacity of emissions at each stack no less than weekly while the affected facility is operating. If visible emissions from any stack are observed (not including condensed water in the plume), the permittee shall determine the opacity using Reference Method 9. In lieu of determining the opacity using U.S. EPA Method 9, the permittee shall immediately perform a corrective action which results in no visible emissions (not including condensed water in the plume). [401 KAR 52:030, Section 10]

   b. The permittee shall monitor the hours of operation and the amount of wood processed (in tons) on a monthly basis. [401 KAR 52:030, Section 10]

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

5. Specific Recordkeeping Requirements:

a. The permittee shall maintain records of the weekly qualitative visual observations, any U.S. EPA Reference Method 9 readings performed, and any corrective actions taken. [401 KAR 52:030, Section 10]

b. The permittee shall maintain records of the hours of operation and the amount of wood processed (in tons) on a monthly basis. [401 KAR 52:030, Section 10]

6. Specific Reporting Requirements:

See **Section F – Monitoring, Recordkeeping, and Reporting Requirements**.

7. Specific Control Equipment Requirements:

a. Control devices shall be operated to maintain compliance with permitted emission limitations, in accordance with manufacturer's specifications and standard operating practices. [401 KAR 50:055, Section 2]

b. The permittee shall maintain records regarding the maintenance of the control equipment. [401 KAR 52:030, Section 10]

c. See **Section E – Source Control Equipment Requirements** for additional requirements.

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

Emission Units: New Stave/Heading Processes EU-03B, EU-03D, and EU03F

Description:

Emission Unit	Description	Construction Commenced	Capacity (tons/hr)	Control Device	Control Efficiency
EU-03B-1	Stave Planers-2	1998	9.8	Stave Dust Collector System Process Cyclones and Baghouses	PM = 99% PM_{10} = 99% $PM_{2.5}$ = 95%
EU-03B-2	Rough Joint Machine	2011	0.62		
EU-03D-1	Heading Planers	2006 / 2024	4.28	Heading Dust Collector System Process Cyclones and Baghouses	
EU-03D-2	Heading Molders – 4	2006	4.28		
EU-03D-3	Heading Hog	2006	3.0		
EU-03D-4	Heading Chop Saws – 2	2001	0.18		
EU-03D-5	Grover – 2	2006	2.0		
EU-03D-6	Heading Joiners	2024	4.28		
EU-03D-7	Heading Rounders	2024	4.28		
EU-03F-1	Enclosed Trailer Loadout	1999	5.3	Baghouse	

APPLICABLE REGULATION:
401 KAR 59:010 *New process operations*

1. **Operating Limitations:**
   N/A

2. **Emission Limitations:**
   a. No person shall cause, suffer, allow or permit any continuous emission into the open air from a control device or stack associated with any affected facility which is equal to or greater than twenty (20) percent opacity. [401 KAR 59:010, Section 3(1)(a)]

      Compliance Demonstration Method:
      Compliance with the applicable 401 KAR 59:010 opacity limitations shall be demonstrated according to **4. Specific Monitoring Requirements a.** and **5. Specific Recordkeeping Requirements a.**

   b. Particulate matter (PM) emissions into the open air shall not exceed the limitations as determined by the following table: [401 KAR 59:010 Section 3(2)]

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

P = Process Rate (tons/hr)	E = PM Emission Rate (lbs/hr)
$P \leq 0.50$	$E = 2.34$
$0.50 < P < 30$	$E = 3.59P^{0.62}$

Compliance Demonstration Method:
Compliance with the applicable 401 KAR 61:020 PM emission limitations shall be demonstrated according to **4. Specific Monitoring Requirements b.**, **5. Specific Recordkeeping Requirements b.**, and **7. Specific Control Equipment Operating Conditions a.**

~~c. See **Section D – Source Emission Limitations and Testing Requirements** for source-wide emission limitations of PM.~~

3. Testing Requirements:
Testing shall be conducted at such times as may be requested by the Cabinet. [401 KAR 50:045, Section 1]

4. Specific Monitoring Requirements:

a. The permittee shall perform a qualitative visual observation of the opacity of emissions at each stack no less than weekly while the affected facility is operating. If visible emissions from any stack are observed (not including condensed water in the plume), the permittee shall determine the opacity using Reference Method 9. In lieu of determining the opacity using U.S. EPA Method 9, the permittee shall immediately perform a corrective action which results in no visible emissions (not including condensed water in the plume). [401 KAR 52:030, Section 10]

b. The permittee shall monitor the hours of operation and the amount of wood processed (in tons) on a monthly basis. [401 KAR 52:030, Section 10]

5. Specific Recordkeeping Requirements:

a. The permittee shall maintain records of the weekly qualitative visual observations, any U.S. EPA Reference Method 9 readings performed, and any corrective actions taken. [401 KAR 52:030, Section 10]

b. The permittee shall maintain records of the hours of operation and the amount of wood processed (in tons) on a monthly basis. [401 KAR 52:030, Section 10]

6. Specific Reporting Requirements:
See **Section F – Monitoring, Recordkeeping, and Reporting Requirements**.

7. Specific Control Equipment Requirements:

a. Control devices shall be operated to maintain compliance with permitted emission limitations, in accordance with manufacturer's specifications and standard operating practices. [401 KAR 50:055, Section 2]

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

b. The permittee shall maintain records regarding the maintenance of the control equipment. [401 KAR 52:030, Section 10]

c. See **Section E – Source Control Equipment Requirements** for additional requirements

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

Emission Unit EU-05 **Dry Chamber**

Description:

Equipment:	Drying Chamber
Fuel:	Natural Gas
Construction Commenced:	1960
Heat Input Capacity:	32 MMBtu/hr

APPLICABLE REGULATION:

401 KAR 61:020, *Existing process operations*

1. **Operating Limitations:**
   To preclude applicability of 401 KAR 52:020, the permittee shall limit operation of this unit to 6,000 hours during any 12 consecutive months. [401 KAR 52:030, Section 10]

   Compliance Demonstration Method:
   Compliance shall be demonstrated according to **4. Specific Monitoring Requirements** and **5. Specific Recordkeeping Requirements**.

2. **Emission Limitations:**
   a. No person shall cause, suffer, allow or permit any continuous emission into the open air from a control device or stack associated with any affected facility which is equal to or greater than forty (40) percent opacity. [401 KAR 61:020, Section 3(1)(a)]

   b. Particulate matter (PM) emissions shall not exceed 2.58 lbs/hr. [401 KAR 61:020, Section 3(2)(a)]

   Compliance Demonstration Method:
   Compliance with the applicable 401 KAR 61:020 opacity and PM emission limitations shall be assumed while combusting natural gas.

   c. See **Section D – Source Emission Limitations and Testing Requirements** for source-wide emission limitations of nitrogen oxides (NOx)~~carbon monoxide (CO) and PM~~.

3. **Testing Requirements:**
   Testing shall be conducted at such times as may be requested by the Cabinet. [401 KAR 50:045, Section 1]

4. **Specific Monitoring Requirements:**
   The permittee shall monitor the hours of operation and the amount of natural gas combusted (in MMscf) on a monthly basis. [401 KAR 52:030, Section 10]

5. **Specific Recordkeeping Requirements:**
   The permittee shall maintain records of the hours of operation and the amount of natural gas combusted (in MMscf) on a monthly basis. [401 KAR 52:030, Section 10]

6. **Specific Reporting Requirements:**
   See **Section F – Monitoring, Recordkeeping, and Reporting Requirements.**

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

Emission Unit EU-011 Heading Char

Description:

Emission Unit	Fuel	Capacity	Construction Commenced
~~EU-011-1~~	~~Wood~~	~~4.68 MMBtu/hr (0.30 tons/hr)~~	1960
EU-011-2	Barrel Heads (Char Only)	500~~376~~ Barrel Heads/hr	
EU-011-3	Natural Gas	1.05 MMBtu/hr	

APPLICABLE REGULATION:
401 KAR 61:020, *Existing process operations*

STATE-ORIGIN REQUIREMENT:
401 KAR 63:020, *Potentially hazardous matter or toxic substances*

1. **Operating Limitations~~Conditions~~:**

   N/A

   ~~To preclude applicability of 401 KAR 52:020, the permittee shall limit operation of this unit to 6,000 hours during any 12 consecutive months. [401 KAR 52:030, Section 10]~~

   ~~*Compliance Demonstration Method:*~~
   ~~Compliance shall be demonstrated according to **4. Specific Monitoring Requirements a.** and **5. Specific Recordkeeping Requirements a.**~~

2. **Emission Limitations:**

   a. No person shall cause, suffer, allow or permit any continuous emission into the open air from a control device or stack associated with any affected facility which is equal to or greater than forty (40) percent opacity. [401 KAR 61:020, Section 3(1)(a)]

      Compliance Demonstration Method:
      Compliance with the applicable 401 KAR 61:020 opacity limitations shall be demonstrated according to **4. Specific Monitoring Requirements b.** and **5. Specific Recordkeeping Requirements b.**

   b. Particulate matter (PM) emissions shall not exceed 2.58 lbs/hr. [401 KAR 61:020, Section 3(2)(a)]

      Compliance Demonstration Method:
      Compliance with the applicable 401 KAR 61:020 opacity and PM emission limitations shall be assumed while combusting natural gas~~wood~~.

   c. Persons responsible for a source from which hazardous matter or toxic substances may be emitted shall provide the utmost care and consideration, in the handling of these materials,

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

to the potentially harmful effects of the emissions resulting from such activities. No owner or operator shall allow any affected facility to emit potentially hazardous matter or toxic substances in such quantities or duration as to be harmful to the health and welfare of humans, animals and plants. Evaluation of such facilities as to adequacy of controls and/or procedures and emission potential will be made on an individual basis by the Cabinet. [401 KAR 63:020, Section 3]

Compliance Demonstration Method:
Based upon the emission rates of toxics and hazardous air pollutants determined by the Cabinet using information provided in the application and supplemental information submitted by the source, the Cabinet determines the affected facility to be in compliance with 401 KAR 63:020.

d. See **Section D – Source Emission Limitations and Testing Requirements** for source-wide emission limitations of nitrogen oxides (NOx)~~carbon monoxide (CO) and PM~~.

3. Testing Requirements:

a. Testing shall be conducted at such times as may be requested by the Cabinet. [401 KAR 50:045, Section 1]

~~b. The permittee shall conduct a performance test on Emission Unit EU-011 for CO emissions using U.S. EPA Reference Method 10 for the purpose of developing an appropriate CO emission factor for the head charring operations, EU-011-2.~~

~~i. The performance test shall be conducted within 180 days after the final issuance of F-20-032.~~

~~ii. The performance test shall be conducted under normal conditions that are representative of normal operations and create the highest rate of emission. If the maximum production rate represents the highest emission rate and a performance test is conducted at less than the maximum production rate, the unit shall be limited to a production rate of no greater than 110 percent of the average production rate during the performance test.~~

~~iii. The performance test shall consist of at least three test runs. Each test run shall be at least 60 minutes in duration.~~

~~iv. The permittee shall monitor the number of heads charred during each test run.~~

~~[401 KAR 50:045, Section 1 and 401 KAR 61:005, Section 2]~~

~~c. In lieu of testing, the permittee may use the test result for EU-012 Stave Charring, to develop a representative emission factor. [401 KAR 52:030, Section 10]~~

4. Specific Monitoring Requirements:

a. The permittee shall monitor the hours of operation, ~~the amount of wood combusted (in tons)~~, the amount of natural gas combusted (in MMscf), and the number of barrel heads charred on a monthly basis. [401 KAR 52:030, Section 10]

b. The permittee shall perform a qualitative visual observation of the opacity of emissions at

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

the stack no less than weekly while the affected facility is operating. If visible emission from the stack are observed (not including condensed water in the plume), the permittee shall determine the opacity using Reference Method 9. In lieu of determining the opacity using U.S. EPA Method 9, the permittee shall immediately perform a corrective action which results in no visible emissions (not including condensed water in the plume). [401 KAR 52:030, Section 10]

5. Specific Recordkeeping Requirements:

a. The permittee shall maintain records of the hours of operation, ~~the amount of wood combusted (in tons),~~ the amount of natural gas combusted (in MMscf), and the number of barrel heads charred on a monthly basis. [401 KAR 52:030, Section 10]

b. The permittee shall maintain records of the weekly qualitative visual observations, any U.S. EPA Reference Method 9 reading performed, and any corrective actions taken. [401 KAR 52:030, Section 10]

6. Specific Reporting Requirements:

See **Section F – Monitoring, Recordkeeping, and Reporting Requirements**.

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

Emission Unit EU-012 **Stave Char**

Description:

Emission Unit	Fuel	Capacity	Construction Commenced
~~EU-012-1~~	~~Wood~~	~~7.02 MMBtu/hr (0.46 tons/hr)~~	2017
EU-012-2	Natural Gas	6.0 MMBtu/hr (0.0059 MMscf/hr)	
EU-012-3	Staves (Char Only)	250~~188~~ Barrels/hr	

APPLICABLE REGULATION:
401 KAR 59:010, *New process operations*

STATE-ORIGIN REQUIREMENT:
401 KAR 63:020, *Potentially hazardous matter or toxic substances*

1. **Operating Limitations:**

   N/A

   ~~To preclude applicability of 401 KAR 52:020, the permittee shall limit wood combustion to 1,752 hours and natural gas combustion to 1,676 hours during any 12 consecutive months, based on 23 seconds of wood combustion and 22 seconds of natural gas combustion during each 115 second run-time. [401 KAR 52:030, Section 10]~~

   ~~*Compliance Demonstration Method:*~~
   ~~Compliance shall be demonstrated according to **4. Specific Monitoring Requirements b.** and **5. Specific Recordkeeping Requirements b.**~~

2. **Emission Limitations:**
   a. No person shall cause, suffer, allow, or permit any continuous emission into the open air from a control device or stack associated with any affected facility which is equal to or greater than twenty (20) percent opacity. [401 KAR 59:010, Section 3(1)(a)]

      Compliance Demonstration Method:
      Compliance with the applicable 401 KAR 59:010 opacity limitation shall be demonstrated according to **4. Specific Monitoring Requirements a.** and **5. Specific Recordkeeping Requirements a.**

   b. Particulate matter (PM) emissions shall not exceed the following: [401 KAR 59:010, Section 3(2)]

P = Process Rate (tons/hr)	E = PM Emission Rate (lbs/hr)
$P \leq 0.50$	$E = 2.34$
$0.50 < P < 30$	$E = 3.59P^{0.62}$

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

Compliance Demonstration Method:
Initial compliance with the applicable 401 KAR 59:010 PM emission limitation shall be demonstrated by **3. Testing Requirements b.** Continued compliance shall be demonstrated according to **4. Specific Monitoring Requirements b.** and **5. Specific Recordkeeping Requirements b.**

c. Persons responsible for a source from which hazardous matter or toxic substances may be emitted shall provide the utmost care and consideration, in the handling of these materials, to the potentially harmful effects of the emissions resulting from such activities. No owner or operator shall allow any affected facility to emit potentially hazardous matter or toxic substances in such quantities or duration as to be harmful to the health and welfare of humans, animals and plants. Evaluation of such facilities as to adequacy of controls and/or procedures and emission potential will be made on an individual basis by the cabinet. [401 KAR 63:020, Section 3]

Compliance Demonstration Method:
Based upon the emission rates of toxics and hazardous air pollutants determined by the Cabinet using information provided in the application and supplemental information submitted by the source, the Cabinet determines the affected facility to be in compliance with 401 KAR 63:020.

d. See **Section D – Source Emission Limitations and Testing Requirements** for source-wide emission limitations of nitrogen oxides (NOx)~~carbon monoxide (CO) and PM~~.

3. Testing Requirements:

a. Testing shall be conducted at such times as may be requested by the Cabinet. [401 KAR 50:045, Section 1]

~~a. The permittee shall conduct a performance test on Emission Unit EU-012 for CO emissions using U.S. EPA Reference Method 10 for the purpose of developing an appropriate CO emission factor for the charring operations.~~

~~i. The performance test shall be conducted within 180 days after the final issuance of F-20-032.~~

~~ii. The performance test shall be conducted under normal conditions that are representative of normal operations and create the highest rate of emission. If the maximum production rate represents the highest emission rate and a performance test is conducted at less than the maximum production rate, the unit shall be limited to a production rate of no greater than 110 percent of the average production rate during the performance test.~~

~~iii. The performance test shall consist of at least three test runs. Each test run shall be at least 60 minutes in duration.~~

~~iv. The permittee shall monitor the number of barrels charred during each test run.~~

~~[401 KAR 50:045, Sections 1 and 5; 401 KAR 59:005, Section 2]~~

~~b. The permittee shall conduct a performance test using U.S. EPA Reference Methods 5 and~~

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

~~202 to demonstrate compliance with the applicable PM mass emission limitation and to establish a PM emission factor for the charring operations. Except as provided in 401KAR 50:045, performance tests used to demonstrate compliance with the 401 KAR 59:010 PM emission limitations shall be conducted according to 401 KAR 59:010, Section 4.~~

~~i. The performance test shall be conducted within 180 days after the final issuance of F-20-032.~~

~~ii. The performance test shall be conducted under normal conditions that are representative of normal operations and create the highest rate of emission. If the maximum production rate represents the highest emission rate and a performance test is conducted at less than the maximum production rate, the unit shall be limited to a production rate of no greater than 110 percent of the average production rate during the performance test.~~

~~iii. The performance test shall consist of at least three test runs. Each test run shall be at least 60 minutes in duration.~~

~~iv. The permittee shall monitor the number of barrels charred during each test run.~~

~~[401 KAR 50:045, Sections 1 and 5; 401 KAR 59:005, Section 2(1)]; and 401 KAR 59:010, Section 4]~~

4. Specific Monitoring Requirements:

a. The permittee shall perform a qualitative visual observation of the opacity of emissions at the stack no less than weekly while the affected facility is operating. If visible emissions from the stack are observed (not including condensed water in the plume), the permittee shall determine the opacity using Reference Method 9. In lieu of determining the opacity using U.S. EPA Method 9, the permittee shall immediately perform a corrective action which results in no visible emissions (not including condensed water in the plume). [401 KAR 52:030, Section 10]

b. The permittee shall monitor the hours of operation, ~~the amount of wood combusted (in tons),~~ the amount of natural gas combusted (in MMscf), and the number of barrels charred on a monthly basis. [401 KAR 52:030, Section 10]

5. Specific Recordkeeping Requirements:

a. The permittee shall maintain records of the weekly qualitative visual observations, any U.S. EPA Reference Method 9 readings performed, and any corrective actions taken. [401 KAR 52:030, Section 10]

b. The permittee shall maintain records of the hours of operation, ~~the amount of wood combusted (in tons)~~, the amount of natural gas combusted (in MMscf), and the number of barrels charred on a monthly basis. [401 KAR 52:030, Section 10]

6. Specific Reporting Requirements:

See **Section F – Monitoring, Recordkeeping, and Reporting Requirements.**

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

Emission Unit 13 **G5 Process**

Description:

Emission Unit	Description	Construction Commenced	Capacity (tons/hr)	Control Device	~~Control Efficiency~~
~~EU 13-1~~	~~Equalizer 2~~	~~2018~~	~~19.35~~	CAMCORP Baghouse	~~99.9%~~
~~EU 13-2~~	~~Stave Planar 2~~	~~2018~~	~~18.86~~		
~~EU 13-3~~	~~Stave G5 24~~	~~2019~~	~~16.84~~		
~~EU 13-4~~	~~Grinder 2~~	~~2018~~	~~1.04~~		
EU 13-5	G5 Processes	2018	10.80		

APPLICABLE REGULATION:
401 KAR 59:010, *New process operations*

1. **Operating Limitations:**
   N/A

2. **Emission Limitations:**
   a. No person shall cause, suffer, allow or permit any continuous emission into the open air from a control device or stack associated with any affected facility which is equal to or greater than twenty (20) percent opacity. [401 KAR 59:010, Section 3(1)(a)]

      Compliance Demonstration Method:
      Compliance with the applicable 401 KAR 59:010 opacity limitations shall be demonstrated according to **4. Specific Monitoring Requirements a.** and **5. Specific Recordkeeping Requirements a.**

   b. Particulate matter (PM) emissions into the open air shall not exceed the limitations as determined by the following table: [401 KAR 59:010, Section 3(2)]

P = Process Rate (tons/hr)	E = PM Emission Rate (lbs/hr)
$P \leq 0.50$	$E = 2.34$
$0.50 < P < 30$	$E = 3.59P^{0.62}$

      Compliance Demonstration Method:
      Compliance with the applicable 401 KAR 59:010 PM emission limitations shall be demonstrated according to **3. Testing Requirements**, **7. Specific Control Equipment Requirements**.

   ~~c. See **Section D - Source Emission Limitations and Testing Requirements** for source-wide emission limitations of PM.~~

3. **Testing Requirements:**

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

a. Testing shall be conducted at such times as may be requested by the Cabinet. [401 KAR 50:045, Section 1]

~~The permittee shall conduct a performance test using U.S. EPA Reference Method 5 to demonstrate compliance with the applicable 401 KAR 59:010 PM mass emission limitation, establish a PM emission factor for the G5 Process, and to measure the control efficiency of the CAMCORP Baghouse. Except as provided in 401 KAR 50:045, performance tests used to demonstrate compliance with the 401 KAR 59:010 PM emission limitations shall be conducted according to 401 KAR 59:010, Section 4. [401 KAR 50:045, Section 1; 401 KAR 59:005, Section 2(1)]; and 401 KAR 59:010, Section 4]~~

~~a. The performance test shall be conducted within 180 days after the final issuance of F-20-032. [401 KAR 59:005, Section 2(1)]~~

~~b. The performance test shall be conducted under normal conditions that are representative of normal operations and create the highest rate of emission. If the maximum production rate represents the highest emission rate and a performance test is conducted at less than the maximum production rate, the unit shall be limited to a production rate of no greater than 110 percent of the average production rate during the performance test.~~

~~c. The performance test shall consist of at least three test runs. Each test run shall be at least 60 minutes in duration.~~

~~[401 KAR 50:045, Section 1; 401 KAR 59:005, Section 2(1)]; and 401 KAR 59:010, Section 4]~~

4. Specific Monitoring Requirements:

a. The permittee shall perform a qualitative visual observation of the opacity of emissions at the stack on a daily basis while the G5 Process is operating. If visible emissions from the stack is observed (not including condensed water in the plume), the permittee shall determine the opacity using Reference Method 9. In lieu of determining the opacity using U.S. EPA Method 9, the permittee shall immediately perform a corrective action which results in no visible emissions (not including condensed water in the plume). [401 KAR 52:030, Section 10]

b. The permittee shall monitor the hours of operation and the amount of wood processed (in tons) on a monthly basis. [401 KAR 52:030, Section 10]

c. The permittee shall monitor the differential pressure reading across the baghouse on a daily basis. [401 KAR 52:030, Section 10]

5. Specific Recordkeeping Requirements:

a. The permittee shall maintain a log of the qualitative visual observations made as specified in **4. Specific Monitoring Requirements a.** including the date, time, initials of observer, whether any emissions were observed (yes/no), any Method 9 readings taken and/or any corrective actions performed. [401 KAR 52:030, Section 10]

b. The permittee shall maintain records of the hours of operation and the amount of wood processed (in tons) on a monthly basis. [401 KAR 52:030, Section 10]

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

c. The permittee shall maintain records of the differential pressure reading across the baghouse on a daily basis. [401 KAR 52:030, Section 10]

6. Specific Reporting Requirements:

See **Section F – Monitoring, Recordkeeping, and Reporting Requirements**.

7. Specific Control Equipment Requirements:

a. The baghouse shall be operated to maintain compliance with permitted emission limitations, in accordance with manufacturer's specifications and standard operating practices. [401 KAR 50:055, Section 2]

b. The permittee shall install, calibrate, operate, and maintain a pressure drop monitoring device to continuously monitor the differential pressure across the baghouse. The pressure drop range recommended by the manufacturer shall be posted near the pressure drop monitoring device to ensure that the pressure differential does not fall outside of the recommended range. [401 KAR 52:030, Section 10]

c. The permittee shall maintain records regarding the inspection and maintenance of the baghouse. [401 KAR 52:030, Section 10]

d. See **Section E – Source Control Equipment Requirements** for additional requirements.

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

Emission Unit EU-15 **Paved and Unpaved Roads (T1-T11)**

Description:

Equipment:	Semis and Forklifts
Maximum Operating Rate:	0.85 VMT/hr
Construction Commenced:	1960

APPLICABLE REGULATIONS:

401 KAR 63:010, *Fugitive emissions*

1. **Operating Limitations:**
   a. A person shall not cause, suffer, or allow any material to be handled, processed, transported, or stored; a building or its appurtenances to be constructed, altered, repaired, or demolished; or a road to be used without taking reasonable precautions to prevent particulate matter from becoming airborne. Reasonable precautions shall include, as applicable: [401 KAR 63:010, Section 3(1)]

      i. Use, if possible, of water or suitable chemicals for control of dust in the demolition of existing building or structures, construction operations, the grading of roads, or the clearing of land; [401 KAR 63:010, Section 3(1)(a)]

      ii. Application and maintenance of asphalt, oil, water, or suitable chemicals on roads, materials stockpiles, and other surfaces that create airborne dusts; [401 KAR 63:010, Section 3(1)(b)]

      iii. Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials, or the use of water sprays or other measures to suppress the dust emissions during handling. Adequate containment methods shall be employed during sandblasting or other similar operations; [401 KAR 63:010, Section 3(1)(c)]

      iv. Covering, at all times while in motion, open bodied trucks transporting materials likely to become airborne; [401 KAR 63:010, Section 3(1)(d)]

      v. The maintenance of paved roadways in a clean condition; or [401 KAR 63:010, Section 3(1)(e)]

      vi. The prompt removal of earth or other material from a paved street to which earth or other material has been transported by trucking or earth moving equipment or erosion by water. [401 KAR 63:010, Section 3(1)(f)]

   b. If dust, fumes, gases, mist, odorous matter, vapors, or any combination thereof escape from a building or equipment in a manner and amount as to cause a nuisance or to violate any administrative regulation, the secretary may, based on the cause, type, or amount of a fugitive emission, order that the building or equipment in which processing, handling, and storage are done be tightly closed and ventilated in a way that all air and gases and air or gas-borne material leaving the building or equipment are treated by removal or destruction of air contaminants before discharge to the open air. [401 KAR 63:010, Section 3(3)]

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

c. At all times while in motion, open bodied trucks, operating outside company property, transporting materials likely to become airborne shall be covered. [401 KAR 63:010, Section 4(1)]

d. The provisions of 401 KAR 63:010, Section 3(1) and (2) shall not be applicable to temporary blasting or construction operations. [401 KAR 63:010, Section 4(2)]

e. A person shall not cause, suffer, or allow earth or other material being transported by truck or earth moving equipment to be deposited onto a paved street or roadway. [401 KAR 63:010, Section 4(3)]

Compliance Demonstration Method:
Compliance with the applicable 401 KAR 63:010 operating limitations shall be demonstrated according to **4. Specific Monitoring Requirements a.** and **5. Specific Recordkeeping Requirements a.**

2. Emission Limitations:
A person shall not cause, suffer, or allow visible fugitive dust emissions beyond the lot line of the property on which the emissions originate, as determined by Reference Method 22 of Appendix A in 40 C.F.R. Part 60, for: [401 KAR 63:010, Section 3(2)]

a. More than five (5) minutes of emission time during any sixty (60) minutes observation period; or [401 KAR 63:010, Section 3(2)(a)]

b. More than twenty (20) minutes of emission time during any twenty-four (24) hour period. [401 KAR 63:010, Section 2(b)]

3. Testing Requirements:
Testing shall be conducted at such times as may be requested by the Cabinet. [401 KAR 50:045, Section 1]

4. Specific Monitoring Requirements:

a. The permittee shall monitor the amount of material hauled (in tons), the distance the vehicle travels (in VMT), and the type of vehicle (in tons) that traverses the paved or unpaved roadways on a monthly basis. [401 KAR 52:030, Section 10]

b. The permittee shall monitor the reasonable precautions taken to prevent particulate matter from becoming airborne n on a monthly basis. [401 KAR 52:030, Section 10]

c. If fugitive dust emissions beyond the lot line of the property are observed, the permittee shall conduct Reference Method 22 (visual determination of fugitive emissions) observations per Appendix A of 40 C.F.R. Part 60. In lieu of conducting U.S. EPA Reference Method 22, the permittee shall immediately perform a corrective action which results in no visible fugitive dust emissions beyond the lot line of the property. [401 KAR 52:030, Section 10]

5. Specific Recordkeeping Requirements:

a. The permittee shall maintain records of the amount of material hauled (in tons), the distance the vehicle travels (in VMT), and the type of vehicle (in tons) that traverses the paved or unpaved roadways on a monthly basis. [401 KAR 52:030, Section 10]

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

b. The permittee shall maintain a log of the reasonable precautions taken to prevent particulate matter from becoming airborne, on a daily basis. Notation of the operating status, down-time, or relevant weather conditions are acceptable for entry to the log. [401 KAR 52:030, Section 10]

c. The permittee shall maintain a log of the following: [401 KAR 52:030, Section 10]
   i. Qualitative fugitive emissions observations conducted including the date, time, initials of observer, whether any fugitive dust emissions were observed,

   ii. Any Reference Method 22 performed and field records identified in Reference Method 22.

   iii. Any corrective action taken and the results.

6. Specific Reporting Requirements:
See **Section F – Monitoring, Recordkeeping, and Reporting Requirements**.

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

Emission Unit 16 **Natural Gas-Fired Boiler**

Description:

Equipment:	Johnson Boiler, Model PFTA-500-3
Fuel:	Natural Gas
Construction Commenced:	August 27, 2018
Heat Input Capacity:	21.0 MMBtu/hr
Power Output:	500 hp

APPLICABLE REGULATIONS:

401 KAR 59:015, *New indirect heat exchangers*

401 KAR 60:005, Section 2(2)(d), 40 CFR 60.40c to 60.48c (**Subpart Dc**), *Standards of Performance for Small Industrial-Commercial-Institutional Steam generating Units*

1. **Operating Limitations:**
   During a startup period or a shutdown period, an owner or operator shall comply with the following work practice standards: [401 KAR 59:015, Section 7]

   a. The permittee shall comply with 401 KAR 50:055, Section 2(5); [401 KAR 59:015, Section 7(1)(a)]

   b. The frequency and duration of startup periods or shutdown periods shall be minimized by the affected facility; [401 KAR 59:015, Section 7(1)(b)]

   c. All reasonable steps shall be taken by the permittee to minimize the impact of emissions on ambient air quality from the affected facility during startup periods and shutdown periods; and [401 KAR 59:015, Section 7(1)(c)]

   d. Startups and shutdowns shall be conducted according to either the manufacturer's recommended procedures or recommended procedures for a unit of similar design, for which manufacturer's recommended procedures are available, as approved by the Cabinet based on documentation provided by the permittee. [401 KAR 59:015, Section 7(1)(e)]

   Compliance Demonstration Method:
   Compliance with the applicable 401 KAR 59:015 work practice standards shall be demonstrated according to **5. Specific Recordkeeping Requirements b.**

2. **Emission Limitations:**
   a. Particulate matter (PM) emissions shall not exceed 0.39 lbs/MMBtu. [401 KAR 59:015, Section 4(1)(c)]

   b. Visible emissions shall not exceed twenty (20) percent opacity except: [401 KAR 59:015, Section 4(2)]
      i. A maximum of forty (40) percent opacity shall be allowed for a maximum of six (6) consecutive minutes in any sixty (60) consecutive minutes during fire box cleaning or soot blowing; and [401 KAR 59:015, Section 4(2)(b)]

SECTION B - EMISSION POINTS, EMISSION UNITS, APPLICABLE REGULATIONS, AND OPERATING CONDITIONS (CONTINUED)

ii. For emissions from an affected facility caused by building a new fire, emissions during the period required to bring the boiler up to operating conditions shall be allowed, if the method used is recommended by the manufacturer and the time does not exceed the manufacturer's recommendations. [401 KAR 59:015, Section 4(2)(c)]

c. Sulfur dioxide (SO_2) emissions shall not exceed 2.21 lbs/MMBtu. [401 KAR 59:015, Section 5(1)(c)2.b.]

Compliance Demonstration Method:
This unit is assumed to be in compliance with the applicable 401 KAR 59:015 PM, opacity, and SO_2 emission limitations while combusting natural gas.

d. See **Section D – Source Emission Limitations and Testing Requirements** for source-wide emission limitations of nitrogen oxides (NOx)~~carbon monoxide (CO) and PM~~.

3. Testing Requirements:
Testing shall be conducted at such times as may be requested by the Cabinet. [401 KAR 50:045, Section 4 and 401 KAR 59:005, Section 2(2)]

4. Specific Monitoring Requirements:
The permittee shall monitor the amount of natural gas combusted (in MMscf) on a monthly basis. [401 KAR 52:030, Section 10 and 40 CFR 60.48c(g)(2)]

5. Specific Recordkeeping Requirements:
a. The permittee shall maintain records of the amount of natural gas combusted (in MMscf) on a monthly basis. [401 KAR 52:030, Section 10 and 40 CFR 60.48c(g)(2)]

b. The actions, including duration of the startup period, of the permittee during startup periods and shutdown periods, shall be documented by signed, contemporaneous logs or other relevant evidence. [401 KAR 59:015, Section 7(1)(d)]

6. Specific Reporting Requirements:
See **Section F – Monitoring, Recordkeeping, and Reporting Requirements**.

SECTION C - INSIGNIFICANT ACTIVITIES

The following listed activities have been determined to be insignificant activities for this source pursuant to 401 KAR 52:030, Section 6. Although these activities are designated as insignificant the permittee must comply with the applicable regulation. Process and emission control equipment at each insignificant activity subject to an opacity standard shall be inspected monthly and a qualitative visible emissions evaluation made. Results of the inspection, evaluation, and any corrective action shall be recorded in a log.

	Description	Generally Applicable Regulation
1.	EU-14 Kilns (5) and Dryers	401 KAR 61:020

SECTION D - SOURCE EMISSION LIMITATIONS AND TESTING REQUIREMENTS

1. As required by Section 1b of the *Cabinet Provisions and Procedures for Issuing Federally-Enforceable Permits for Non-Major Sources* incorporated by reference in 401 KAR 52:030, Section 26; compliance with annual emissions and processing limitations contained in this permit, shall be based on emissions and processing rates for any twelve (12) consecutive months.

2. Particulate matter, SO_2, and opacity emissions, measured by applicable reference methods, or an equivalent or alternative method specified in 40 C.F.R. Chapter I, or by a test method specified in the state implementation plan shall not exceed the respective limitations specified herein.

3. To preclude the applicability of 401 KAR 52:020, Title V permits, total source-wide emissions of NOx ~~CO and PM_{10}~~ from all emission units and insignificant activities shall not exceed 90 tons per year during any twelve consecutive months. The annual emissions shall be calculated by adding monthly emission to the previous eleven months' emissions. To demonstrate compliance with these emission limitations, the twelve-month rolling total shall be calculated monthly and reported semi-annually (See **Section F – Monitoring, Recordkeeping, and Reporting Requirements**). The permittee shall maintain onsite, available for review by the Division, a log of the 12-month rolling total.

NOx Compliance Demonstration Method

Monthly NOx emissions shall be calculated using the following formulas:

Source-Wide NOx Emissions:

$$NOx_{Total}\left(\frac{tons}{month}\right) = \sum_{n=1}^{6} NOx_n\left(\frac{tons}{month}\right)$$

Placeholders for unit specific NOx emission formulas

~~*CO Compliance Demonstration Method:*~~
~~Monthly CO emissions shall be calculated using the following formulas:~~

~~Source-Wide CO Emissions:~~

$$CO_{Total}\left(\frac{tons}{month}\right) = \sum_{n=1}^{6} CO_n\left(\frac{tons}{month}\right)$$

~~EU01/02 Wood-Fired Boilers CO Emissions (n = 1):~~

$$CO_1\left(\frac{tons}{month}\right) = \frac{EF\ \left(\frac{lbs}{1\ ton}\right) \times Wood\ Usage\ \left(\frac{tons}{1\ month}\right)}{2000\ \frac{lbs}{ton}}$$

~~$EF_1 = 9.24 \frac{lbs}{ton}$ of current CO emission factor from AP-42, Table 1.6-2~~

~~Note: AP-42 EF in $(\frac{lbs}{MMBtu})$ and converts using the following formula:~~

$$~~AP-42\ EF\ (\frac{lbs}{ton}) = \frac{AP-42\ EF(\frac{lbs}{MMBtu}) \times 7700 \frac{Btu}{lb} \times 2000 \frac{lbs}{ton}}{10^6 \frac{Btu}{MMBtu}}~~$$

~~At 11% moisture content, $HHV = 7700 \frac{Btu}{lb}$ (provided by the facility)~~

SECTION D - SOURCE EMISSION LIMITATIONS AND TESTING REQUIREMENTS (CONTINUED)

EU-05 Drying Chamber CO Emissions (n = 2):

$$CO_2\left(\frac{tons}{month}\right) = \frac{EF_2\left(\frac{lbs}{MMscf}\right) \times NG\ Usage_2\left(\frac{MMscf}{month}\right)}{2000\frac{lbs}{ton}}$$

$EF_2 = 84\frac{lbs}{MMscf}$ or current CO emission factor from AP-42, Table 1.4-1

Hours of operation shall not exceed 6,000 hours during any twelve consecutive months.

EU-011 Heading Char – Wood Combustion CO Emissions (n = 3):

$$CO_3\left(\frac{tons}{month}\right) = \frac{EF_3\left(\frac{lbs}{ton}\right) \times Wood\ Usage_3\left(\frac{tons}{month}\right)}{2000\frac{lbs}{ton}}$$

$EF_3 = EF_1 = 9.24\frac{lbs}{ton}$ or current CO emission factor from AP-42, Table 1.6-2

Note: AP-42 EF in $\left(\frac{lbs}{MMBtu}\right)$ and converts using the following formula:

$$AP-42\ EF\left(\frac{lbs}{ton}\right) = \frac{AP-42\ EF\left(\frac{lbs}{MMBtu}\right) \times 7700\frac{Btu}{lb} \times 2000\frac{lbs}{ton}}{10^6\frac{Btu}{MMBtu}}$$

At 11% moisture content, $HHV = 7700\frac{Btu}{lb}$ (provided by the facility)

Hours of operation shall not exceed 6,000 hours during any twelve consecutive months.

Upon completion of the performance test and approval by the Division, the permittee shall use the new emission factor (in lbs/head) to calculate CO emissions for EU-011 Heading Char. The new emission factor will include CO emissions from wood combustion and head charring (EU-011-1 and EU-011-2).

If the permittee chooses to only test EU-012, upon completion of the CO performance test on EU-012 and approval by the Division, the permittee shall derive a new emission factor (in lbs/head) for EU-011 using engineering calculations. The new emission factor shall replace EF_3 and will include CO emissions from both the wood combustion and head charring (EU-011-1 and EU-011-2).

EU-012-1 Stave Char – Wood Combustion CO Emissions (n = 4):

$$CO_4\left(\frac{tons}{month}\right) = \frac{EF_4\left(\frac{lbs}{ton}\right) \times Wood\ Usage_4\left(\frac{tons}{month}\right)}{2000\frac{lbs}{ton}}$$

SECTION D - SOURCE EMISSION LIMITATIONS AND TESTING REQUIREMENTS (CONTINUED)

$EF_4 = EF_3 = EF_1 = 9.24 \frac{lbs}{ton}$ or current CO emission factor from AP-42, Table 1.6-2

Note: AP-42 EF in $(\frac{lbs}{MMBtu})$ and converts using the following formula:

$$AP-42\ EF\ (\frac{lbs}{ton}) = \frac{AP-42\ EF(\frac{lbs}{MMBtu}) \times 7700 \frac{Btu}{lb} \times 2000 \frac{lbs}{ton}}{10^6 \frac{Btu}{MMBtu}}$$

At 11% moisture content, $HHV = 7700 \frac{Btu}{lb}$ (provided by the facility)

Hours of operation shall be no more than 1,752 hours during any twelve consecutive months due to the inherent design of the process.

Upon completion of the performance test and approval by the Division, the permittee shall use the new emission factor (in lbs/barrel) to calculate the CO emissions for EU-012 Stave Char. The new emission factor will include CO emissions from wood and natural gas combustion (EU-012-1 & EU-012-2).

EU-012-2 Stave Char – NG Combustion CO Emissions (n = 5):

$$CO_5(\frac{tons}{month}) = \frac{EF_5(\frac{lbs}{MMscf}) \times NG\ Usage_5(\frac{MMscf}{month})}{2000 \frac{lbs}{ton}}$$

$EF_5 = EF_2 = 84 \frac{lbs}{MMscf}$ or current CO emission factor from AP-42, Table 1.4-1

Hours of operation shall be no more than 1,676 hours during any twelve consecutive months due to the inherent design of the process.

Upon completion of the performance test and approval by the Division, the permittee shall no longer be required to include EU-012-2 Stave Char Natural Gas Combustion in the calculation of the monthly source-wide CO emissions.

EU-16 Natural Gas-Fired Boiler CO Emissions (n = 6):

$$CO_6(\frac{tons}{month}) = \frac{EF_6(\frac{lbs}{MMscf}) \times NG\ Usage_6(\frac{MMscf}{month})}{2000 \frac{lbs}{ton}}$$

$EF_6 = EF_5 = EF_2 = 84 \frac{lbs}{MMscf}$ or current CO emission factor from AP-42, Table 1.4-1

SECTION D - SOURCE EMISSION LIMITATIONS AND TESTING REQUIREMENTS (CONTINUED)

~~*PM_{10} (PM) Compliance Demonstration Method:*~~

~~Source-Wide PM Emissions:~~

$$PM_{Total}\left(\frac{tons}{month}\right) = \sum_{m=1}^{29} PM_m\left(\frac{tons}{month}\right)$$

~~EU01/02 Wood-Fired Boilers PM Emissions (m = 1):~~

$$PM_1\left(\frac{tons}{month}\right) = \frac{EF\ \left(\frac{lbs}{ton}\right) \times Wood\ Usage\ \left(\frac{tons}{month}\right)}{2000\frac{lbs}{ton}}$$

$EF_1 = 5.544\frac{lbs}{ton}$ or current PM emission factor from AP-42, Table 1.6-1

Note: AP-42 EF is in $\left(\frac{lbs}{MMBtu}\right)$ and converts using the following formula:

$$AP-42\ EF\left(\frac{lbs}{ton}\right) = \frac{AP-42\ EF\left(\frac{lbs}{MMBtu}\right) \times 7700\frac{Btu}{lb} \times 2000\frac{lbs}{ton}}{10^6\frac{Btu}{MMBtu}}$$

At 11% moisture content, $HHV = 7700\frac{Btu}{lb}$ (provided by the facility)

~~EU-03A, 03C, 03E, 04, & 07 Existing Silos and Stave/Heading Processes PM Emissions:~~

$$PM_m\left(\frac{tons}{month}\right) = \frac{EF\ \left(\frac{lbs}{ton}\right) \times Throughput\ \left(\frac{tons}{month}\right) \times (1 - Control\ Eff\ )_m}{2000\frac{lbs}{ton}}$$

The following emission factors (EFs) and control efficiencies shall be used:

m	Facility ID	EF (lbs/ton)	Control Efficiency
2	EU-03A-3	2.1	0.99
3	*EU-03C-1**	*2.1*	*0.99*
4	*EU-03C-2***	*2.1*	*0.99*
5	EU-03C-3	2.1	0.99
6	EU-03E-1	1.0	0.99
7	EU-03E-2	1.0	0.99
8	EU-04-1	3.0	0.95
9	EU-04-2	3.0	0.95
10	EU-04-3	2.1	0.95
11	EU-07-1	1.0	0.99
12	EU-07-2	1.0	0.99

*The emission unit "EU-03C-1 Heading Jointers" was removed and replaced with "EU-03D-6 Heading Joiners" during permit F-20-032 R1. The unit was replaced in a "one-in-one-out" fashion, meaning no simultaneous operation occurred.

SECTION D - SOURCE EMISSION LIMITATIONS AND TESTING REQUIREMENTS (CONTINUED)

**The emission unit "EU-03C-2 Heading Rounders" was removed and replaced with "EU-03D-7 Heading Rounders" during permit F-20-032 R1. According to KY Cooperage, the installation requires a transitional stage where both units will be operating simultaneously. After the transitional stage is complete, EU-03C-2 will be removed from the facility.

EU-03B, 03D, and 03F New Stave/Heading Processes PM Emissions:

$$PM_m\left(\frac{tons}{month}\right) = \frac{EF_m\left(\frac{lbs}{ton}\right) \times Wood\ Throughput_m\left(\frac{tons}{month}\right) \times (1 - 0.99)}{2000\frac{lbs}{ton}}$$

The following emission factors (EFs) shall be used:

m	Facility ID	EF (lbs/ton)
13	EU-03B-1	2.1
14	EU-03B-2	2.1
15	EU-03D-1	2.1
16	EU-03D-2	2.1
17	EU-03D-3	2.1
18	EU-03D-4	2.1
19	EU-03D-5	2.1
20	EU-03F-1	1.0
3	EU-03D-6*	2.1
4	EU-03D-7**	2.1

*The emission unit "EU-03C-1 Heading Joiners" was removed and replaced with "EU-03D-6 Heading Joiners" during permit F-20-032 R1.
**The emission unit "EU-03C-2 Heading Rounders" was removed and replaced with "EU-03D-7 Heading Rounders" during permit F-20-032 R1.

EU-05 Drying Chamber PM Emissions (m = 21):

$$PM_{21}\left(\frac{tons}{month}\right) = \frac{EF_{21}\left(\frac{lbs}{MMscf}\right) \times NG\ Usage_{21}\left(\frac{MMscf}{month}\right)}{2000\frac{lbs}{ton}}$$

$EF_{21} = 7.6\frac{lbs}{MMscf}$ or current PM_{10} emission factor from AP-42, Table 1.4-2

Hours of operation shall not exceed 6,000 hours during any twelve consecutive months.

EU-011-1 Heading Char – Wood Combustion PM Emissions (m = 22):

SECTION D - SOURCE EMISSION LIMITATIONS AND TESTING REQUIREMENTS (CONTINUED)

$$PM_{22}\left(\frac{tons}{month}\right) = \frac{EF_{22}\left(\frac{lbs}{ton}\right) \times Wood\ Usage_{22}\left(\frac{tons}{month}\right)}{2000\frac{lbs}{ton}}$$

$EF_{22} = EF_1 = 5.544\frac{lbs}{ton}$ or current PM_{10} emission factor from AP-42, Table 1.6-1

Note: AP-42 EF in $\left(\frac{lbs}{MMBtu}\right)$ and converts using the following formula:

$$AP-42\ EF\left(\frac{lbs}{ton}\right) = \frac{AP-42\ EF\left(\frac{lbs}{MMBtu}\right) \times 7700\frac{Btu}{lb} \times 2000\frac{lbs}{ton}}{10^6\frac{Btu}{MMBtu}}$$

At 11% moisture content, $HHV = 7700\frac{Btu}{lb}$ (provided by the facility)

Hours of operation shall not exceed 6,000 hours during any twelve consecutive months.

EU-012-1 Stave Char – Wood Combustion PM Emissions (m = 23):

$$PM_{23}\left(\frac{tons}{month}\right) = \frac{EF_{23}\left(\frac{lbs}{ton}\right) \times Wood\ Usage_{23}\left(\frac{tons}{month}\right)}{2000\frac{lbs}{ton}}$$

$EF_{23} = EF_{22} = EF_1 = 5.544\frac{lbs}{ton}$ or current PM_{10} EF from AP-42, Table 1.6-1

Note: AP-42 EF in $\left(\frac{lbs}{MMBtu}\right)$ and converts using the following formula:

$$AP-42\ EF\left(\frac{lbs}{ton}\right) = \frac{AP-42\ EF\left(\frac{lbs}{MMBtu}\right) \times 7700\frac{Btu}{lb} \times 2000\frac{lbs}{ton}}{10^6\frac{Btu}{MMBtu}}$$

At 11% moisture content, $HHV = 7700\frac{Btu}{lb}$ (provided by the facility)

Hours of operation shall be no more than 1,752 hours during any twelve consecutive months due to the inherent design of the process.

Upon completion of the performance test and approval by the Division, the permittee shall use the new emission factor (in lbs/ton) to calculate the PM emissions for EU-012 Stave Char. The new emission factor will include PM emissions from EU-012-1 Wood Combustion, EU-012-2 Natural Gas Combustion, and EU-012-3 Barrel Charring.

EU-012-2 Stave Char – NG Combustion PM Emissions (m = 24):

SECTION D - SOURCE EMISSION LIMITATIONS AND TESTING REQUIREMENTS (CONTINUED)

$$PM_{24}\left(\frac{tons}{month}\right) = \frac{EF_{24}\left(\frac{lbs}{MMscf}\right) \times NG\ Usage_{24}\left(\frac{MMscf}{month}\right)}{2000\frac{lbs}{ton}}$$

$EF_{24} = EF_{21} = 7.6\frac{lbs}{MMscf}$ or current PM_{10} emission factor from AP-42, Table 1.4-2

Hours of operation shall be no more than 1,676 hours during any twelve consecutive months due to the inherent design of the process.

Upon completion of the performance test and approval by the Division, the permittee shall no longer be required to include EU-012-2 Stave Char Natural Gas Combustion in the calculation of the monthly source-wide PM emissions.

EU 13 G5 Process PM Emissions:

$$PM_{m}\left(\frac{tons}{month}\right) = \frac{EF_{m}\left(\frac{lbs}{ton}\right) \times Wood\ Throughput_{m}\left(\frac{tons}{month}\right) \times (1 - 0.999)}{2000\frac{lbs}{ton}}$$

The following emission factors (EFs) shall be used:

m	Facility ID	EF (lbs/ton)
25	EU 13-1	50.65
26	EU 13-2	214.21
27	EU 13-3	261.28
28	EU 13-4	2000

Upon completion of the performance test and approval by the Division, the permittee shall use the new emission factors (in lbs/ton) and the tested baghouse efficiency to calculate the PM emissions for EU 13 G5 Process.

EU 16 Natural Gas-Fired Boiler PM Emissions (m = 29):

$$PM_{29}\left(\frac{tons}{month}\right) = \frac{EF_{29}\left(\frac{lbs}{MMscf}\right) \times NG\ Usage_{29}\left(\frac{MMscf}{month}\right)}{2000\frac{lbs}{ton}}$$

$EF_{29} = EF_{21} = 7.6\frac{lbs}{MMscf}$ or current PM_{10} emission factor from AP-42, Table 1.4-2