A & M Engineering and
Environmental Services, Inc.
Consulting - Design - Construction - Remediation

CHOCTAW DEFENSE
BUILT FOR THE BATTLEFIELD

APPLICATION FOR NEW CONSTRUCTION
MINOR NEW SOURCE REVIEW PROGRAM IN INDIAN COUNTRY

Choctaw Defense – McAlester Facility

Latitude 34.88785 / Longitude -95.77958
3 Skyway Drive, McAlester, OK 74501
Pittsburg County, Oklahoma

A & M Project No. 2209-025

April 28, 2020

Prepared For:

Choctaw Defense
3 Skyway Drive, McAlester, OK 74501
Pittsburg County, Oklahoma
John Uvodich, VP of Manufacturing
Phone: (918) 424-8172
Email: juvodich@choctawdefense.com

April 28, 2020

Mr. John Uvodich
Vice President of Manufacturing
Choctaw Defense
3 Skyway Drive
McAlester, OK 74501

A & M Project No. 2209-025

Phone: (918) 424-8172
Email: juvodich@choctawdefense.com

REF: Application for new construction under the EPA Minor New Source Review (NSR) program in Indian Country for the Choctaw Defense facility at 3 Skyway Drive, McAlester, in Pittsburg County, Oklahoma.

Dear Mr. Uvodich:

A & M Engineering and Environmental Services, Inc. (A & M) has assisted Choctaw Defense (Defense) with preparation of the enclosed Air Quality Permit Application (Application). This Application requests coverage under the EPA Minor NSR Program for the above referenced facility. Two (2) copies of the completed Application must be submitted to the Federal Minor NSR Permit Coordinator.

We appreciate this opportunity to be of service. If you have any questions or require additional assistance, please contact us at (918) 665-6575 or via email.

Respectfully,
A & M Engineering and Environmental Services, Inc.

Jeff Elbert
Director of Compliance
jelbert@aandmengineering.com

Herb Neumann
Environmental Specialist
hneumann@aandmengineering.com

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
FEDERAL MINOR NEW SOURCE REVIEW PROGRAM IN INDIAN COUNTRY
40 CFR 49.151

Application for New Construction

(Form NEW)

Please check all that apply to show how you are using this form:

X Proposed Construction of a New Source

☐ Proposed Construction of New Equipment at an Existing Source

☐ Proposed Modification of an Existing Source

☐ Other – Please Explain

Use of this information request form is voluntary and not yet approved by the Office of Management and Budget. The following is a check list of the type of information that Region 6 will use to process information on your proposed project. While submittal of this form is not required, it does offer details on the information we will use to complete your requested approval and providing the information requested may help expedite the process. Use of application forms for this program is currently under Office of Management and Budget review and these information request forms will be replaced/updated after that review is completed.

Please submit information to following two entities:

Federal Minor NSR Permit Coordinator
U.S. EPA, Region 6
1445 Ross Ave., suite 1200, MS: 6MM-AP
Dallas, TX 75202
R6airpermits@epa.gov

For more information, visit:
https://www.epa.gov/caa-permitting/tribal-nsr-implementation-epas-south-central-region

The Tribal Environmental Contact for the specific reservation:

If you need assistance in identifying the appropriate Tribal Environmental Contact and address, please contact:

R6airpermits@epa.gov

A. GENERAL SOURCE INFORMATION

1. (a) **Company Name** Choctaw Nation Manufacturing, LLC (b) **Operator Name** Choctaw Defense Manufacturing, LLC; Choctaw Defense Munitions, LLC; and Choctaw Manufacturing Defense Contractors	2. **Facility Name** Choctaw Defense – McAlester Facility
3. Type of Operation Manufacturing	4. Portable Source? ☐ Yes X No 5. Temporary Source? ☐ Yes X No
6. NAICS Code 336992	7. SIC Code 3711
8. Physical Address 3 Skyway Drive, McAlester, OK 74501	

9. Reservation N/A	10. County Pittsburg	11a. Latitude 34.88785 N	11b. Longitude 95.77958 W
12a. Quarter Quarter Section NW/4 SE/4	12b. Section 24	12c. Township 5N	12d. Range 14E

B. PREVIOUS PERMIT ACTIONS

There are no existing permits for this facility.

C. CONTACT INFORMATION

Company Contact John Uvodich	Title VP Manufacturing
Mailing Address 3 Skyway Drive, McAlester, OK 74501	
Email Address juvodich@choctawdefense.com	
Telephone Number 918 424-8172	Facsimile Number N/A
Operator Contact Same	Title Same
Mailing Address Same	
Email Address Same	
Telephone Number Same	Facsimile Number Same
Permitting Contact Kathy Lance	Title EHS Coordinator
Mailing Address 3 Skyway Drive, McAlester, OK 74501	
Email klance@ChoctawGlobal.com	
Telephone Number 918 426-2871	Facsimile Number N/A
Compliance Contact Kathy Lance	Title EHS Coordinator
Mailing Address 3 Skyway Drive, McAlester, OK 74501	
Email Address klance@ChoctawGlobal.com	

Telephone Number	Facsimile Number
918 426-2871	N/A

ATTACHMENTS

X FORM SYNMIN - New Source Review Synthetic Minor Limit Request Form, if synthetic minor limits are being requested. See Attachment J.

X Narrative description of the proposed production processes. This description should follow the flow of the process flow diagram to be submitted with this application. See Attachment A.

X Process flow chart identifying all proposed processing, combustion, handling, storage, and emission control equipment. See Attachments B1-B5, which include a site map showing all processes.

X A list and descriptions of all proposed emission units and air pollution-generating activities. See Attachment C.

X Type and quantity of fuels, including sulfur content of fuels, proposed to be used on a daily, annual and maximum hourly basis. See Attachment D.

X Type and quantity of raw materials used or final product produced proposed to be used on a daily, annual and maximum hourly basis. See Attachment E.

X Proposed operating schedule, including number of hours per day, number of days per week and number of weeks per year. See Attachment F (10 hours per day, 5 days per week, 50 weeks per year).

X A list and description of all proposed emission controls, control efficiencies, emission limits, and monitoring for each emission unit and air pollution generating activity. See Attachment G.

X Criteria Pollutant Emissions See Attachment H.

X Air Quality Review See Attachment I.

X ESA (Endangered Species Act) See Attachment I.

X NHPA (National Historic Preservation Act) See Attachment I.

ATTACHMENT A

Narrative description of processes

Choctaw Defense manufactures camel water tank/trailers for the military, various caliber projectiles, and miscellaneous small metal products under military contracts. It also has small non-military contracts with similar processing. Process flows depend on the type of metal used, principally divided among aluminum, carbon steel, and stainless steel. Certain shared equipment, including welding or abrasive blasting, may be used in manufacturing more than one product, and will occur in the process flow of several products. Although mentioned in each process flow, these items are not restricted to a particular process. A site map showing the location of buildings and the location of equipment in each is found in Attachment B1.

TANK/TRAILER PROCESSING

Pre-welded tanks are received at the facility. The stainless interiors are treated before attachment to the trailers. This involves closed circulation consisting of four (4) steps. First, the interior surface is passivated with Avesta passivator 601, then pickled with Avesta pickling bath 302, then cleaned with Avesta Cleaner 401, then rinsed. After each of the passivation, pickling, and rinsing steps, the tank is pressure washed by an Atlantis V-1 unit using reverse osmosis (RO) water to remove any residue from each treatment. The rinse water is neutralized with sodium hydroxide before discharge to the drain. The deck and small parts are blasted with aluminum oxide in the Pauli blast booth and the assembled camelback is surface coated in a Building 7 trailer spray booth. Any needed touchup is applied with a Devilbiss sprayer. A process flow diagram showing this process is given in Attachment B2.

ALUMINUM PARTS PROCESSING

Machined aluminum parts require welding, abrasive blasting, or chromate coating. Parts that require welding first are then either blasted or follow the chromate coating process. Blasting is performed inside the Clemco blast cabinet, using aluminum oxide. The chromate coating process involves a sequence of eight (8) 2,000-gallon tanks, progressing from Oakite 61D, to a rinse, to deoxidizer LNC, to a rinse, to Chemeon TCP-HF, to a rinse, to an empty holding tank, and on to neutralization. Following these eight (8) is a 850-gallon transfer tank. All aluminum parts are then coated in Colmet spray booths, preceded by a preheat. The Colmet primer spray booth is followed by an air dry/flash tunnel. The Colmet topcoat spray booth is also followed by an air dry/flash tunnel, followed by a curing oven. Both spray booths and the oven are located inside Building 7. Additional Colmet spray booths and a curing oven not in current use are located inside Building 6, and can be utilized if necessary. These booths and the trailer booth described later all have Graco AirPro 288939 guns. A process flow diagram showing this process is given in Attachment B3.

PROCESSING OF STAINLESS-STEEL PARTS

Stainless steel parts may be welded, but all are cleaned with Avesta Cleaner 401, passivated with Avesta Passivator 601, and coated using the same equipment described in the preceding discussion of aluminum parts and sent for final assembly. This processing flow is contained within Attachments B2 and B3.

CARBON STEEL PROCESSING

Some carbon steel parts require torch cutting in Building 5. Some fabricated parts require bending or shaping in a press brake. After welding, most parts are either phosphatized or abrasively blasted. Phosphatizing uses eight (8) 6,500-gallon tanks in sequence. The first tank contains Liquid Dynanet, Gardoclean R1700F, and Gardoclean 390LB, and is followed by rinsing in the second tank. The third tank is designated for Garbacid P4462/1 and the fourth is designated for Gardolene VP4430T, but neither the third not fourth tanks are currently used. The fifth tank holds Gardolene V6522. The sixth tank holds Cryscoat, Gardobond additive H7014, and Gardobond H7212, followed by rinsing in a seventh tank. The eighth and final tank holds Gardolene D6871. Those parts requiring blasting are handled by the Clemco blast cabinet or Pauli blast booth using aluminum oxide or by the Goff blast table using steel shot. Parts that have been prepared for coating are then preheated, primed, and topcoated as described previously in the aluminum parts discussion or powder coated. As stated in the aluminum parts discussion, although coating is typically performed in Building 7, coating booths and a curing oven in Building 6 are also available if needed. Powder coating will use the Building 6 booths and curing oven, but the filters will be configured slightly differently. Specific parts are neither phospatized or blasted, but pressure washed using the Buffalo Series power washer. A process flow diagram showing these processes is given in Attachment B4.

CENTERFIRE PROCESSING

Projectiles are manufactured inside the Centerfire room, starting with lead wire that is cut to the appropriate length by a header. These lead pieces are tumbled in mica with a small amount of mineral spirits and sent to a projectile press. Brass coil is fed into the press, which cuts and shapes it into a casing and inserts the lead core into the casing. This cased core is then washed, degreased and dried. There are four (4) lines of headers, tumblers, and presses, to accommodate the various calibers involved. Water from the final wash is sent to one of two (2) evaporators and the remaining sludge is shipped offsite for disposal. The evaporators operate at 220^{o} F, the EMC at a heat rate of 0.285 MMBTUH and the Poly Products at a heat rate of 0.550 MMBTUH. A process flow diagram showing this process is given in Attachment B5.

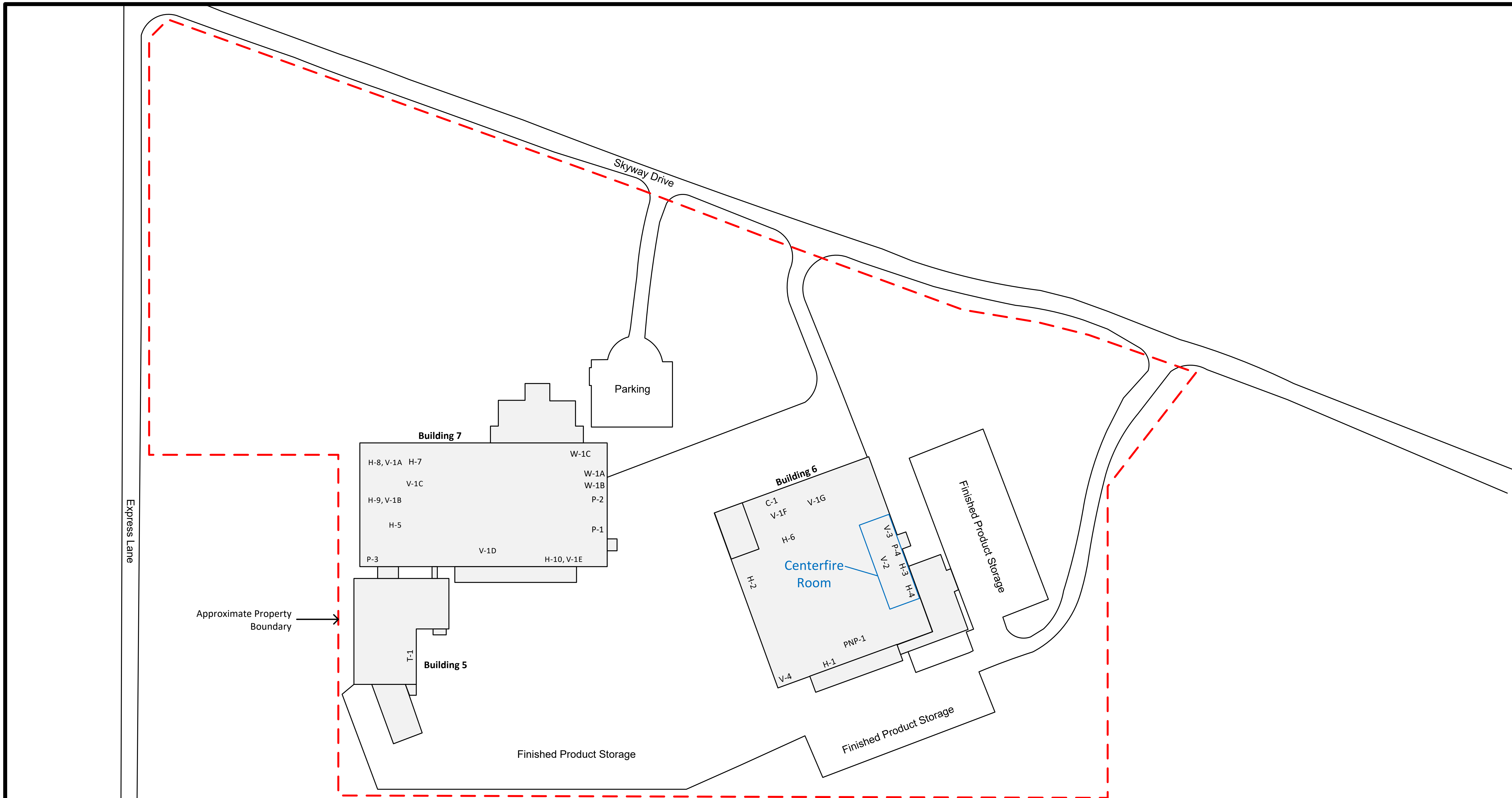
provide a conservatively high estimate of these unlikely emissions, the facility assumes that 1% of all pickling fluids is emitted and that the tanks are subject to one turnover per month. These assumptions result in 0.15 TPY of HF emissions.

Lead

The only source for emissions of lead is through the three fan-powered vents. Method 12 testing was performed during periods of full operation. Adding the average hourly rates for each vent and expanding to continuous operation yields 8.73×10^{-4} TPY. For the conservatively largest value, adding the highest values for each hourly rate and assuming continuous operation yields 1.12×10^{-3} TPY, or approximately two pounds of lead emissions annually.

Attachment B
Site Map and Process Flow Diagrams

- Attachment B-1 Site Map
- Attachment B-2 Camelback Trailer Processing Line
- Attachment B-3 Aluminum Parts Processing Line
- Attachment B-4 Carbon Steel Processing Line
- Attachment B-5 Centerfire Processing Line



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Legend

Property Boundary

H-1	Atlantis V-1 Pressure Washer	V1-C	Coating Emissions Building 7 Touch-up	W-1B	Robotic Welder
H-2	Easy Kleen Pressure Washer	V1-D	Coating Emissions Building 7 Touch-up	W-1C	Manual Welding
H-3	Water Eater Evaporator	H-10, V1-E	Coating Emissions Building 7 Trailer Booth	P-1	Clemco Blast Cabinet
H-4	Poly Products Evaporator	V1-F	Coating Emissions Building 6 Primer and Topcoat Booth	P-2	Goff Blasting Table
H-5	Building 7 Cure Oven	V1-G	Coating Emissions Building 6 Touch-up Booth	P-3	Building 7 Pauli Blast Booth
H-6	Building 6 Cure Oven	V-2	Mineral Spirits	P-4	Centerfire Processing Room Vents
H-7	Preheater	V-3	Parts Washer	T-1	ESAB Plasma Torch
H-8,V-1A	Coating Emissions Building 7 Primer Booth	V-4	Parts Washer	C-1	Trivalent Chromium Plating
H-9, V1-B	Coating Emissions Building 7 Topcoat Booth	W-1A	Robotic Welder	PNP-1	Pickling and Passivation

N

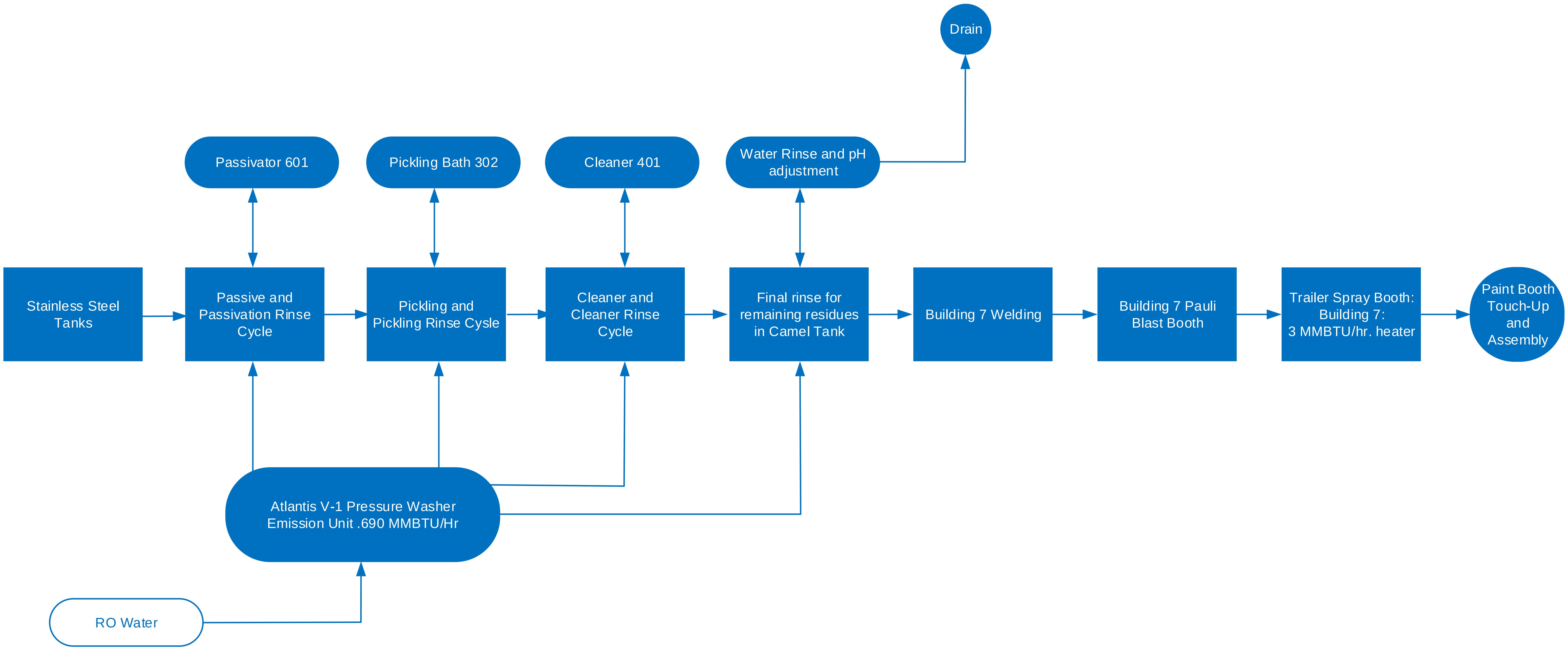
Print In Color

Facility Site Map

Choctaw Defense Manufacturing, LLC

3 Skyway Drive
McAlester, Oklahoma 74501

Figure B-1	January 20, 2020	**2209-025**



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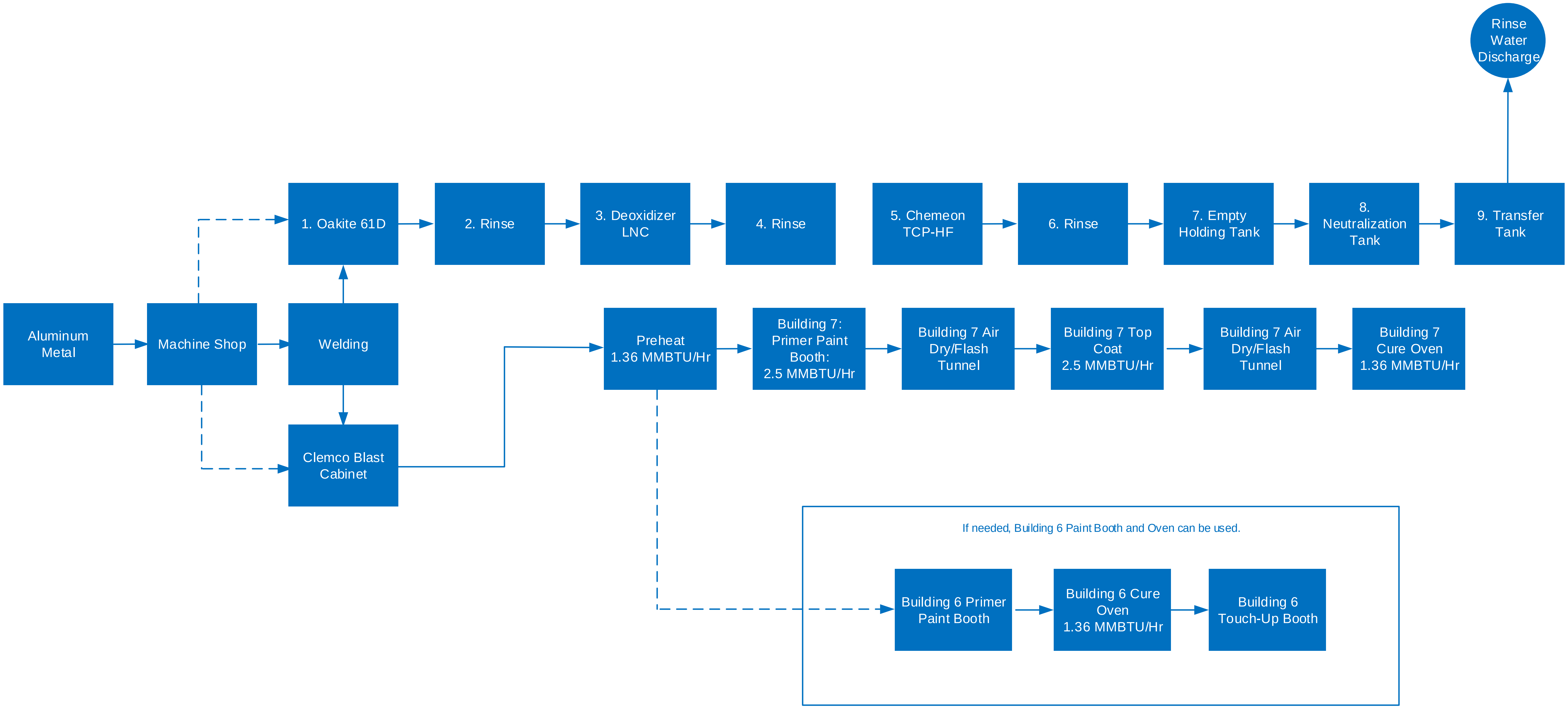
Camelback Trailer Processing Line		
Choctaw Defense		
3 Skyway Drive McAlester, Oklahoma 74501		
Attachment B-2	January 16, 2020	**2209-025**



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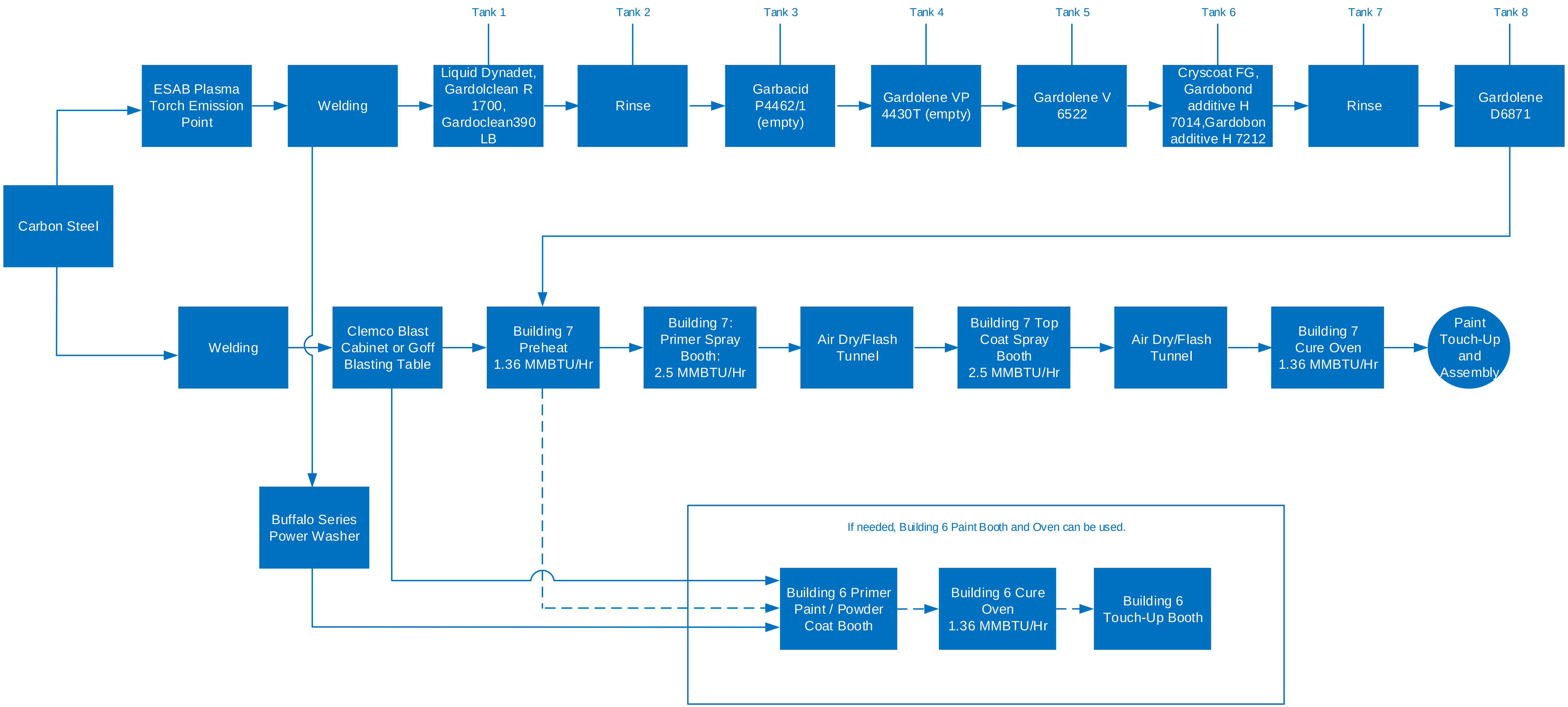
Aluminum Parts Processing Line		
Choctaw Defense		
3 Skyway Drive McAlester, Oklahoma 74501		
Attachment B-3	January 16, 2020	**2209-025**



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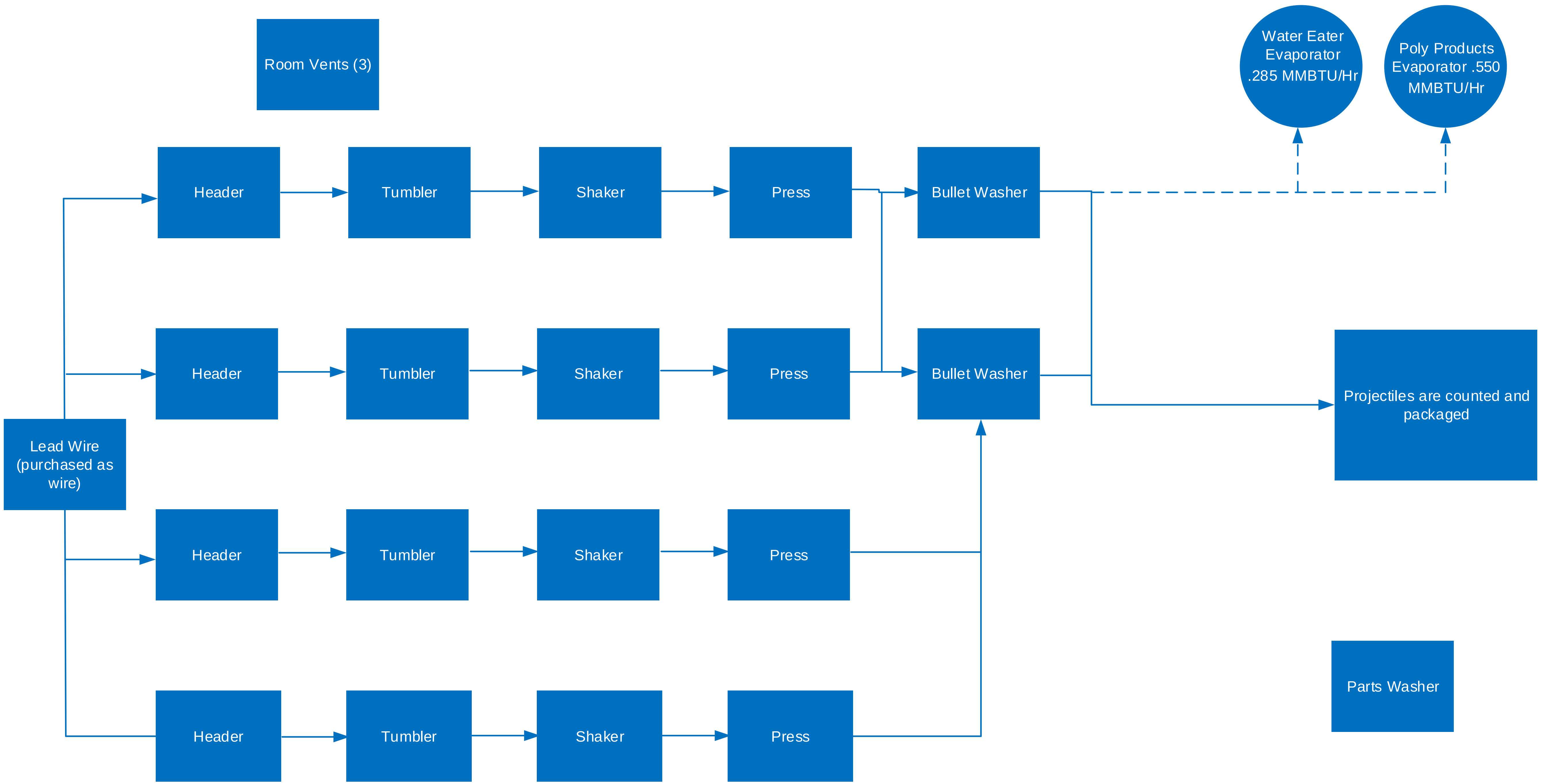
Carbon Steel Processing Line		
Choctaw Defense		
3 Skyway Drive McAlester, Oklahoma 74501		
Attachment B-4	January 16, 2020	**2209-025**



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Centerfire Processing Line

Choctaw Defense

3 Skyway Drive
McAlester, Oklahoma 74501

Attachment B-5	January 16, 2020	**2209-025**

ATTACHMENT C

DESCRIPTIONS OF PROCESSING UNITS AND AIR POLLUTION GENERATING ACTIVITIES

AND APPLICABILITY OF NSPS AND NESHAP SUBPARTS

EMISSION POINTS

Attachment references are to the appropriate process flow diagram. Locations of the various emission points are identified on the site map in attachment B. Manufacturers' information, especially as to control devices, may be found in Attachment K.

H-1 Atlantis V-1 power washer natural gas-fired rated at .650 MMBTUH (Attachment B2)

H-2 Buffalo Series power washer natural gas-fired rated at .390 MMBTUH (Attachment B2)

H-3 EMC evaporator natural gas-fired rated at .285 MMBTUH. Combustion emissions exit the facility through an 8" diameter stack at 16 feet above grade. (Attachment B5)

H-4 Poly Products evaporator natural gas-fired rated at .550 MMBTUH. Combustion emissions exit the facility through a 10" diameter stack at 16 feet above grade. (Attachment B)

H-5 Building 7 curing oven heater natural gas-fired rated at 1.36 MMBTUH (Attachments B3 & B4)

H-6 Building 6 curing oven heater natural gas-fired rated at 1.36 MMBTUH (Attachments B3 & B4)

H-7 Building 7 coating line preheater natural gas-fired rated at 1.36 MMBTUH (Attachments B3 & B4)

H-8 Building 7 primer booth heater natural gas-fired rated at 2.5 MMBTUH (Attachments B3 & B4)

H-9 Building 7 topcoat booth heater natural gas-fired rated at 2.5 MMBTUH (Attachments B3 & B4)

H-10 Trailer spray booth heater natural gas-fired rated at 3 MMBTUH (Attachment B2)

C-1 Chemeon 2,000-gallon tank #5 in chromate process (Attachment B3)

P-1 Clemco blast cabinet, using aluminum oxide at a rate of 1000 pounds per hour, with a reverse pulse canister filter rated at 99.5% (Attachments B3 & B4)

P-2 Goff 60TB/1616DC blast table, using steel shot at 1000 pounds per hour, with a reverse pulse canister filter rated at 99.9% (Attachment B4)

P-3 Pauli blast booth, using aluminum oxide at a rate of 1000 pounds per hour, with a reverse pulse canister filter rated at 99% (Attachment B2)

P-4 Lead emissions from equipment items in the Centerfire room, released through three vent fans. The vents are described fully in the attached Air Hygiene Method 12 test results. (Attachment B5)

PNP-1Chemeon cleaning line

T-1 ESAB Combirex plasma cutter in Building 5 (Attachment B1)

V-1 Coating emissions at the trailer booth, a topcoat booth, a primer booth, and two (2) touchup locations in Building 7, as well as a primer booth and a touchup booth in Building 6. All booths are manufactured by Colmet (model numbers TCC-201526-PDT and TDD-211526-PDT) and have triple layer filters, consisting of a primary layer of Poly Panel rated at 30% efficiency, a secondary layer of E.P. Red with 99.5% efficiency, and a tertiary layer of E.P. Green with 99.74% efficiency. Touchup in Building 7 does not occur in a booth. All spray guns are Graco AirPro 288939 guns, except for the trailer touchup, which is performed with a Devilbiss sprayer. Note that when the Building 6 booths are used for powder coating, they will have two filter layers, a FiberBond EP GXG double layer bag with 90% efficiency and an E.P. Red filter rated at 99.5% efficiency. (Attachments B2, B3, & B4)

V-2 Emissions of mineral spirits from the projectile tumblers through three fan-powered vents in the Centerfire room. (Attachment B5)

V-3 Emissions of mineral spirits from 20-gallon parts washer through three fan-powered vents in the Centerfire room. (Attachment B5)

V-4 Emissions of mineral spirits from 20-gallon parts washer, not for a specific process line (Attachment B1)

W-1 Welding is performed by two robotic units and by manual welding for processes in Building 7. (Attachments B2, B3, & B4)

There are four emission sources that are exempt per 40 CFR 49.153(c), including:

a portable gasoline-fired air compressor (mobile) per paragraph 1;

a natural gas-fired emergency generator per paragraph 9;

less than 10 MMBTUH of combined natural gas-fired comfort heating per paragraph 11(iii);

and air conditioning per paragraph 12.

Spray coating at V-1 is potentially subject to four NESHAP Subparts.

IIII Surface Coating of Automobiles and Light Trucks. The facility coats trailers for the military. Although these do not fit the specific identification of automobiles or trucks, the facility is not a major source of HAP, so IIII is not applicable.

MMMM Surface Coating of Miscellaneous Parts and Products. Regardless of the various products coated, the facility is not a major source of HAP, so MMMM is not applicable.

HHHHHH Paint Stripping and Miscellaneous Surface Coating Operations at Area Sources. Some of the coating products contain target HAP in excess of the thresholds in this subpart, so the facility is subject to the requirements of 6H.

XXXXXX Area Source Standards for Nine Metal Fabrication and Finishing Source Categories. The facility SIC Code is 3711 and its NAICS Code is 336992, so the facility is not one of the nine affected source categories and is not subject to 6X.

Chemical processes at C-1 are potentially subject to one NESHAP Subpart.

WWWWWW Area Source Standards for Plating and Polishing Operations. Material Safety Data Sheets for all products used in chemical treatment lines certify carcinogen density less than 0.1%, so the facility is not subject to 6W per 40 CFR 63.11505(d)(6).

The permit-exempt emergency generator is potentially subject to NSPS and NESHAP Subparts.

NSPS Subpart JJJJ Stationary Spark Ignition Internal Combustion Engines. The gasoline-fired emergency generator engine was manufactured in 2006 and is not subject to the requirements of this subpart.

NESHAP Subpart ZZZZ Stationary Spark Ignition Internal Combustion Engines. The gasoline-fired emergency generator engine was manufactured in 2006 and is not subject to the requirements of this subpart.

ATTACHMENT D

FUELS

Excepting equipment listed in Attachment C as exempt, no fuel is used. All equipment is powered electrically.

ATTACHMENT E

RAW MATERIALS USED

The facility processes raw materials for manufacturing tanks and ammunition, as well as for smaller defense contracts on an as-needed basis. Although the facility currently operates ten hours per day, four days per week, and 50 weeks per year, estimates of actual production are based on ten hours per day, five days per week, and 50 weeks per year. The following table reflects these operating characteristics.

Material	Maximum lb/hr	Average lb/day	Anticipated tons/year
Carbon steel	120	2,600	325
Stainless steel	500	5,000	625
Aluminum	140	700	87.5
Lead	200	2,000	2250
Brass	260	2,600	325

ATTACHMENT F

PROPOSED OPERATING SCHEDULE

The facility proposes to operate 10 hours per day, 5 days per week, and 50 weeks per year, except for the Centerfire process, which will operate 24 hours per day, 5 days per week, and 50 weeks per year.

ATTACHMENT G

EMISSION CONTROLS, EFFICIENCIES, LIMITS, AND MONITORING

P-1 Clemco blast cabinet, using aluminum oxide at a rate of 1000 pounds per hour, with a reverse pulse canister filter rated at 99.5%

P-2 Goff 60TB/1616DC blast table, using steel shot at 1000 pounds per hour, with a reverse pulse canister filter rated at 99.9%

P-3 Pauli blast booth, using aluminum oxide at a rate of 1000 pounds per hour, with a reverse pulse canister filter rated at 99%

P-1, P-2, and P-3 standards include pressure drop measurements to be taken at least once each day the equipment is used. According to manufacturers, pressure drop should not exceed six (6) inches of water column. The blasters have cartridges that should be inspected at least once a month to check for any caking that may not have been removed by reverse pulsing. If pressure drop exceeds six (6) inches and after any other measures fail to restore the pressure drop to a reading below 6", the filter shall be replaced. A complementary control requires that hours of booth shall also be recorded each day that each piece of equipment is in use. The canister filter shall be replaced when hours of operation reach 2,500 hours, regardless of pressure drop.

V-1 Spray coating emissions at the trailer booth V-1E, the topcoat booth V-1B, and the primer booth V-1A in Building 7, as well as the primer/topcoat booth V-1F and the touchup booth V-1G in Building 6 are controlled by filters. All booths are manufactured by Colmet (model numbers TCC-201526-PDT and TDD-211526-PDT) and all but V-1E have triple layer filters, consisting of a primary layer of Poly Panel rated at 30% efficiency, a secondary layer of E.P. Red with 99.5% efficiency, and a tertiary layer of E.P. Green with 99.74% efficiency. V-1E has a double layer, consisting of E.P. Red and a Poly Panel. Note that when the Building 6 booths are used for powder coating, they will have two filter layers, a FiberBond EP GXG double layer bag with 90% efficiency and an E.P. Red filter rated at 99.5% efficiency.

V-1 (E, A, B, F, G) standards include pressure drop measurements to be taken at least once each day the equipment is used. Pressure drop should range between one (1) and four (4) inches of water column, with no reading to exceed five (5) inches. When fresh filters are in place, the booth may be operated until pressure drop approaches five (5) inches. Before that level is reached, the primary layer (Poly) shall be replaced. Measurements shall continue as above, but when the level again approaches five (5) inches, all three layers of filters, primary, secondary, and tertiary, shall be replaced.

ATTACHMENT H

EMISSIONS CALCULATIONS

Spray painting

Emissions of VOC and PM from spray painting are based on usage of each coating product along with the characteristics of each product. Characteristics of the products used follow. Concentrations of each pollutant are based on stated factors or the highest level of any pollutant for which a band of values is stated. Where water or other exempt solvents are not identified as such on the data sheets, liquids are assumed to be VOC, yielding conservatively high numbers.

Coating	Pounds per gallon						
	VOC	PM_{10}	Co cmpds	Cr III	HDI	Xylene	Cumene
Epoxy primer (white)	0.716	11.218					
Epoxy primer catalyst	7.094	0					
Green polyurethane	1.01	10.006	1.212	1.271			
Tan polyurethane	1.05	9.215	0.7	0.7			
Urethane catalyst	8.846	0			.027		
Zinc rich primer	3.370	24.253				0.608	
Zinc primer catalyst	7.427	0				0.817	0.178

Emission calculations assume that all VOC is emitted, that overspray is 50%, and that filter efficiency is 98%, although the triple filter efficiency is rated at 99.75%, thus assuring conservatively high results. The following table presents emissions based on actual coating usage over a period of 12 months.

Coating	Gallons	TPY						
		VOC	PM_{10}	Co cmpds	Cr III	HDI	Xylene	Cumene
Epoxy primer (white)	1016	0.364	0.057	-	-	-	-	-
Epoxy primer catalyst	877	3.111	-	-	-	-	-	-
Green polyurethane	878	0.443	0.044	0.005	0.006	-	-	-
Tan polyurethane	174	0.091	0.008	0.001	0.001	-	-	-
Urethane catalyst	441.5	1.953	-	-	-	0.006	-	-
Zinc rich primer	36	0.061	0.004	-	-	-	0.011	-
Zinc primer catalyst	9	0.033	-	-	-	-	0.004	0.001
Totals	3431.5	6.056	0.113	0.006	0.007	0.006	0.015	0.001

Potential to emit (PTE) could be calculated based on spray rates, but this ignores the fact that coating is restricted by the amount of product manufactured. Because the preceding table reflects single shift operations, a reasonable estimated of PTE may be calculated by inflating the totals to represent continuous operation, or 8,760 hours per year. The resulting numbers were adjusted upwards to reflect a conservatively high requested compliance limit of 15,000 gallons per year. Doing so yields PTE values as follow.

Gallons	TPY						
	VOC	PM10	Co cmpds	Cr III	HDI	Xylene	Cumene
15,000	26.472	0.494	0.026	0.030	0.026	0.065	0.003

Note that even if all the increase were to occur in the coating with the highest as-applied VOC content, the net change in total VOC emissions would be less than one (1) TPY. Similarly, to emit as much as one (1) TPY of any individual HAP would require an increase of nearly 20-fold in the use of any coating system.

In the absence of filter controls, PM emissions are much higher. Without the detailed analysis for each coating product, but continuing to assume 50% overspray, the annual and TPY totals for PM and PM HAPs follow.

	TPY		
	PM_{10}	Co cmpds	Cr III
Annual	5.880	0.307	0.321
Uncontrolled PTE	24.763	1.294	1.352

Powder Coating

There is no organic solvent involved in powder coating, so particulate matter is the only emission to consider. The facility estimates a maximum of 400 parts to be coated each month, with a maximum of four (4) pounds per part. To obtain conservatively high results, transfer efficiency is assumed to be only 90% and the combined efficiencies of all filters is assumed to be only 98%, so that

4 lbs/part × 400 parts/month × 12 months per year × 1 ton/2000 lbs × (1-0.9) × (1-0.98) = 0.019 TPY of PM_{10}.

Because this calculation assumes 2,500 hours of operation per year, PTE may be calculated by assuming continuous operation, for 0.067 TPY of PM_{10}.

Welding

Choctaw Defense has two robotic welders and one manual welding station, using five types of wire or rod. The most severe characteristics of each, as well as the highest emission rates indicated by AP-42 Tables 12.19-1 and -2 are used to evaluate the total of all 5,251 pounds used for one year. PTE is calculated as in the spray-painting calculations above, by inflating to continuous operations over 2,500 of expected annual hours.

	PM	Manganese	Chromium III	Beryllium	Nickel
Characteristics	24.1 lb/1000 lb	2.1%	0.2%	0.0003%	0.15%
Actual (TPY)	0.063	0.001	<0.001	<0.001	<0.001
PTE (TPY)	0.221	0.0047	0.0005	<0.0001	0.0004

Blasting

Calculations of PTE for each piece of blasting equipment assumes continuous operation at 1000 pounds per hour, with no control devices. Emission factors from AP-42 13.2.6-1 yield the following.

Source	Throughput Lb/year	Emission factor Lb/lb	$PM_{2.5}$ TPY	Emission factor Lb/lb	PM_{10} TPY
Booth	8,760,000	0.0013	5.694	0.013	56.940
Table	8,760,000	0.0013	5.694	0.013	56.940
Cabinet	8,760,000	0.0013	5.694	0.013	56.940
Totals	26,280,000		17.082		170.820

Actual emissions are estimated by assuming a maximum of 2,500 hours per year for each piece of equipment and utilizing manufacturers' control efficiency, coupled with AP-42 factors as above.

Source	Throughput Lb/year	Control efficiency %	Emission factor Lb/lb	$PM_{2.5}$ TPY	Emission factor Lb/lb	PM_{10} TPY
Booth	2,500,000	99	0.0013	0.057	0.013	0.569
Table	2,500,000	99.9	0.0013	0.006	0.013	0.057
Cabinet	2,500,000	99.5	0.0013	0.028	0.013	0.285
Totals	7,500,000			0.091		0.911

Power washers

Emissions from two natural gas-fired power washers, identified as Atlantis rated at 0.650 MMBTUH and Buffalo rated at 0.390 MMBTUH are calculated using factors from AP-42 Tables 1.4-1 and -2. These emission factors imply a heat content of 1020 BTU/CF. Because each unit is small, emission totals are combined. Estimated annual totals assume a conservatively high use of 2,500 hours per year, while PTE totals assume continuous use.

Pollutant	EF (Lb/MMSCF)	Emissions (Lb/hr)	Annual Emissions (TPY)	PTE (TPY)
NO_X	100	0.102	0.127	0.447
CO	84	0.086	0.107	0.375
VOC	5.5	0.006	0.007	0.025
$PM_{10}/PM_{2.5}$	7.6	0.008	0.010	0.034
SO_2	0.6	<.001	0.001	0.003
CO_2	120,000	122	153	536
CH_4	2.3	0.002	0.003	0.010
n-Hexane	1.8	0.002	0.002	0.008
N_2O	2.2	0.002	0.003	0.010

Evaporators

Emissions from two natural gas-fired evaporators, identified as EMC rated at 0.285 MMBTUH and Poly Products rated at 0.550 MMBTUH are calculated using factors from AP-42 Tables 1.4-1 and -2. These emission factors imply a heat content of 1020 BTU/CF. Because each unit is small, emission totals are combined. Estimated annual totals assume a conservatively high use of 6,000 hours per year, even though the Poly Product unit has been idle for a long period, while PTE totals assume continuous use.

Pollutant	EF (Lb/MMSCF)	Emissions (Lb/hr)	Annual Emissions (TPY)	PTE (TPY)
NO_X	100	0.082	0.246	0.359
CO	84	0.069	0.206	0.301
VOC	5.5	0.005	0.014	0.020
$PM_{10}/PM_{2.5}$	7.6	0.006	0.018	0.027
SO_2	0.6	<.001	0.001	0.002
CO_2	120,000	98	295	430
CH_4	2.3	0.002	0.005	0.008
n-Hexane	1.8	0.001	0.004	0.006
N_2O	2.2	0.002	0.005	0.008

Heaters associated with spray painting

Emissions from these units are calculated using factors from AP-42 Tables 1.4-1 and -2. These emission factors imply a heat content of 1020 BTU/CF. There are two (2) curing ovens rated at 1.36 MMBTUH, a preheater rated at 1.36 MMBTUH, a topcoat heater rated at 2.5 MMBTUH, a primer heater rated at 2.5 MMBTUH, and a trailer unit heater rated at 3 MMBTUH. These units are similar in size and in use, so emission totals are combined. Estimated annual totals assume a conservatively high use of 2,500 hours per year, even though the Building 6 curing heater has been idle for a long period, while PTE totals assume continuous use.

Pollutant	EF (Lb/MMSCF)	Emissions (Lb/hr)	Annual Emissions (TPY)	PTE (TPY)
NO_X	100	1.184	1.480	5.187
CO	84	0.995	1.244	4.357
VOC	5.5	0.065	0.081	0.285
$PM_{10}/PM_{2.5}$	7.6	0.090	0.113	0.394
SO_2	0.6	0.007	0.009	0.031

CO_2	120,000	1,421	1,776	6,225
CH_4	2.3	0.027	0.034	0.119
n-Hexane	1.8	0.021	0.027	0.093
N_2O	2.2	0.026	0.033	0.114

Chemeon

One tank contains 2,000 gallons, with a data sheet showing quantities of carcinogens less than 1% (stated ranges are 0.1 – 1%). Although the inorganic chromic compound (chrome sulfate salt – CAS 12336-95-7) could be vaporized, with amounts calculated by using Antoine's Equation and/or the Clausius-Clapeyron Equations, amounts calculated in this manner are almost immeasurably small. The facility elects to use material balance, assuming one turnover per month. Thus, at a density of 8.5 pounds per gallon, a maximum of 0.085 TPY of a chromium compound (chrome sulfate salt) could be emitted. The salt consists of 0.333 Cr III by weight. Although this is a solid that is intended to plate onto the product and is highly unlikely to be emitted through vaporization, emissions have been calculated in this manner to conservatively overestimate emissions of chrome. Therefore, emissions of Chrome III are identified as 0.028 TPY.

Plasma Torch

Emissions are based on "Emission of Fume, Nitrogen Oxides and Noise in Plasma Cutting of Stainless and Mild Steel," Swedish Institute of Production Engineering Research Document IE-174-93, March 1994. Excerpts from this paper are mentioned as Related Emission Factors on the title page of Chapter 12 in the Fifth Edition of AP-42. The facility uses oxygen as a plasma gas, the process involves semi-dry cutting of carbon steel, and thicknesses vary between 1/8" and 1". According to the reference, using the high end of stated range, one may expect emissions of fumes at 4 grams/minute, of which 10% may be manganese, and 3.1 liters per minute of NO_X. The following table assumes 2,500 hours of operation annually and continuous operation (8760 hours) for purposes of calculating PTE.

Pollutant (emission factor)	Pounds per hour	Expected TPY	PTE TPY
PM (4 g/min)	0.529	0.661	2.318
Manganese (10% of PM)	0.053	0.066	0.232
NO_X (3.1 l/min)	0.836	1.046	3.664

Parts washers

A highly conservative method for calculating VOC emissions is to assume all VOC is emitted and assume twelve turnovers per year per tank. With tank capacity of 20 gallons and product density of 8.2 pounds per gallon, this yields 0.984 TOY of VOC for each tank. Because this methodology does not reflect actual operation, an AP-42 4 lb/tank/year is taken from Table 4.6-1, yielding actual emissions of 0.002 TPY for each parts washer.

Tumbler

Mineral spirits used in the tumbler may be released into the Centerfire room directly or may survive processing through to the evaporators. In either case, all VOC will be emitted, unlike the case of the parts washers. These VOC emissions are assigned to the vents arbitrarily, to avoid double-counting. The facility consumes one 55-gallon drum every two months. Calculations for annual emissions use 330 gallons, yielding 1.353 TPY of VOC. Because Centerfire operates 6,000 hours per year, scaling up to continuous operation, yields 1.975 TPY of VOC.

Pickling 302

The pickling bath used in military tank processing contains 15% hydrofluoric acid by weight. This is a closed process, with no exposure to air, so there is no loss through vaporization. Further, the tanks are pressure washed with RO water after pickling. Both the RO water and material disposed from the closed process are titrated to neutral pH before their release to city wastewater, so there is very small likelihood of fluoride emissions. To

The following table provides the total emissions in tons/year for all pollutants, based on the preceding calculations.

Proposed New Source

Pollutant	Potential Emissions (tpy)	Proposed Allowable Emissions (tpy)
PM	**200.470**	**1.927**
PM_{10}	**200.470**	**1.927**
$PM_{2.5}$	**46.735**	**1.107**
SO_2	**0.034**	**0.012**
NO_x	**9.298**	**2.899**
CO	**4.732**	**1.557**
VOC	**24.020**	**7.448**
Pb	**0.0012**	**0.0012**
Fluorides	**0.15**	**0.15**
H_2SO_4	**0.085**	**0.085**
H_2S	**N/A**	**N/A**
TRS	**N/A**	**N/A**
RSC	**N/A**	**N/A**
Co	**1.294**	**0.006**
Cr III	**1.352**	**0.007**
HDI	**0.006**	**0.006**
Xylene	**0.015**	**0.015**
Cumene	**0.001**	**0.001**
Manganese	**0.005**	**0.001**
Beryllium	**0.0001**	**0.0001**
Nickel	**0.0004**	**0.0001**

PM - Particulate Matter

PM_{10} - Particulate Matter less than 10 microns in size

$PM_{2.5}$ - Particulate Matter less than 2.5 microns in size

SO_2 - Sulfur Oxides

NOx - Nitrogen Oxides

CO - Carbon Monoxide

VOC - Volatile Organic Compound

Pb - Lead and lead compounds

Fluorides - Gaseous and particulates

H_2SO_4 - Sulfuric Acid Mist

H_2S - Hydrogen Sulfide

TRS - Total Reduced Sulfur

RSC - Reduced Sulfur Compounds-

Co – Cobalt compounds

Cr III – Trivalent chrome

HDI – Hexamethylene diisocyanate (monomer)

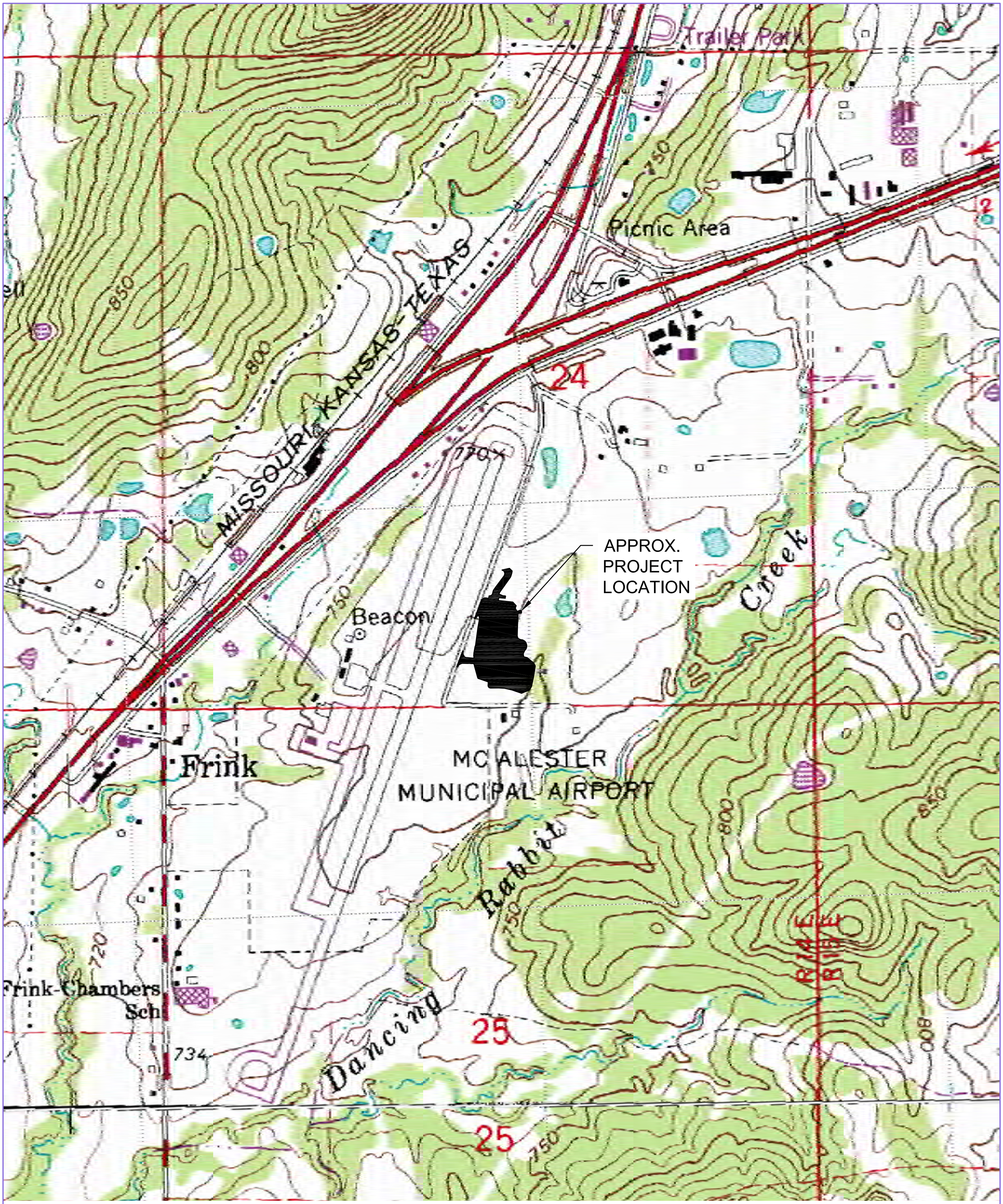
Because this is a new source, there is no need for a table describing changes.

ATTACHMENT I

AIR QUALITY REVIEW, ESA, AND NHPA

Air Quality Review

The area around the facility is at an elevation of approximately 775 feet above sea level. Pittsburg County is mostly gentle rolling terrain with a few ridges. The nearest such ridge to the facility is approximately ½ mile west, peaks at 1000 feet and extends less than 100 yards at this height. In fact, Pittsburg County averages 750’ in elevation, with a County maximum of only 1,500’. Meteorological data include an average annual temperature of 62^{o}F, average wind speed of 5.9 mph, and average rainfall of 42”. Pittsburg County is in attainment for all criteria pollutants. Most of the emissions from the facility are fugitive, with only the evaporators having stacks extending above the roof to a height of 16’ above grade. The Centerfire room also has fan-powered vents that issue horizontally as described more fully in the attached Air Hygiene Method 12 Emissions testing report. As discussed in the emissions calculations of Attachment H, PTE for NO_X, the largest component of emissions from the evaporators is only 0.359 TPY, and PTE for VOC from the tumblers, recognized as vent emissions, is 4.741 TPY. Because the largest component of expected emissions, including fugitives, is 7.44 TPY of VOC, it is unlikely that any significant effect on local air quality may occur.



SECTION 24, TOWNSHIP 5 NORTH, RANGE 14 EAST OF THE INDIAN BASE AND MERIDIAN, PITTSBURG COUNTY, STATE OF OKLAHOMA

Biological Resources/Endangered Species

After reviewing the USFWS Endangered Species Database to identify federally protected threatened and endangered species in McAlester, Oklahoma. The following federally protected threatened and endangered species are identified in McAlester, Oklahoma:

Common Name	**Scientific Name**	**Federal Status**	**Record Status**
Mammals:			
Northern Long-eared Bat	Myotis septentrionalis	Threatened	Current
Avian:			
Least Tern	Strena antillarum	Endangered	Current
Piping Plover	Charadrius melodus	Threatened	Current
Red Knot	Calidris canutus rufa	Threatened	Current
Insect:			
American Burying Beetle	Nicrophorus americanus	Endangered	Current

Northern Long-eared Bat (Myotis septentrionalis)

Description: The northern long-eared bat is a medium-sized bat about 3 to 3.7 inches in length but with a wingspan of 9 to 10 inches. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus, Myotis, which are actually bats noted for their small ears (Myotis means mouse-eared). The northern long-eared bat is found across much of the eastern and north central United States and all Canadian provinces from the Atlantic coast west to the southern Northwest Territories and eastern British Columbia.

Habitat: Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. They use areas in various sized caves or mines with constant temperatures, high humidity, and no air currents. Within hibernacula, surveyors find them hibernating most often in small crevices or cracks, often with only the nose and ears visible.

During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags (dead trees). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats seem to be flexible in selecting roosts, choosing roost trees based on suitability to retain bark or provide cavities or crevices.

Conclusion: Based on the location and size of the project and lack of suitable habitat for the Northern Long-eared bat it is our opinion that the proposed project is not likely to adversely affect the Northern Long-eared bat.

Least Tern (Strena antillarum)

Description: The least tern is the smallest member of the gull and tern family with an approximate length of only 9”. The least tern has narrow pointed wings with a wingspan of 20” and a forked tail. Their body is predominantly gray and white, with a black streak on the top of the head. Least terns are unique when compared to other members of its family because they dive into water for prey.

Habitat: Least terns can use a wide array of habitat types for foraging that includes large rivers, lakes, ponds, and shallow wetlands. Least terns only occur in Oklahoma during the breeding season from late-May to mid-July and require a very specific nesting habitat, one of open sand and gravel areas that are largely devoid of vegetation. In addition to specific nesting habitat requirements the least tern also tend to nest in colonies of 2 to 70 pairs. This type of behavior requires large swathes of sandy vegetation devoid ground for least terns.

Conclusion: Based on the small size for foraging, and complete lack of sand or gravel substrate for nesting this site is undesirable, and almost unusable, for the least tern. Therefore, it is our opinion that the proposed project is not likely to adversely affect the least tern.

Piping Plover (Charadrius melodus)

Description: The piping plover is a stocky shorebird that is approximately 5.5” inches in length with a wingspan of 19”. The plover is sand-colored with a white underside and orange legs. Adults have a black forehead and breast band as well as an orange bill with a black tip during breeding season.

Habitat: Piping plovers prefer mudflats as well as sandbars in order to forage for invertebrate prey. They appear in Oklahoma from March to May and again July to September and use the state as a stopover site, not typically as a breeding ground.

Conclusion: Based on the small size and type of aquatic environment with densely vegetated edges, along with the lack of mudflats for foraging, this habitat is not suitable for the piping plover. In addition, the complete lack of sandy substrate for nesting renders this site undesirable. Therefore, it is our opinion that the proposed project is not likely to adversely affect the piping plover.

Red Knot (Calidris canutus rufa)

Description: A migratory shorebird 9-10” in length with a 23” wingspan. It has a rust-colored head, neck, and belly during breeding season. This bird migrates from its summer breeding grounds in the Arctic Tundra to Chile where the bird overwinters.

Habitat: Rufa red knot forage on mudflats and search for mollusks, invertebrates, and seeds. Long distant migrants typically do not stopover in Oklahoma; however, inclement weather events sometimes ground them. Of note - fewer than five birds that are seen in Oklahoma, annually.

Conclusion: Fewer than five birds are reported in Oklahoma annually with those reports 85% have been during the bird’s fall migration from the Arctic Tundra. Ideal foraging habitat for the rufa red knot is very limited in Oklahoma with preferred sites on mudflats with abundant mollusks, invertebrates, and seeds. The small project site and lack of exposed mudflats for foraging render this habitat practically unsuitable for the red knot. Consequently, it is our opinion that the proposed project will not adversely affect the rufa red knot.

American Burying Beetle (Nicrophorus americanus)

Description: The American burying beetle is a large beetle, approximately 1-2’ in length. It has an overall black coloration and four red-orange markings on its back as well as a prominent red-orange coloration on the area between the head and wing covers.

Habitat: American burying beetle prefers open, oak-hickory forests with native grass cover. They can also be found in close-canopied forests and tallgrass prairies. They need access to suitable soils for carcass burial and a diverse small mammal or bird community to prey upon.

Conclusion: The American burying beetle is unlikely to be found at the project location. The vegetation has been regularly mowed and maintained at less than 8” in height, which is undesirable for the American burying beetle. It is our opinion that the proposed project will not adversely affect the American burying beetle or any of its habitat.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
Phone: (918) 581-7458 Fax: (918) 581-7467
http://www.fws.gov/southwest/es/Oklahoma/

In Reply Refer To: January 29, 2019
Consultation Code: 02EKOK00-2019-SLI-0681
Event Code: 02EKOK00-2019-E-01547
Project Name: CMDC Expansion

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Non-federal entities conducting activities that may result in take of listed species should consider seeking coverage under section 10 of the ESA, either through development of a Habitat Conservation Plan (HCP) or, by becoming a signatory to the General Conservation Plan (GCP) currently under development for the American burying beetle. Each of these mechanisms provides the means for obtaining a permit and coverage for incidental take of listed species during otherwise lawful activities.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit through our Project Review step-wise process http://www.fws.gov/southwest/es/oklahoma/OKESFO%20Permit%20Home.htm.

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
(918) 581-7458

Project Summary

Consultation Code: 02EKOK00-2019-SLI-0681

Event Code: 02EKOK00-2019-E-01547

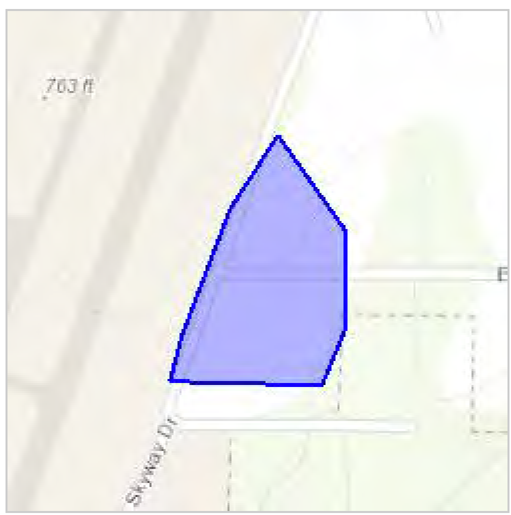
Project Name: CMDC Expansion

Project Type: LAND - MANAGEMENT PLANS

Project Description: Choctaw Nation of Oklahoma plans to develop a parcel of property for commercial/industrial use. The disturbed site consists of approximately 7 acres located southwest of McAlester, OK at 365 Skyway Drive. The tract is located in the S/2 of Section 24 T5N R14E of I.B.M. Coordinates are 36 deg 53'12"N 95 deg 46'45"W.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/34.88562290343428N95.78003160610487W



Counties: Pittsburg, OK

Endangered Species Act Species

There is a total of 5 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat Myotis septentrionalis No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Birds

NAME	STATUS
Least Tern Sterna antillarum Population: interior pop. No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8505	Endangered
Piping Plover Charadrius melodus Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot Calidris canutus rufa No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Insects

NAME	STATUS
American Burying Beetle Nicrophorus americanus Population: Wherever found, except where listed as an experimental population No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/66	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Eastern Whip-poor-will Antrostomus vociferus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20
Red-headed Woodpecker Melanerpes erythrocephalus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

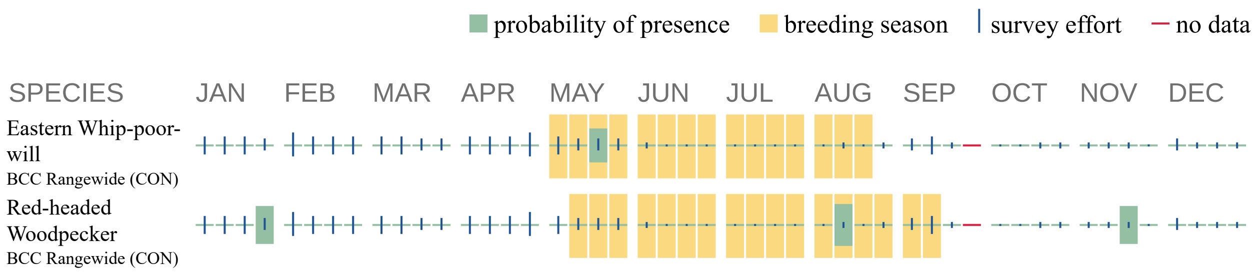
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that ar e potentially affected by offshor e pr ojects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Pr oper Interpr etation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

THERE ARE NO WETLANDS WITHIN YOUR PROJECT AREA.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Division of Ecological Services
9014 East 21st Street
Tulsa, Oklahoma 74129
918/581-7458 / (FAX) 918/581-7467

January 31, 2019

Online Project Review Concurrence Letter

To: Choctaw Nation of Oklahoma
Sean Lenardo, Vice President of Manufacturing
3 Skyway Drive
McAlester, OK 74501
slenardo@choctawdefense.com 918-426-2871

Project Name: CMDC Expansion

Consultation Code: 02EKOK00-2019-SLI-0681

Dear Applicant:

Thank you for using the U.S. Fish and Wildlife Service (Service) Oklahoma Ecological Services Field Office (ESFO) online project review process. By providing this letter in conjunction with your complete project review package, you are certifying that you have accurately completed the online project review process for the referenced project in accordance with all instructions provided, using the best available information to reach your conclusions. Concurrence with "not likely to adversely affect" determinations does not provide any exemption for violations of section 9 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended (ESA) or "take" of federally-listed species. The Federal action agency is ultimately responsible for ensuring compliance with the ESA and any take that occurs due to your proposed action would be considered a violation under section 9 of the ESA.

This letter and the enclosed project review package complete the review of your project in accordance with the ESA. This letter also provides information for your project review under the National Environmental Policy Act (National Environmental Policy Act of 1969 (P.L. 91-190, 42 U.S.C.4321-4347, 83 Stat. 852), as amended.

A copy of this letter and the project review package must be emailed to **okprojectreview@fws.gov** for this certification to be valid. This letter and the project review package will be maintained in Service records. **Please allow the Oklahoma ESFO 45 days to review your information. If the Oklahoma ESFO determines that the package is not complete, or that additional coordination is necessary, we will contact your office. If, after 45 days from the date of your email submittal of your project review package, the Oklahoma ESFO has not contacted your office, consider your section 7 consultation complete.**

The proposed action consists of:

Choctaw Nation of Oklahoma plans to develop a parcel of property for commercial/industrial use. The disturbed site consists of approximately 7 acres located southwest of McAlester, OK at 365 Skyway Drive. The tract is located in the S/2 of Section 24 T5N R14E of I.B.M. Coordinates are 36 deg 53'12"N 95 deg 46'45"W.

Project start and completion dates:

Estimated start date February 2019 and completion January 2020.

Federal agency or federal program providing a permit, funding, grant, authorization, loan, etc. associated with the proposed project and how that agency is associated with your project:

United States EPA, Federal Minor New Source Review Program in Indian Country.
United States EPA NPEDS General Permit for Construction Activities

Federal Agency/Program Point of contact (Name, phone, and email address):

Federal Minor NSR Permit Coordinator, AND NPDES Permits and TMDL Branch
U.S. EPA, Region 6 Suzanna Perea 214-665-7217
R6airpermits@epa.gov perea.suzanna@epa.gov

The species conclusions table in the enclosed project review package summarizes your ESA conclusions. These conclusions resulted in "not likely to adversely affect/modify" determinations for listed species and critical habitat in relation to potential effects of your proposed project. We certify that the use of the online project review process in strict accordance with the instructions provided as documented in the enclosed project review package results in reaching the appropriate determinations. Therefore, we concur with determinations of "not likely to adversely affect" for listed species and critical habitat reached by proper use of this process. For projects where this particular determination is reached, additional coordination with this office is not needed.

Candidate species are not legally protected pursuant to the ESA. However, the Service encourages efforts to avoid or minimize adverse impacts to them from project effects. Some federal agencies have standing policies that grant limited protections to candidate species. Conservation of candidate species now may preclude future needs to federally list them as endangered or threatened, at which point their legal protection would become required. Please contact this office for additional coordination if your project action area contains candidate species.

Should project plans change or if additional information on the distribution of listed species or critical habitat becomes available, this determination may be reconsidered. You should re-visit the Service's Information, Planning, and Conservation (IPaC) website at http://ecos/fws.gov/ipac/ within 90 days of project initiation to ensure species information is correct. If new species or critical habitat is identified, this letter is no longer valid and a new project package should be submitted to the Oklahoma ESFO.

Information about the online project review process including instructions and use, species information, and other information regarding project reviews within Oklahoma is available at our website: <http://www.fws.gov/southwest/es/oklahoma/ >. If you have any questions, please call 918-581-7458 or send an email message to OKProjectReview@fws.gov.

Sincerely,
/s/ Jonna Polk
Field Supervisor
Oklahoma Ecological Services Field Office

Enclosures:

1) ENTIRE PROJECT REVIEW
   - ☑ PACKAGE: Species Conclusion Table
   - ☑ IPaC Species List and Action Area map
   - ☑ This letter (Online Concurrence Letter)
   - ☑ (Optional) Additional maps
2) Other relevant project data/documents

Email from FWS concurring with provided documents from:
Kevin Stubbs
U.S. Fish and Wildlife Service
918-382-4516

From:	Stubbs, Kevin
To:	Kimberly M. Merryman
Cc:	Melissa Robinson; Tye Baker; Brian McClain; Daniel Fenner
Subject:	Re: [EXTERNAL] USFWS PLEASE REVIEW
Date:	Wednesday, January 30, 2019 5:11:09 PM
Attachments:	image001.png

Halito: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Kim, Your additional information was very helpful and I would concur that the site does not have favorable habitat. The area is not likely to support American burying beetles and your proposed project is not likely to adversely affect any federally-listed species.

Kevin Stubbs
U.S. Fish and Wildlife Service
918-382-4516

On Wed, Jan 30, 2019 at 3:58 PM Kimberly M. Merryman <kmerryman@choctawnation.com> wrote:

> Hi Kevin. I made the correction on the ABB section of the T&E write up. I have included 3 more photos that show they site has been mowed and maintained regularly. I am certain I could get landscaping records if necessary. Will this work for you to provide concurrence for the future work being done on this project?
>
> ---
>
> **From:** Stubbs, Kevin [mailto:kevin_stubbs@fws.gov]
> **Sent:** Wednesday, January 30, 2019 2:29 PM
> **To:** Kimberly M. Merryman <kmerryman@choctawnation.com>
> **Cc:** Melissa Robinson <melissarobinson@choctawnation.com>; Tye Baker <tbaker@choctawnation.com>; Brian McClain <bmcclain@choctawnation.com>; Daniel Fenner <daniel_fenner@fws.gov>
> **Subject:** Re: [EXTERNAL] USFWS PLEASE REVIEW
>
> **Halito:** This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.
>
> Kim, From the picture it looks like you already did dirt work/soil disturbance at the site. I can't give you a permit or concurrence for work that has already been done. I would recommend that you try to find pictures or other documentation to show the area was routinely mowed and maintained at less than 8 inches prior to this project (as you told me) to

support a no effect determination. If there are portions of the proposed project area that have not been disturbed yet, you could send me pictures of that and I could provide a concurrence for the future work. ABBs can occur in habitat that ranges from prairie to forest so the current language you have (" Conclusion: The American burying beetle is unlikely to be found at the project location. The lack of oak-hickory forests or saplings with native grass cover makes this site undesirable and difficult to reach for the American burying beetle. It is our opinion that the proposed project will not adversely affect the American burying beetle or any of its habitat.") won't work. If your real reason is that the vegetation is mowed and maintained at less than 8 inches in height, then I would use that to replace the existing conclusion.

Kevin

918-382-4516

On Wed, Jan 30, 2019 at 9:01 AM Kimberly M. Merryman <kmerryman@choctawnation.com> wrote:

> Hi Kevin. Thank you for taking the time to speak with us about this project. I have attached the documents I produced through IPaC. The species list states no critical habitats within your project area. It did list several that don't have a determination key but looking at ECOS species information I cannot see how this project area would impact the long-eared bat; it doesn't show up in Pittsburg County. I don't know what to do with the report now.
>
> I have also attached the quad map for the new construction area for the project. The project area is within a larger tract of Choctaw Nation trust land. I have attached the Phase I ESA dated November 2015, that was completed for the larger tract that encompasses the new project area, just for reference. Finally I have attached the scoping letters sent out for the Categorical Exclusion when the large tract was being moved to trust status and the responses received. I did compare the species lists from the State of Oklahoma and the responses about those species. Those letters concur with the No Effect determination that I think we have from the IPaC Report. Lastly I have attached a photo of the project area. I am pretty sure that it is not a viable ABB location.   I went ahead and attached the letter that will be sent to EPA. Then I added the T&E write-up based on ECOS and IPaC.
>
> Would you please look over these things and see what I may have missed? Feel free to give me a call after reviewing. IF we can get something from you that concurs with the No Effect from IPaC, even if it is informal, that would be very helpful. Or please advise who and how to get this through the channels as quickly as possible. I will be happy to

hand deliver if that will speed things up. I just need to know who to get it to.

Yakoke (Thank You),

Kim Merryman

Sr. Environmental Protection Specialist

Land Assessment and Environmental Services

Choctaw Nation of Oklahoma

Office 580-924-8280 Ext. 4550

Cell (580)579-6235

This message is intended only for the use of the individual or entity to which it is addressed and may contain information that is privileged, confidential and exempt from disclosure. If you have received this message in error, you are hereby notified that we do not consent to any reading, dissemination, distribution or copying of this message. If you have received this communication in error, please notify the sender immediately and destroy the transmitted information. Please note that any view or opinions presented in this email are solely those of the author and do not necessarily represent those of the Choctaw Nation.

ATTACHMENT J

SYNTHETIC MINOR APPLICATION

	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY **FEDERAL MINOR NEW SOURCE REVIEW PROGRAM IN INDIAN COUNTRY** **40 CFR 49.151** **Application For Synthetic Minor Limit** (Form SYNMIN)

Use of this information request form is voluntary and not yet approved by the Office of Management and Budget. The following is a check list of the type of information that Region 6 will use to process information on your proposed project. While submittal of this form is not required, it does offer details on the information we will use to complete your requested approval and providing the information requested may help expedite the process. Use of application forms for this program is currently under Office of Management and Budget review and these information request forms will be replaced/updated after that review is completed.

GENERAL INFORMATION

Company Name Choctaw Defense Manufacturing, LLC	**Facility Name** Choctaw Defense – McAlester Facility
Company Contact John Uvodich	Title VP of Manufacturing
Mailing Address 3 Skyway Drive, McAlester, OK 74501	
Email Address juvodich@choctawdefense.com	
Telephone Number 918 424-8172	Facsimile Number N/A

ATTACHMENTS

Item 1 – The facility proposes that hours of operation be limited to 2,500 hours per year and that use of coatings be limited to 15,00 gallons per year of all products used in coating, including primers, topcoats, catalysts, thinners, and cleanup solvents. Further, that various operations have emissions controlled by air pollution control equipment. Spray painting in booths shall be controlled by layers of filters and blasting shall be controlled by canister filters. Method 12 testing for lead emissions indicates potential to emit of approximately two pounds per year. It is not necessary to set emission limits or to require further controls. The effect of these limits and control devices on PTE is described in Attachment H of the NSR permit application above.

Item 2 – Annual use of coating products will be monitored by recording paint usage as it occurs. Hours of operation will also be recorded as they occur. Control equipment and efficiencies are described in Attachment G of the NSR permit application above.

Item 3 – Control equipment and efficiencies are described in Attachment G of the NSR permit application above. Because this is a new permit, there is no change in emissions to be calculated.

Items 4 – All emission calculations and methodologies are available in Attachment H of the NSR permit application above. Because this is a new permit, there is no change in emissions to consider.

Item 5 – Greenhouse gas emissions are aggregated from the calculations in Attachment H of the NSR permit application above as follow. Conversion factors of 25 for methane and 298 for nitrous oxide to obtain CO_2 equivalents (CO_2e) are taken from Table A-1 of 40 CFR 98. Only PTE is examined, because this is a new source not requiring an evaluation of increases.

Source	CO_2	CH4	CO_2e	N2O	CO_2e
Washers	536	0.010	0.250	0.010	2.950
Evaporators	430	0.008	0.200	0.008	2.360
Booth heaters	6225	0.119	2.975	0.114	33.972
Totals	**7191**	**0.137**	**3.425**	**0.132**	**39.282**

Total mass is 7,191.3 tons, while CO_2e is 7,234 tons. Because this is not a PSD facility, neither number exceeds a significance threshold.

Attachment J
Synthetic Minor Application

	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY **FEDERAL MINOR NEW SOURCE REVIEW PROGRAM IN INDIAN COUNTRY** **40 CFR 49.151** **Application For Synthetic Minor Limit** (Form SYNMIN)
Use of this information request form is voluntary and not yet approved by the Office of Management and Budget. The following is a check list of the type of information that Region 6 will use to process information on your proposed project. While submittal of this form is not required, it does offer details on the information we will use to complete your requested approval and providing the information requested may help expedite the process. Use of application forms for this program is currently under Office of Management and Budget review and these information request forms will be replaced/updated after that review is completed.	

GENERAL INFORMATION

Company Name Choctaw Defense Manufacturing, LLC	**Facility Name** Choctaw Defense – McAlester Facility	
Company Contact Terry Lanham		Title CEO
Mailing Address 3 Skyway Drive, McAlester, OK 74501		
Email Address tlanham@choctawdefense.com		
Telephone Number 918 426-2871	Facsimile Number N/A	

ATTACHMENTS

Item 1 – The facility proposes that hours of operation be limited to 2,500 hours per year and that use of coatings be limited to 15,00 gallons per year of all products used in coating, including primers, topcoats, catalysts, thinners, and cleanup solvents. Further, that various operations have emissions controlled by air pollution control equipment. Spray painting in booths shall be controlled by layers of filters and blasting shall be controlled by canister filters. Method 12 testing for lead emissions indicates potential to emit of approximately two pounds per year. It is not necessary to set emission limits or to require further controls. The effect of these limits and control devices on PTE is described in Attachment H of the NSR permit application above.

Item 2 – Annual use of coating products will be monitored by recording paint usage as it occurs. Hours of operation will also be recorded as they occur. Control equipment and efficiencies are described in Attachment G of the NSR permit application above.

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Source	CO_2	CH4	CO_2e	N2O	CO_2e
Washers	536	0.010	0.250	0.010	2.950
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Totals	**7191**	**0.137**	**3.425**	**0.132**	**39.282**

Total mass is 7,191.3 tons, while CO_2e is 7,234 tons. Because this is not a PSD facility, neither number exceeds a significance threshold.

ATTACHMENT K

MANUFACTURERS' DATA

Hazard classes to the hazard categories and hazard statements codes
1/H290: May be corrosive to metals
1/H310: Fatal in contact with skin
1A/H314: Causes severe skin burns and eye damage
2/H300: Fatal if swallowed
2/H330: Fatal if inhaled

Safety phrases:
S 1/2: Keep locked up and out of the reach of children.

S 7/47: Keep container tightly closed and at temperature not exceeding 30°C.

S 23: Do not breathe fumes.

S 26: In case of contact with eyes rinse immediately with plenty of water and seek medical advice.

S 28: After contact with skin, wash immediately with plenty of water or Avesta First Aid Spray.

S 36/37/39: Wear suitable protective clothing, gloves and eye/face protection.

S 45: In case of accident or if you feel unwell, seek medical advice immediately. Show the label where possible.

S 61: Avoid release to environment. Refer to special instructions/safety data sheet.

1. IDENTIFICATION OF PREPARATION AND COMPANY

PRODUCT IDENTIFIER

Trade name: Avesta Pickling Bath 302
Avesta Classic Pickling Bath 302

RELEVANT IDENTIFIED USES AND USES ADVISED AGAINST

Application and use: Pickling of stainless steel

Not to be used on Other metals than stainless steel

DETAILS OF THE SUPPLIER OF THE SAFETY DATA SHEET

Manufacturer: **Böhler Welding Group Nordic AB**
Avesta Finishing Chemicals
Lodgatan 14, 211 24 MALMÖ, Sweden
Telephone: +46 (0)40 288 300
E-mail: safety@avestafinishing.com

EMERGENCY TELEPHONE NUMBER

+44 1 132 450 530 (Leeds.)

MISCELLANEOUS

Issue date: **2013-08-16**

Version No: 6

Valid from: 2013-08-31

2. HAZARDS IDENTIFICATION

CLASSIFICATION

Health hazard in case of accidental exposure (R-phrases):
Very toxic by inhalation, contact with skin and if swallowed. It causes severe burns.

Environmental effects:
Pickling Fluid will strongly reduce pH in water. Must be neutralised. See also section 12.

Physical and chemical risks:
When heated nitrous gases can be developed.

LABEL ELEMENTS

Hazard symbols:

Very toxic

Corrosive

Risk phrases:
R 26/27/28

R 35

Safety phrases:

S 1/2
S 7/47
S 23
S 26
S 28
S 36/37/39
S 45
S 61

OTHER HAZARDS

The mixture contains sulphates which in the acidic environment can form sulphuric acid.

3. COMPOSITION/INFORMATION ON INGREDIENTS

PREPARATION

Chemical identity: Strong acid paste/solution with corrosive properties.

INFORMATION ON IGREDIENTS

CLASIFICATION ACCORDING TO REGULATION 67/548/EEG OR 1999/45/EG					
Hazardous components, chemical name, formula	CAS No.	EC No.	Contents weight-%	Hazard symbol/ Risk phrase*	
Nitric acid, HNO_3	7697-37-2	231-714-2	40-50	O, C: R8, R35	
Hydrofluoric acid, HF	7664-39-3	231-634-8	10-15	T+, C: R26, 27, 28-35	
CLASIFICATION ACCORDING TO REGULATION (EG) no 1272/2008					
Hazardous components, chemical name, formula	CAS No.	EC No.	Contents weight-%	Hazard category	Hazard statements cod
Nitric acid, HNO_3	7697-37-2	231-714-2	40-50	1 1A	H290 H314
Hydrofluoric acid, HF	7664-39-3	231-634-8	10-15	2 1 2 1A	H330 H310 H300 H314

*The full texts of the phrases are shown in section 16.

Additional information Classification according to directive 67/548/EEC.
Symbols and risk phrases are for concentrated substances.

4. FIRST AID MEASURES

DESCRIPTION OF FIRST AID MEASURES AND INDICATION OF INMEDIATE AND SPECIAL TREATMENT NEEDED

Inhalation:

Remove to fresh air. Keep victim lying down, quiet and warm. Rinse nose and mouth with water. Might require assistance with breathing. Seek medical care even if only slight discomfort occurs.

Ingestion:
If victim is conscious and alert give milk or water to drink. Thereafter 20 lime tablets dissolved in 2 L of water. Do not induce vomiting. Seek medical care.

Skin contact:
Alternative A **-** Rinse immediately with plenty of water, then treat with 2.5% Calcium Gluconate gel, follow the instructions on the packaging. If not available, see alt. B.

Alternative B **-** Rinse immediately with *Avesta First Aid Spray 910*. Spray liberally onto the affected area, always using the complete content. Avoid rinsing with water first, as it reduces the effect of the solution.

After alternative A and B seek medical help.

Eye contact:
Protect intact eye. Rinse immediately with plenty of water for at least 15 minutes and seek immediate medical care (eye specialist).

Information for medical care:
Inform the doctor that the injury has been caused by contact with hydrofluoric and nitric acid mixtures.

SYMPTOMS ACUTE AND DELAYED

Pain in the mouth, throat and breast may occur at inhalation. Salivation and easier dysphonia and discomfort feeling in the breast. In contact with the skin symptoms can be delayed.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Use most appropriate media to extinguish surrounding fire depending on what is burning.

SPECIAL HAZARDS ARISING FROM THE MIXTURE

Chemical exposure risks caused by released gases/vapours:
The Pickling Fluid will emit toxic fumes and nitrous fumes when exposed to heat/fire.

ADVICE FOR FIREFIGHTERS

Danger of fire/explosion:
Fluid is non-flammable. Bottles close to fire should be removed or cooled with water.

Protective clothing for firemen:
Appropriate protective acid-resistant clothing should be used.

Breathing protection:
Gas mask with filter of chlorine type B (grey) and dust filter P2, according to CEN (Central European Norms).

How to clean or destroy soiled fire equipment:
Thoroughly wash with water.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal precautions:

Avoid direct contact. If there is still a risk of direct contact or stench protect with some form of acid-resistant material. Wear eye protection, skin protection, rubber gloves and breathing apparatus. Keep working area well ventilated.

ENVIRONMENTAL PRECAUTIONS

Spillage (water, air, soil):

Prevent spillage from entering sewage or public waters or nature.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for cleaning up:

Neutralise with Avesta Neutralising Agent or a strong alkaline compound i.e. slaked lime. Embank with sand. Arrange for pick up. Rinse with plenty of water.

Spillage should be picked up and disposed of in full compliance with federal, state and local regulations as acid waste.

REFERENCE TO OTHER SECTIONS

Handling and storage section 7, exposure control/personal protection section 8 and disposal considerations section 13.

7. HANDLING AND STORAGE

PRECAUTIONS FOR SAFE HANDLING

Technical measures:

Working place and methods should be worked out in order to avoid direct contact. Work and storage area should be well ventilated. A closed rinse water system with filtration and reuse of clear water is recommended.

To prevent fire and explosion:

Bottles close to fire should be removed or cooled with water.

Precautions:

Avoid fume generation and accumulation by using in a well-ventilated area. Use in areas having local exhaust and general ventilation.

Avesta First Aid Spray 910 should be available at the premises. Emergency eyewash and safety shower must be available at the working place.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Technical measures:

Storage room should be kept separate, cool, dry, well ventilated and closed to unauthorised persons.

Incompatible products:

Not applicable.

Storage conditions:

Keep containers securely closed when not in use and in an upright position. Store in areas where temperature remains between 0-30 °C at all times.

Packaging materials:

Package must be of acid resistant plastic material.

SPECIFIC END USES

See section 1. Contact the manufacturer for more information.

8. EXPOSURE CONTROL/PERSONAL PROTECTION

CONTROL PARAMETERS

Hydrofluoric acid:
EU: IOEL 1,5 mg/m^3 (8 hr), 2,5 mg/m^3 (15 min)

Nitric acid:
EU: IOEL 0,05 mg/m^3 (8 hr)

Sulphuric acid:
EU: IOEL 0,05 mg/m^3 thoracic fraction (8 hr)

Chronic effects, inhalation:
Exposure to strong inorganic acid mists containing sulphuric acid is known to be a human carcinogen, based on sufficient evidence of carcinogenicity from studies in humans.

EXPOSURE CONTROLS

Respiratory protection:
Gas mask with a filter of the chlorine type B (grey) and dust filter P2

Hand protection:
Acid resistant rubber gloves.

Eye protection:
Face shield.

Skin and body protection:
Rubber boots and acid resistant clothes, which covers all body parts exposed to splashes.

Specific hygienic measures:
Do not inhale fumes, avoid contact with eyes, skin and clothes. It is not allowed to eat, drink and smoke at workplace. Remove contaminated clothes immediately. Wash hands and face thoroughly after working with pickling paste. *Avesta First Aid Spray 910* should be available at the premises.

Environmental exposure controls: See section 6 and 7.

9. PHYSICAL AND CHEMICAL PROPERTIES

INFORMATION ON BASIC PHYSICAL AND CHEMICAL PROPERTIES

Physical state (form, colour, smell) at 20°C:
Colourless liquid with a pungent smell.

Boiling point:
80-100°C

Flash point / Explosion properties:
Not applicable

Specific temperatures:
Solid-fluid 40°C, Fluid-gas 50-60°C (nitric fumes)

Vapour pressure at 20°C:
< 0.01 kPa

pH:
0 at 20°C

Density:
1.1-1.4 g/cm^3 at 20°C

Solubility in water at 20°C:
100 weight %

10. STABILITY AND REACTIVITY

REACTIVITY
Reacts vigorously with base metals and alkaline substances

CHEMICAL STABILITY
Stable under normal conditions.

POSSIBILITY OF HAZARDOUS REACTIONS
Polymerization will not occur

CONDITIONS TO AVOID
Avoid high temperatures, must not be exposed to direct sunshine. When heated, nitrous gases will be developed.

INCOMPATIBLE MATERIALS
Contact with low alloyed metals and alkaline compounds causes a heavy exothermic reaction with heat development and stench risk.

HAZARDOUS DECOMPOSITION PRODUCTS
Will emit nitrous gases, hydrofluoric acid and sulphuric oxides.

11. TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Effects on the skin:
Gives corrosive damages with yellowish discoloration of the skin, blisters and slow-healing wounds.

Effects on the eyes:
Causes intensive pain and corrosive damages. Risk of irreparable damage to the eyes.

After ingestion:
Gives corrosive damages with burning pain, possibly severe general effect and damage to kidneys and liver.

Upon inhalation:
Inhalation of fumes or mist might cause aches, cough and difficulty in breathing. Risk for pulmonary oedema.

Additional information:
Symptoms will not appear immediately.

OTHER RELEVANT INFORMATION

CMR-effects:

Exposure to strong inorganic acid mists containing sulphuric acid is known to be a human carcinogen (IARC Group 1), based on sufficient evidence of carcinogenicity from studies in humans.

12. ECOLOGICAL INFORMATION

TOXICITY (Hydroflouric acid):

Fish (fresh water), 60ppm, lethal (time period not specified)

LC50 Fish 96h: 441 mg/l (Gambusia affinis)

EC50 Daphnia 48h: 10-100 mg/l

IC50 Algae 72 h: 2 mg/l

PERSISTENCE AND DEGRADABILITY

Will be protolized in water to H^+, NO^-_3, F^-

BIOACCUMULATIVE POTENTIAL

The product is not regarded as bioaccumulative.

MOBILITY IN SOIL

The product is viscous and, after a period could hike down to the groundwater.

RESULTS OF PBT AND vPvB ASSESSMENT

Non-current

OTHER ADVERSE EFFECTS

Acute effects due to the lowering of pH and burns, i.e. there is a significant decrease in the number of algae at pH<6.

13. DISPOSAL CONSIDERATIONS

WASTE TREATMENT METHODS

Methods of disposal the product:

Discarded product and related waste is hazardous waste. Alloting of EWC-code should be made on the basis of the source causing the waste.

Suggested EWC-code is 11 01 05* Pickling acids.

Waste from residues:

Upon neutralization of remaining acid rests and rinsing water can heavy metals precipitate and these constitute hazardous waste. Neutralise with Avesta Neutralising Agent or slaked lime. Suggested EWC-code 11 01 09* Sludges and filter cakes containing dangerous substances.

Contaminated packing:

Rinse with plenty of water.

Additional information:

Effluent must be separated and disposed of as acidic waste. The product has in the undiluted form toxic effects on soil and water. The remaining acid rests and rinsing water can lower the pH value of wastewater and therefore should not be released until it has undergone a neutralization process.

Consult with your local authorized and licensed waste disposal agency and ministry of environment for instructions and procedures for approved waste disposal.

14. TRANSPORT INFORMATION

UN-Classification No:

2922

UN PROPPER SHIPPING NAME

CORROSIVE LIQUID, TOXIC, N.O.S. (hydrofluoric acid, nitric acid)

TRANSPORT HAZARD CLASS(ES)

Classification Code:

CT1

PACKING GROUP

II

ENVIRONMENTAL HAZARDS

***IMDG* (Sea):**

Class 8 (6.1) EmS F-A, S-B

Marine Pollutant: No

***ADR/RID* (road, rail):**

Class 8 (6.1)

Tunnel restriction code:
(E)

***IATA/DGR* (air):**

Class 8 (6.1)

ADDITIONAL INFORMATION

The product is to be transported according to dangerous goods regulations.

15. REGULATORY INFORMATION

SAFETY, HEALTH AND ENVIRONMENTAL REGULATIONS

Regulations:

1907/2006/EC, 1272/2008/EC Table 3.1, 67/648/EEC, EWC 2000/532/EC

Other regulations:

IMDG

ADR/RID

IATA/DGR

Chemical Safety Assessment:

Has not been carried out for this product (or substances in the preparation).

16. OTHER INFORMATION

CHANGES MADE SINCE LAST VERSION

Information on dual classification of elements in section 3, explanation of the hazard classes referred to in section 16.

TRAINING ADVICE

The Avesta Welding "Handbook for the pickling and cleaning of stainless steel" and "Guidelines for Planning and Designing a Pickling Workshop".

KEY LITTERATURE REFERENCES AND SOURCES FOR DATA

Standard Practice for cleaning stainless steel (ASTM-A-380),

Fluorides WHO (Env. Health Criteria 36), International Standard ISO 11014-1l

LIST OF RELEVANT R- AND S-PHRASES, HAZARD CATEGORIES AND STATEMENTS CODES AS WELL AS PRECAUTIONARY STATEMENTS IN SECTION 2 AND 3.

Risk phrases:

R 8: Contact with combustible material may cause fire.

R 26/27/28: Very toxic by inhalation, in contact with skin and if swallowed.

R 35: Causes severe burns.

1. IDENTIFICATION OF PREPARATION AND COMPANY

PRODUCT IDENTIFIER

Trade name:	Avesta Cleaner 401 Avesta Classic Cleaner 401

RELEVANT IDENTIFIED USES AND USES ADVISED AGAINST

Application and use:	Cleaning of stainless steel
Not to be used on	Other metals than stainless steel

DETAILS OF THE SUPPLIER OF THE SAFETY DATA SHEET

Manufacturer:	**Böhler Welding Group Nordic AB** Avesta Finishing Chemicals Lodgatan 14, 211 24 MALMÖ, Sweden Telephone: +46 (0)40 288 300 E-mail: safety@avestafinishing.com

EMERGENCY TELEPHONE NUMBER

+44 1 132 450 530 (Leeds)

MISCELLANEOUS

Issue date:	**2013-08-16**
Version No:	7
Valid from:	2013-08-31

2. HAZARDS IDENTIFICATION

CLASSIFICATION

Health hazard in case of accidental exposure (R-phrases):
The product is classified as corrosive. Risk for injuries on skin and mucous membranes.

Environmental effects:
Will reduce pH in water. Must be neutralised. See also section 12.

Physical and chemical risks:
When heated phosphorus gases and hydrogen can be emitted.

LABEL ELEMENTS

Hazard symbols:

Corrosive

Risk phrases:
R 34

Safety phrases:
S 1/2
S 26
S 28
S 36/37/39
S 45

OTHER HAZARDS
Not known

3. COMPOSITION/INFORMATION ON INGREDIENTS

PREPARATION

Chemical identity: Colourless acid solution with corrosive properties.

INFORMATION ON IGREDIENTS

CLASIFICATION ACCORDING TO REGULATION 67/548/EEG OR 1999/45/EG					
Hazardous components, chemical name, formula	CAS No.	EC No.	Contents weight-%	Hazard symbol/ Risk phrase*	
Phosphoric acid , H_3PO_4	7664-38-2	231-633-2	16	C, R34	
Alcohols, C11-14-iso-, C13-rich, ethoxylated	78330-21-9	-	3-5	Xn, R22, 41	
CLASIFICATION ACCORDING TO REGULATION (EG) no 1272/2008					
Hazardous components, chemical name, formula	CAS No.	EC No.	Contents weight-%	Hazard category	Hazard statements cod
Phosphoric acid , H_3PO_4	7664-38-2	231-633-2	16	1 1B	H290 H314
Alcohols, C11-14-iso-, C13-rich, ethoxylated	78330-21-9	-	3-5	1 4	H318 H302

*The full texts of the phrases are shown in section 16.

Additional information Classification according to directive 67/548/EEC.
Symbols and risk phrases are for concentrated substances.

4. FIRST AID MEASURES

DESCRIPTION OF FIRST AID MEASURES AND INDICATION OF INMEDIATE AND SPECIAL TREATMENT NEEDED

Inhalation:
Remove to fresh air. Keep victim lying down, quiet and warm. Rinse nose and mouth with water. Might require assistance with breathing. Seek medical care even if only slight discomfort occurs.

Ingestion:
Drink at once milk or water. Seek medical care.

Skin contact:
Rinse immediately with plenty of water, seek medical care.

Eye contact:
Protect intact eye. Rinse immediately with plenty of water for at least 15 minutes and seek immediate medical care (eye specialist). Keep rinsing during transport.

SYMPTOMS ACUTE AND DELAYED

Not known

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

The most appropriate media to extinguish surrounding fire is depending on what is burning.

SPECIAL HAZARDS ARISING FROM THE MIXTURE

Chemical exposure risks caused by released gases/vapours:
The Pickling Fluid will emit toxic fumes and phosphoric oxides when exposed to heat/fire.

ADVICE FOR FIREFIGHTERS

Danger of fire/explosion:

Fluid is non-flammable. Bottles close to fire should be removed or cooled with water.

Protective clothing for firemen:
Appropriate protective acid-resistant clothing should be used.

Breathing protection:
Gas mask with filter according to CEN (Central European Norms).

How to clean or destroy soiled fire equipment:
Thoroughly wash with water.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal precautions:
Avoid direct contact. If there is still a risk of direct contact or stench protect with some form of acid-resistant material. Wear eye protection, skin protection, rubber gloves and breathing apparatus. Keep working area well ventilated.

ENVIRONMENTAL PRECAUTIONS

Spillage (water, air, soil):
Prevent spillage from entering sewage or public waters or nature.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for cleaning up:
Neutralise with Avesta Neutralising Agent or a strong alkaline compound i.e. slaked lime. Embank with sand. Arrange for pick up. Rinse with plenty of water.

Spillage should be picked up and disposed of in full compliance with federal, state and local regulations as acid waste.

REFERENCE TO OTHER SECTIONS

Handling and storage section 7, exposure control/personal protection section 8 and disposal considerations section 13.

7. HANDLING AND STORAGE

PRECAUTIONS FOR SAFE HANDLING

Technical measures:
Working place and methods should be worked out in order to avoid direct contact. Work and storage area should be well ventilated. A closed rinse water system with filtration and reuse of clear water is recommended.

To prevent fire and explosion:
Bottles close to fire should be removed or cooled with water.

Precautions:
Avoid fume generation and accumulation by using in a well-ventilated area. Use in areas having local exhaust and general ventilation.

Emergency eyewash and safety shower must be available at the working place.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Technical measures:
Storage room should be kept separate, cool, dry, well ventilated and closed to unauthorised persons.

Incompatible products:
Not applicable.

Storage conditions:
Keep containers securely closed when not in use and in an upright position. Store in areas where temperature remains between 0-30 °C at all times.

Packaging materials:
Package must be of acid resistant plastic material.

SPECIFIC END USES

See section 1. Contact the manufacturer for more information.

8. EXPOSURE CONTROL/PERSONAL PROTECTION

CONTROL PARAMETERS

Phosphoric acid:
EU: IOEL 1,0 mg/m^3 (8 hr), 2,0 mg/m^3 (15 min)

EXPOSURE CONTROLS

Respiratory protection:
Gas mask with a filter according to CEN (Central European Norms)

Hand protection:
Acid resistant rubber gloves, i.e. Butyl and Nitrile rubber.

Eye protection:
Face shield.

Skin and body protection:
Rubber boots and acid resistant clothes, which covers all body parts exposed to splashes.

Specific hygienic measures:
Do not inhale fumes, avoid contact with eyes, skin and clothes. It is not allowed to eat, drink and smoke at workplace.

Environmental exposure controls: See section 6 and 7.

9. PHYSICAL AND CHEMICAL PROPERTIES

INFORMATION ON BASIC PHYSICAL AND CHEMICAL PROPERTIES

Physical state (form, colour, smell) at 20°C:
Transparent liquid with a slight smell.

Boiling point:
80-100°C

Flash point / Explosion properties:
Not applicable

Specific temperatures:
Solid-fluid 0°C, Fluid-gas 80-100°C

Vapour pressure at 20°C:
< 0.01 kPa

pH:
0,6 at 20°C

Density:
1.1 g/cm^3 at 20°C

Solubility in water at 20°C:
100 weight %

10. STABILITY AND REACTIVITY

REACTIVITY
Reacts vigorously with alkaline substances

CHEMICAL STABILITY
Stable under normal conditions.

POSSIBILITY OF HAZARDOUS REACTIONS
Polymerization will not occur

CONDITIONS TO AVOID
Avoid high temperatures, must not be exposed to direct sunshine. When heated, phosphoric gases will be emitted.

INCOMPATIBLE MATERIALS
Contact with alkaline compounds causes a heavy exothermic reaction with heat development.

HAZARDOUS DECOMPOSITION PRODUCTS
Will emit phosphoric gases and hydrogen gas.

11. TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Acute toxicity
LD_{50} rat oral 1530 mg/kg (Phosphoric acid)

Effects on the skin:
Will irritate, burn and may cause wounds.

Effects on the eyes:
Fumes may cause irritation. Splashes can cause serious damage to the eye.

After ingestion:
May cause damage to mucous membranes, pain, vomiting and diarrhoea.

Upon inhalation:
Inhalation of fumes or mist might cause aches, cough and difficulty in breathing. Risk for pulmonary oedema.

OTHER RELEVANT INFORMATION

CMR-effects:

Not known

12. ECOLOGICAL INFORMATION

PERSISTENCE AND DEGRADABILITY

No data

BIOACCUMULATIVE POTENTIAL

The product is not regarded as bioaccumulative.

MOBILITY IN SOIL

The product can hike down to the groundwater.

RESULTS OF PBT AND vPvB ASSESSMENT

Non-current

OTHER ADVERSE EFFECTS

The product is soluble in water and in its concentrated form will lower the pH of ground water.

13. DISPOSAL CONSIDERATIONS

WASTE TREATMENT METHODS

Methods of disposal the product:

Discarded product and related waste is hazardous waste. Alloting of EWC-code should be made on the basis of the source causing the waste.

Suggested EWC-code is 11 01 05* Pickling acids.

Waste from residues:

Contaminated residues i.e. wastewater must be neutralised and heavy metals from the process should be removed and these constitute hazardous waste.

Contaminated packing:

Rinse with plenty of water.

Additional information:

Effluent must be separated and disposed of as acidic waste. A filtration system for rinse water is recommended.

Consult with your local authorized and licensed waste disposal agency and ministry of environment for instructions and procedures for approved waste disposal.

14. TRANSPORT INFORMATION

UN-Classification No:

3264

UN PROPPER SHIPPING NAME

CORROSIVE LIQUID, ACIDIC, INORGANIC N.O.S. (phosphoric acid)

TRANSPORT HAZARD CLASS(ES)

Classification Code:

C1

PACKING GROUP
III

ENVIRONMENTAL HAZARDS

***IMDG* (Sea):**
Class 8 EmS F-A, S-B

Marine Pollutant: No

***ADR/RID* (road, rail):**
Class 8

Tunnel restriction code:
(E)

***IATA/DGR* (air):**
Class 8

ADDITIONAL INFORMATION

The product is to be transported according to dangerous goods regulations.

15. REGULATORY INFORMATION

SAFETY, HEALTH AND ENVIRONMENTAL REGULATIONS

Regulations:
1907/2006/EC, 1272/2008/EC Table 3.1, 67/648/EEC, EWC 2000/532/EC

Other regulations:

IMDG

ADR/RID

IATA/DGR

Chemical Safety Assessment:

Has not been carried out for this product (or substances in the preparation).

16. OTHER INFORMATION

CHANGES MADE SINCE LAST VERSION

Information on dual classification of elements in section 3, explanation of the hazard classes referred to in section 16.

TRAINING ADVICE

The Avesta Welding "Handbook for the pickling and cleaning of stainless steel" and "Guidelines for Planning and Designing a Pickling Workshop".

KEY LITTERATURE REFERENCES AND SOURCES FOR DATA

Standard Practice for cleaning stainless steel (ASTM-A-380),

International Standard ISO 11014-1l

LIST OF RELEVANT R- AND S-PHRASES, HAZARD CATEGORIES AND STATEMENTS CODES AS WELL AS PRECAUTIONARY STATEMENTS IN SECTION 2 AND 3.

Risk phrases:
R 22: Harmful if swallowed.

R 34: Causes burns

R 41: Risk of serious damages to eyes.

Hazard classes to the hazard categories and hazard statements codes
1/H290: May be corrosive to metals
1B/H314: Causes severe skin burns and eye damage
1/H318: Causes serious eye damage
4/H302: Harmful if swallowed

Safety phrases:
S 1/2: Keep locked up and out of the reach of children.

S 26: In case of contact with eyes rinse immediately with plenty of water and seek medical advice.

S 28: After contact with skin, wash immediately with plenty of water or Avesta First Aid Spray.

S 36/37/39: Wear suitable protective clothing, gloves and eye/face protection.

S 45: In case of accident or if you feel unwell, seek medical advice immediately. Show the label where possible.

MATERIAL SAFETY DATA SHEET

For Welding Consumables and Related Products
Conforms to OSHA Hazard Communication Standard 29CFR 1910.1200
Standard must be Consulted for Specific Requirements

Date: 2010/01/01 MSDS No. 724

SECTION 1: IDENTIFICATION

Manufacturer	Welding Material Sales Inc. 1340 Reed Road Geneva, Il 60134
Trade Name	Pure Tungsten (EWP), 2% Ceriated Tungsten (EWCe-2), 2% Lanthanated Tungsten (EWLa-1), 1% Thoriated Tungsten (EWTh-1), 2% Thoriated Tungsten (EWTh-2), Zirconated Tungsten (EWZr-1), 1.5% Lanthanated Tungsten (EWG)
Classifications	AWS A5.12
Telephone Number Emergency Number	630-232-6421 800-424-9300
Web site:	www.weldingmaterialsales.com

SECTION 2: HAZARDOUS INGREDIENTS

Important: This section covers the materials from which the product is manufactured. The fumes and gases produced during welding with the normal use of this product are covered under Section V. Thorium dioxide is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40 CFR Part 372.

*The term "HARDOUS MATERIALS" should be interpreted as a term required and defined in OSHA HAZARD COMMUNICATION STANDARD 29 CFR 1910.1200 however the use of this term does not necessarily imply the existence of any hazard.

PRODUCT	W	ZrO_2	ThO_2	LaO_2	CeO_2
Pure Tungsten	>99.5%	-	-	-	-
Zirconated Tungsten	>99.7%	0.25%	-	-	-
1% Thoriated Tungsten	>98.3%	-	1.2%	-	-
2% Thoriated Tungsten	>97.3%	-	2.2%	-	-
2% Lanthanated Tungsten	>97.3%	-	-	2.2%	-
2% Ceriated Tungsten	>97.3%	-	-	-	2.2%

Occupational Safety and Health Administration 28 CFR 1910.1000 Permissible Exposure Limit (PEL). American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV[R]).

SECTION 3: PHYSICAL DATA

Melting Point: Approximately 3400°C
Boiling Point: Approximately 5900°C
Vap. Press: N/A at 25°C
Vap. Density: N/A
Radioactive Isotope: Th-232

Solubility in Water: Insoluble
Specific Gravity (H_2O=1): Approximately 19
Appearance and Odor: Gray, no odor

SECTION 4: FIRE AND EXPLOSION HAZARD DATA

Non-Flammable: Welding arc and sparks can ignite combustibles. See Z49.1 referenced in Section 6.

SECTION 5: REACTIVITY DATA

Hazardous Decomposition Products

Welding fumes and gases cannot be classified simply. The composition and quantity of these fumes and gases are dependent upon the metal being welded, the procedures followed and the electrodes used.

Workers should be aware that the composition and quantity of fumes and gases to which they may be exposed, are influenced by: coatings which may be present on the metal being welded (such as paint, plating or galvanizing), the number of welders in operation and the volume of the work area, the quality and amount of ventilation, the position of the welder's head with respect to the fume plume, as well as the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing procedure). When the electrode is consumed, the fumes and gas decomposition products generated are different in percent and form from the ingredients listed in Section II, The composition of these fumes and gases are the concerning matter and not the composition of the electrode itself.

Decomposition products include those originating from the volatilization, reaction, or oxidation of the ingredients shown in Section II, plus those from the base metal, coating and the other factors noted above.

INGREDIENT	CAS No.	OSHA PEL	ACGIH TWA	ACGIH STEL
Tungsten (W)	7440-33-7	-	$5mg/m^3$	$10mg/m^3$
Thorium Dioxide	1314-20-1	-	-	-
Zirconium Oxide	1314-23-4	$5mg/m^3$	$5mg/m^3$	$10mg/m^3$
Cerium Dioxide	1345-13-7	-	-	-
Lanthanum Dioxide	1312-81-8	-	-	-

Gaseous reaction products may include carbon monoxide and carbon dioxide.
Ozone and nitrogen oxides may be formed by the radiation from the arc.
One method of determining the composition and quantity of the fumes and gases to which the workers are exposed is to take an air sample from inside the welder's helmet while worn or within the worker's breathing zone. See ANSI/AWS F1.1 publication available from the American Welding Society 550 N.W. LeJeune Road, Miami, FL 33126.

SECTION 6: HEALTH HAZARD DATA

Threshold Limit Value: The ACGIH recommended general limit for welding fume NOC (Not otherwise classified) is 5 mg/m^3. ACGIH-1985 preface states: "The TLC-TWA should be used as guides in the control of health hazards and should not be used as fine lines between safe and dangerous concentrations." See Section V for specific fume constituents, which may modify this TLV.

Common Entry is by Inhalation.

Effects of Overexposure: Inhalation of welding fumes and gases can be dangerous to your health. Short-term (acute) overexposure to welding fumes may result in discomfort such as dizziness, nausea, or dryness or irritation of nose, throat, or eyes. Although the inhalation of Tungsten has the potential for causing transient or permanent lung damage, it is generally considered to exhibit a low degree of toxicity. Thorium is a naturally occurring radioactive element. Its primary hazard lies in inhalation of dust/fumes. Normal handling of these electrodes is not expected to result in any significant radiation exposure. Considerable experience in refining and use of thorium has not revealed any adverse effects fro industrial exposure. Long-term (chronic) over-exposure to welding fumes can lead to siderosis (iron deposits in lung) and is believed to affect pulmonary function.

Arc Rays can inure eyes and burn skin.
Electric Shock can kill.
See Section 7.

Emergency and First Aid Procedures: Call for medical assistance. Use first aid procedures recommended by the American Red Cross. If breathing is difficult-give oxygen. If not breathing use CPR (cardiopulmonary resuscitation).

Carcinogenicity

Thorium dioxide has been identified as a carcinogen by NTP, IARC and others. Evidence for its ability to cause cancer has come solely from its internal medical use.

SECTION 7: CONTOL MEASURES AND PRECAUTIONS FOR SAFE HANDLING AND USE

Read and understand the manufacturer's instructions and precautionary label on this product. See American Standard Z49.1 *Safety in Welding and Cutting*, published by the American Welding Society, 550 N.W. LeJeune Road, Miami, Florida 33126 and OSHA Publication 2206 (29 CFR 1910), U.S. Government Printing Office, Washington D.C. 20402 for more details on the following topics.

Ventilation: Use plenty of ventilation and/or local exhaust at the arc, to keep the fumes and gases below the threshold limit value within the worker's breathing zone and the general work area. Welders should be advised to keep their head out of the fume.

Respiratory Protection: Use respirator or air supplied respirator when welding in a confined space or general work area where local exhaust and/or ventilation does not keep exposure below the threshold limit value.

Eye Protection: Wear a helmet or face shield with a filer lens shade number 12-14 or darker. Shield other workers by providing screens and flash goggles.

Protective Clothing: Wear approved head, hand and body protection, which help to prevent injury from radiation, sparks and electrical shock. See ANSI Z-49.1. This would include wearing welder's gloves and protective face shield and may include arm protectors, apron, hats, shoulder protection, as well as dark substantial clothing. Welders should be trained not to allow electrically live parts to contract the skin or wet clothing and gloves. The welders should insulate them selves from the work and ground.

Waste Disposal Method: Discard any product, residue, disposal container, or liner in an environmentally acceptable manner approved by Federal, State and Local regulations.

Safety Data Sheet
CHEMEON TCP-HF

1. Identification

Product identifier used on the label

CHEMEON TCP-HF

Recommended use of the chemical and restriction on use

Recommended use*: Surface treatment agent

* The "Recommended use" identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:
Chemetall U.S., Inc.
675 Central Avenue
New Providence, NJ 07974 – USA

Telephone: +1 800 526-4473
E-mail address: michael.l.chang@basf.com

Emergency telephone number

Telephone: 800-424-9300, 1-703-527-3887

Other means of identification

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid
Colour	light green
Odour	none
Hazard Summary	Burns eyes. Also harmful in contact with skin. Liquid or vapor causes burns which may be delayed. Also harmful by inhalation and if swallowed.

	Inhalation of sulfuric acid mist may cause cancer

GHS Classification

Skin corrosion : Category 1A

Serious eye damage : Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Causes severe skin burns and eye damage.

Precautionary statements : **Prevention:**
Wash skin thoroughly after handling.
Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response:
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
Wash contaminated clothing before reuse.
Storage:
Store locked up.
Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Potential Health Effects

Inhalation : yes

Skin : yes

Ingestion : yes

Aggravated Medical Condition : None known.

Carcinogenicity:

IARC No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH Suspected human carcinogen

	Sulfuric acid	7664-93-9
OSHA	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.	
NTP	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.	

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture :

Hazardous components

Component	CAS-No.	Weight percent
Trivalent Chromium Salt	12336-95-7	0.1 - 1

Unidentified ingredients are considered not hazardous, or not required to be listed under Federal Hazard Communication Standard (29CFR 1910.1200).

Specific chemical identity of composition has been withheld as a trade secret.

Exact percentage of composition has been withheld as a trade secret.

SECTION 4. FIRST AID MEASURES

If inhaled : If inhaled, remove to fresh air.
If symptoms persist, call a physician.
If breathing is irregular or stopped, administer artificial respiration.

In case of skin contact : Wash off immediately with plenty of water for at least 15 minutes.
Pay particular attention to skin under nails.
Take off contaminated clothing and shoes immediately.
First treatment with calcium gluconate paste.
Get medical attention immediately if irritation develops and persists

In case of eye contact : Rinse immediately with plenty of water for at least 15 minutes.
Keep eye wide open while rinsing.
Get medical attention immediately

If swallowed : Rinse mouth.
Give several glasses of water to drink followed by milk of magnesia.
Never give anything by mouth to an unconscious person.
Get medical attention immediately

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media : Water

Carbon dioxide (CO_2)
Dry chemical

Special protective equipment for firefighters : Use personal protective equipment.
Wear self-contained breathing apparatus for firefighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Methods and materials for containment and cleaning up : Cover with dry sodium carbonate.
Sweep up and shovel into suitable containers for disposal.
Flush with water.

Additional advice : Never return spills in original containers for re-use.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling : Wear personal protective equipment.(see section 8)

Conditions for safe storage : Keep containers dry and tightly closed to avoid moisture absorption and contamination.
Store indoors in a cool, well-ventilated place

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Sulfuric acid	7664-93-9	TWA (Thoracic fraction)	0.200000 mg/m3	ACGIH
		TWA (Thoracic fraction)	0.200000 mg/m3	ACGIH
		TWA	1.000000 mg/m3	NIOSH REL
		TWA	1.000000 mg/m3	NIOSH REL
		TWA	1.000000 mg/m3	OSHA Z-1
		TWA	1.000000 mg/m3	OSHA Z-1
		TWA	1.000000 mg/m3	OSHA P0
		TWA	1.000000 mg/m3	OSHA P0

Engineering measures : Licensed to CHEMEON Surface Technology, LLC. from U.S. Navy under U.S. Patent Number 6,375,726 (PCT/US 01/45434); 6,511,532 (PCT/US 02/35599); 6,521,029; and 6,527,841 (PCT/US 02/35490). www.chemeon.com

Personal protective equipment

Respiratory protection	:	If the occupational exposure limits cannot be met, suitable respirator equipment shall be worn.
Hand protection		
Remarks	:	Neoprene gloves
Eye protection	:	Chemical resistant goggles must be worn.
Skin and body protection	:	Complete suit protecting against chemicals
Hygiene measures	:	Avoid contact with skin, eyes and clothing. Wear suitable gloves and eye/face protection. Wear suitable protective clothing. Wash hands before breaks and immediately after handling the product. Provide adequate ventilation. Do not inhale fumes. Keep away from food and drink.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	light green
Odour	:	none
pH	:	2.0 - 3.5
Freezing point	:	0 °C
Boiling point/boiling range	:	No data available
Flash point	:	does not flash
Evaporation rate	:	1 Water = 1
Upper explosion limit	:	Not applicable
Lower explosion limit	:	Not applicable
Vapour pressure	:	No data available
Relative density	:	1.02
Bulk density	:	8.5 lb/gal
Solubility(ies)		
Water solubility	:	completely soluble
Partition coefficient: n-octanol/water	:	No data available
Auto-ignition temperature	:	No data available
Thermal decomposition	:	No data available
Viscosity, dynamic	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Incompatible materials	: Bases Warning! Do not use with chlorinated products as dangerous chlorine gas can be emitted.
Hazardous decomposition products	: Acidic fumes Sulphur oxides

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity : Acute toxicity estimate : > 5,000.000000 mg/kg
Method: Calculation method

Skin corrosion/irritation

Components:

Trivalent Chromium Salt:
Result: Mild skin irritation

Serious eye damage/eye irritation

Components:

Trivalent Chromium Salt:
Result: Corrosive

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

No data available

Bioaccumulative potential

Product:

Partition coefficient: n-octanol/water : Remarks: No data available

Other adverse effects

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Refer to all federal, provincial, state and local regulation prior to disposition of container and unused contents by reuse, recycle or disposal.

SECTION 14. TRANSPORT INFORMATION

International Regulations

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

National Regulations

SECTION 15. REGULATORY INFORMATION

TSCA Status : All components of this material comply with US TSCA requirements.

OSHA Hazards : Carcinogen
WHMIS Classification : D2B: Toxic Material Causing Other Toxic Effects

EPCRA - Emergency Planning and Community Right-to-Know Act

Potassium zirconium hexafluoride	735517-5007P	1,000	
Sulfuric acid	7664-93-9	1,000	

SARA 311/312 Hazards : Chronic Health Hazard

SARA 302 : The following components are subject to reporting levels established by SARA Title III, Section 302:
Sulfuric acid 7664-93-9

SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

US State Regulations

Massachusetts Right To Know

Sulfuric acid	7664-93-9

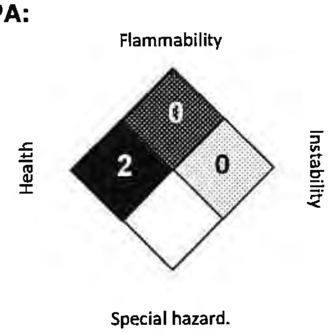
Pennsylvania Right To Know

water	7732-18-5
Potassium zirconium hexafluoride	735517-5007P
Sulfuric acid	7664-93-9

New Jersey Right To Know

water	7732-18-5
Sulfuric acid	7664-93-9

NFPA:



HMIS III:

HEALTH	2
FLAMMABILITY	0
PHYSICAL HAZARD	0

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

Acid

Splash Goggles, Gloves, Apron, Dust and Vapour Respirator

SECTION 16. OTHER INFORMATION

Further information

Version *1.6*
Revision Date 01/06/2018

SDS Prepared by:
Chemetall (now part of BASF Group) NA Product Regulations
SDS Prepared on: 2018/01/12

IMPORTANT: WHILE THE DESCRIPTIONS, DESIGNS, DATA AND INFORMATION CONTAINED HEREIN ARE PRESENTED IN GOOD FAITH AND BELIEVED TO BE ACCURATE , IT IS PROVIDED FOR YOUR GUIDANCE

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The content of this Safety Data Sheet (SDS) is based on an existing document from an acquired company with adaptations to Section I. The data is currently under validation.

END OF DATA SHEET

SUPERGLAZE® 5356

Aluminum ▪ AWS ER5356

KEY FEATURES

- General purpose filler alloy for welding 5XXX series alloys
- The most widely used welding alloy

WELDING POSITIONS

All, except vertical down

SHIELDING GAS

100% Argon
Argon / Helium Mixtures
Flow Rate: 30 - 50 CFH

NOTE

- Typical Operating Procedures on pg. I-15 - I-16

CONFORMANCES

SFA/AWS A5.10:	ER5356
ASME SFA-A5.10:	ER5356
Lloyd's Register:	WB/I-1 S
DNV Grade:	5356
GL:	RAIMg4
BV Grade:	WB
CWB/CSA W48-06:	ER5356

TYPICAL APPLICATIONS

- Automotive bumpers and supports
- Structural frames in the shipbuilding industry
- Formed truck panels
- Railing Industry
- Power Industry
- Trailer Manufacturing

DIAMETERS / PACKAGING

Diameter in (mm)	1 lb (0.4 kg) Plastic Spool 20 lb (9.1 kg) Master Carton	16 lb (7.3 kg) Platic Spool	20 lb (9.1 kg) Plastic Spool	60 lb (27.2 kg) Mini-Drum	300 lb (136 kg) Accu-Pak® Box	300 lb (136 kg) Gem-Pak™ Box
0.035 (0.9)	ED030312	ED028385		ED036720	ED033178[a]	ED034722
3/64 (1.2)	ED030314		ED030282	ED036593	ED031826[b]	ED034550
1/16 (1.6)			ED030283	ED036721	ED030985[b]	ED034551

[a]This part number is Made-To-Order. [b]Wire payoff kit K2860-1 sold separately.

WIRE COMPOSITION[1] – *As Required per SFA/AWS A5.10*

	%Al	%Si	%Fe	%Cu	%Mn
Requirements - AWS ER5356	Remainder	0.25 max	0.40 max	0.10 max	0.05 - 0.20
Typical Results[2]	Remainder	0.05	0.09	0.03	0.12
	%Mg	**%Cr**	**%Zn**	**%Ti**	**%Be**
Requirements - AWS ER5356	4.50 - 5.50	0.05 - 0.20	0.10 max	0.06 - 0.20	0.0003 max
Typical Results[2]	4.90	0.08	< 0.01	0.15	0.0002

[1]Typical all weld metal. [2]See test results disclaimer

Material Safety Data Sheets (MSDS) and Certificates of Conformance are available on our website at www.lincolnelectric.com

Publication C8.05.4 | Issue Date 07/17

THE LINCOLN ELECTRIC COMPANY
22801 St. Clair Avenue ▪ Cleveland, OH ▪ 44117-1199 ▪ U.S.A.
Phone: +1.216.481.8100 ▪ www.lincolnelectric.com

LINCOLN® ER70S-6

Mild Steel, Copper Coated ▪ AWS ER70S-6

KEY FEATURES

- High levels of manganese and silicon deoxidizers tolerate medium to heavy mill scale surfaces
- More puddle fluidity
- Excellent wetting action
- Ink jet printing identification on entire length of electrode
- Q2 Lot® - Certificates showing actual wire chemistry available online

WELDING POSITIONS

All

CONFORMANCES

AWS A5.18/A5.18M:	ER70S-6
ASME SFA-A5.18:	ER70S-6
CSA W48 CLASSIFICATION	B-G 49A 3 CG6 (ER495-6)

TYPICAL APPLICATIONS

- Repairs on a variety of mild and low alloy steel
- Small diameter pipe and tubing
- Sheet metal applications
- Root pass pipe welding

DIAMETERS / PACKAGING

Diameter in (mm)	5 lb (2.3 kg) Plastic Tube 20 lb (9.1 kg) Master Carton	10 lb (4.5 kg) Plastic Tube 30 lb (13.6 kg) Master Carton	50 lb (22.7 kg) Carton
1/16 (1.6)	ED034334	ED034337	ED034340
3/32 (2.4)	ED034335	ED034338	ED034341
1/8 (3.2)	ED034336	ED034339	ED034342
5/32 (4.0)		ED034781	

WIRE COMPOSITION – *As Required per AWS A5.18/A5.18M*

	%C	%Mn	%S	%Si	%P
Requirements - AWS ER70S-6	0.06-0.15	1.40-1.85	0.035 max	0.80-1.15	0.025 max
Typical Results(2)	0.09	<1.60	0.007	0.90	0.007
	%Cu	**%Cr**	**%Ni**	**%Mo**	**%V**
Requirements - AWS ER70S-6	0.50 max	(1)	(1)	(1)	(1)
Typical Results(2)	0.20	0.05	0.05	0.05	0.05

(1)Total 0.50% maximum, combined. (2)See test results disclaimer

Publication C4.10.12 | Issue Date 02/16

THE LINCOLN ELECTRIC COMPANY
22801 St. Clair Avenue ▪ Cleveland, OH ▪ 44117-1199 ▪ U.S.A.
Phone: +1.216.481.8100 ▪ www.lincolnelectric.com

SUPERARC® L-59®

Mild Steel, Copper Coated ▪ AWS ER70S-6

KEY FEATURES

- Engineered alloy system enhances silicon island management
- Minimal spatter
- Copper coated for long contact tip life
- Fast travel speeds
- MicroGuard® Ultra provides superior feeding and arc stability

CONFORMANCES

AWS A5.18/A5.18M:	ER70S-6
ASME SFA-A5.18:	ER70S-6
ABS:	3YSA (100 CO_2 & Mixed)
DNV Grade:	III YMS H5 (Mixed)
BV Grade:	SA3YHHH (Mixed)
CWB/CSA W48-06:	ER49S-6
EN ISO 14341-B:	G 49A 3 C S6

WELDING POSITIONS

All

SHIELDING GAS

100% CO_2
75-95% Argon / Balance CO_2
95-98% Argon / Balance O_2
Flow Rate: 30 - 50 CFH

TYPICAL APPLICATIONS

- Robotic or hard automation
- Automotive
- Pipeline & Offshore
- Pressure vessels
- Heavy fabrication
- Alternative to metal-cored wire

DIAMETERS / PACKAGING

Diameter in (mm)	33 lb (14.9 kg) Plastic Spool	44 lb (20 kg) Fiber Spool	44 lb (20 kg) Steel Spool	60 lb (27.2 kg) Fiber Spool	500 lb (227 kg) Accu-Pak® Box
0.035 (0.9)	ED034270	ED033033	ED032366		ED032894
0.040 (1.0)					ED032895
0.045 (1.1)	ED034271		ED032367		ED032896
0.052 (1.3)	ED034272	ED034430*	ED032368	ED032814	ED032897
1/16 (1.6)	ED034356	ED036220**	ED032968		
Diameter in (mm)	**500 lb (227 kg) Infinity-Pak®**	**900 lb (408 kg) Accu-Pak® Box**	**1000 lb (454 kg) Infinity-Pak®**	**1000 lb (454 kg) Accu-Pak® Box**	**1000 lb (454 kg) Precise-Trak® Reel**
0.035 (0.9)	ED034402	ED032861			
0.040 (1.0)					
0.045 (1.1)			ED033215	ED032863	ED032808
0.052 (1.3)				ED032864, ED034431*	ED032809
1/16 (1.6)				ED032865	

**Buy America Product **Tested Material*

MECHANICAL PROPERTIES[1] – *As Required per AWS A5.18/A5.18M*

	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)	Charpy V-Notch J (ft•lbf) @ -40°C (-40°F)
Requirements - AWS ER70S-6 As-Welded with 100% CO_2	400 (58) min	485 (70) min	22 min	27 (20) min	Not Specified
Typical Results[3]					
As-Welded with 100% CO_2	455 (66)	565 (82)	28	71 (52)	53 (39)
As-Welded with 75% Ar/25% CO_2	485 (70)	595 (86)	25	56 (41)	53 (39)
As-Welded with 90% Ar/10% CO_2	460 (67)	570 (83)	25	75 (55)	65 (48)

[1]Typical all weld metal. [2]Measured with 0.2% offset. [3]See test results disclaimer

WIRE COMPOSITION – *As Required per AWS A5.18/A5.18M*

	%C	%Mn	%Si	%S	%P
Requirements - AWS ER70S-6	0.06-0.15	1.40-1.85	0.80-1.15	0.035 max	0.025 max
	%Cu(4)	%Ni	%Cr	%Mo	%V
Requirements - AWS ER70S-6	0.50 max	0.15 max	0.15 max	0.15 max	0.03 max

TYPICAL OPERATING PROCEDURES

Diameter, Polarity Shielding Gas	CTWD(5) mm (in)	Wire Feed Speed m/min (in/min)	Voltage (volts)	Approx. Current (amps)	Melt-Off Rate kg/hr (lb/hr)
0.035 in (0.9 mm), DC+					
Short Circuit Transfer 75% Ar/25% CO_2 (6)	12 (1/2)	2.5 (100) 3.8 (150) 6.4 (250)	17 18 20	80 120 175	0.7 (1.6) 1.1 (2.4) 1.8 (4.0)
Spray Transfer 90% Ar/10% CO_2	19 (3/4)	9.5 (375) 12.7 (500) 15.2 (600)	23 29 30	195 230 275	2.7 (6.0) 3.6 (8.0) 4.4 (9.6)
0.045 in (1.1 mm), DC+					
Short Circuit Transfer 75% Ar/25% CO_2 (6)	12 (1/2)	3.2 (125) 3.8 (150) 5.1 (200)	18 19 20	145 165 200	1.5 (3.4) 1.8 (4.0) 2.4 (5.4)
Spray Transfer 90% Ar/10% CO_2	19 (3/4)	8.9 (350) 12.1 (475) 12.7 (500)	27 30 30	285 335 340	4.2 (9.2) 5.7 (12.5) 6.0 (13.2)
0.052 in (1.3 mm), DC+					
Spray Transfer 90% Ar/10% CO_2	19 (3/4)	7.6 (300) 8.1 (320) 12.3 (485)	30 30 32	300 320 430	4.8 (10.6) 5.2 (11.5) 7.8 (17.1)
1/16 in (1.6 mm), DC+					
Spray Transfer 90% Ar/10% CO_2	19 (3/4)	5.3 (210) 6.0 (235) 7.4 (290)	25 27 28	325 350 430	4.8 (10.7) 5.4 (12.0) 6.7 (14.8)

(1)Typical all weld metal. (2)Measured with 0.2% offset. (3)See test results disclaimer (4)Copper due to any coating on the electrode plus the copper content of the filler metal itself, shall not exceed the stated 0.50% max. (5)CTWD (Contact Tip to Work Distance). Subtract 1/4 in (6.4 mm) to calculate Electrical Stickout. (6)Procedures in these areas are procedures for short circuiting mode using 75% Argon, 25% CO_2. NOTE: For 100% CO_2 procedures, add 1 to 2 volts for short circuit transfer and 2 to 3 volts for globular transfer.

Material Safety Data Sheets (MSDS) and Certificates of Conformance are available on our website at www.lincolnelectric.com

Publication C4.10.4 | Issue Date 11/16

THE LINCOLN ELECTRIC COMPANY
22801 St. Clair Avenue ▪ Cleveland, OH ▪ 44117-1199 ▪ U.S.A.
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SUPERARC® LA-90™

Low Alloy, Copper Coated ▪ AWS ER80S-D2, ER90S-D2 & EA3K

KEY FEATURES

- Capable of producing weld deposits with 550 - 620 MPa (80 - 90 ksi) tensile strength
- Contains 0.50% molybdenum for strength after stress-relief
- MicroGuard® Ultra provides superior feeding and arc stability
- Supports short-circuiting, globular, axial spray and pulsed spray transfer

WELDING POSITIONS

All

SHIELDING GAS

100% CO_2
75-95% Argon / Balance CO_2
95-98% Argon / Balance O_2
Flow Rate: 30 - 50 CFH

CONFORMANCES

AWS A5.28/A5.28M:	ER80S-D2 (100% CO_2), ER90S-D2 (Mixed)
ASME SFA-A5.28:	ER80S-D2 (100% CO_2), ER90S-D2 (Mixed)
AWS A5.23/A5.23M:	EA3K
CWB/CSA W48-06:	ER55S-D2 (ER80S-D2), ER62S-D2 (ER90S-D2)
EN ISO 16484-B:	G 59A 3 C 4M31
EN ISO 16834-B:	G 62A 3 A 4M31
MIL-E-23765/2:	MIL-80S-3

TYPICAL APPLICATIONS

- Requirements for strength after stress relieving
- ASTM A182, A217, A234 and A335 high temperature service pipe, fittings, flanges and valves
- ASTM A336 pressure vessel forgings

DIAMETERS / PACKAGING

Diameter in (mm)	33 lb (15 kg) Steel Spool	44 lb (20 kg) Steel Spool	44 lb (20 kg) Fiber Spool
0.035 (0.9)	ED031413	EDS30775	ED029546
0.045 (1.1)	ED031414	EDS30776	
0.052 (1.3)		EDS30777	
1/16 (1.6)			

Diameter in (mm)	60 lb (27.2 kg) Coil	60 lb (27.2 kg) Fiber Spool	500 lb (227 kg) Accu-Trak® Drum
0.035 (0.9)			EDS01372
0.045 (1.1)		EDS01380	ED001378
0.052 (1.3)			ED026627
1/16 (1.6)	ED013999		

Diameter in (mm)	500 lb (227 kg) Accu-Pak® Box	1000 lb (454 kg) Accu-Trak® Drum	1000 lb (454 kg) Accu-Pak® Box	1000 lb (454 kg) Infinity-Pak®
0.035 (0.9)		EDS29590		
0.045 (1.1)	ED032919	ED029591	ED034436	
0.052 (1.3)	ED032920	EDS29592		ED034955
1/16 (1.6)				

MECHANICAL PROPERTIES[1] *– As Required per AWS A5.28/A5.28M*

	Yield Strength[2] MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Charpy V-Notch J (ft•lbf) @ -29°C (-20°F)	Charpy V-Notch J (ft•lbf) @ -40°C (-40°F)
Requirements - AWS ER80S-D2					
As-Welded with 100% CO_2	470 (68) min	550 (80) min	17 min	27 (20) min	Not Specified
AWS ER90S-D2					
As-Welded with 95-99% Ar/Balance O_2	540 (78) min	620 (90) min	17 min	27 (20) min	Not Specified
Typical Results[3]					
As-Welded with 100% CO_2	560 (81)	655 (95)	23	36 (26)	- -
As-Welded with 95% Ar/5% O_2	650 (94)	730 (106)	25	125 (92)	- -
As-Welded with 75% Ar/25% CO_2	620 (90)	705 (102)	26	124 (91)	122 (90)

[1]Typical all weld metal. [2]Measured with 0.2% offset. [3]See test results disclaimer

WIRE COMPOSITION – *As Required per AWS A5.28/A5.28M*

	%C	%Mn	%Si	%Ni
Requirements - AWS ER80S-D2, ER90S-D2	0.07-0.12	1.60-2.10	0.50-0.80	0.15 max
Typical Results[3]	0.09-0.11	1.63-1.74	0.56-0.64	≤ 0.04
	%Mo	**%S**	**%P**	**%Cu (Total)**[4]
Requirements - AWS ER80S-D2, ER90S-D2	0.40-0.60	0.025 max	0.025 max	0.50 max
Typical Results[3]	0.43-0.46	≤ 0.010	0.007-0.016	0.16-0.22

TYPICAL OPERATING PROCEDURES

Diameter, Polarity Shielding Gas	CTWD[5] mm (in)	Wire Feed Speed m/min (in/min)	Voltage (volts)	Approx. Current (amps)	Melt-Off Rate kg/hr (lb/hr)
0.035 in (0.9 mm), DC+					
Short Circuit Transfer 75% Ar/25% CO_2 [6]	9-12 (3/8-1/2)	2.5 (100) 3.8 (150) 6.4 (250)	18 19 22	80 120 175	0.7 (1.6) 1.1 (2.4) 1.8 (4.0)
Spray Transfer 90% Ar/10% CO_2	12-19 (1/2-3/4)	9.5 (375) 12.7 (500) 15.2 (600)	23 29 30	195 230 275	2.7 (6.0) 3.6 (8.0) 4.4 (9.6)
0.045 in (1.1 mm), DC+					
Short Circuit Transfer 75% Ar/25% CO_2 [6]	12-19 (1/2-3/4)	3.2 (125) 3.8 (150) 5.1 (200)	19 20 21	145 165 200	1.5 (3.4) 1.8 (4.0) 2.5 (5.4)
Spray Transfer 90% Ar/10% CO_2	12-19 (1/2-3/4)	8.9 (350) 12.1 (475) 12.7 (500)	27 30 30	285 335 340	4.2 (9.2) 5.7 (12.5) 6.0 (13.2)
0.052 in (1.3 mm), DC+					
Spray Transfer 90% Ar/10% CO_2	12-19 (1/2-3/4)	7.6 (300) 8.1 (320) 12.3 (485)	30 30 32	300 320 430	4.8 (10.6) 5.2 (11.5) 7.8 (17.1)
1/16 in (1.6 mm), DC+					
Spray Transfer 90% Ar/10% CO_2	12-25 (1/2-1)	5.3 (210) 6.0 (235) 7.4 (290)	25 27 28	325 350 430	4.8 (10.7) 5.4 (12.0) 6.7 (14.8)

[1]Typical all weld metal. [2]Measured with 0.2% offset. [3]See test results disclaimer [4]Copper due to any coating on the electrode plus the copper content of the filler metal itself, shall not exceed the stated 0.50% max. [5]CTWD (Contact Tip to Work Distance). Subtract 1/4 in (6.4 mm) to calculate Electrical Stickout. [6]Procedures in these areas are procedures for short circuiting mode using 75% Argon, 25% CO_2. NOTE: For 100% CO_2 p rocedures, add 1 to 2 volts for short circuit transfer and 2 to 3 volts for globular transfer.

Material Safety Data Sheets (MSDS) and Certificates of Conformance are available on our website at www.lincolnelectric.com

Publication C4.10.7 | Issue Date 06/16

THE LINCOLN ELECTRIC COMPANY
22801 St. Clair Avenue ▪ Cleveland, OH ▪ 44117-1199 ▪ U.S.A.
Phone: +1.216.481.8100 ▪ www.lincolnelectric.com

SUPERGLAZE® 4043

Aluminum ▪ AWS ER4043

KEY FEATURES

- Use on many weldable cast and wrought aluminum alloys
- Generally recommended for welding 5052, any 6XXX series alloys and castings
- Embossed on each end for easy identification after use

WELDING POSITIONS

All

NOTE

- Typical Operating Procedures on pg. I-15 - I-16

CONFORMANCES

SFA/AWS A5.10/A5.10M:	ER4043
ASME SFA-A5.10:	ER4043
AMS4190K: *(Chemistry Only)*	5.2Si (4043)

TYPICAL APPLICATIONS

- Bicycle frames
- Pressure vessels

DIAMETERS / PACKAGING

Diameter in (mm)	10 lb (4.5 kg) Carton
1/16 (1.6)	ED031111
3/32 (2.4)	ED031112
1/8 (3.2)	ED031113

WIRE COMPOSITION[1] – *As Required per SFA/AWS A5.10/A5.10M*

	%Al	%Si	%Fe	%Cu	%Mn
Requirements - AWS ER4043	Remainder	4.50-6.00	0.80 max	0.30 max	0.05 max
Typical Results[2]	Remainder	5.01	0.13	0.008	0.009
	%Mg	**%Cr**	**%Zn**	**%Ti**	**%Be**
Requirements - AWS ER4043	0.05 max	Not Specified	0.10 max	0.20 max	0.0003 max
Typical Results[2]	0.03	—	0.002	0.007	0.0002

[1]Typical all weld metal. [2]See test results disclaimer

Material Safety Data Sheets (MSDS) and Certificates of Conformance are available on our website at www.lincolnelectric.com

TEST RESULTS

Test results for mechanical properties, deposit or electrode composition and diffusible hydrogen levels were obtained from a weld produced and tested according to prescribed standards, and should not be assumed to be the expected results in a particular application or weldment. Actual results will vary depending on many factors, including, but not limited to, weld procedure, plate chemistry and temperature, weldment design and fabrication methods. Users are cautioned to confirm by qualification testing, or other appropriate means, the suitability of any welding consumable and procedure before use in the intended application.

CUSTOMER ASSISTANCE POLICY

The Lincoln Electric Company is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for information or advice about their use of our products. Our employees respond to inquiries to the best of their ability based on information provided to them by the customers and the knowledge they may have concerning the application. Our employees, however, are not in a position to verify the information provided or to evaluate the engineering requirements for the particular weldment. Accordingly, Lincoln Electric does not warrant or guarantee or assume any liability with respect to such information or advice. Moreover, the provision of such information or advice does not create, expand, or alter any warranty on our products. Any express or implied warranty that might arise from the information or advice, including any implied warranty of merchantability or any warranty of fitness for any customers' particular purpose is specifically disclaimed.

Lincoln Electric is a responsive manufacturer, but the selection and use of specific products sold by Lincoln Electric is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond the control of Lincoln Electric affect the results obtained in applying these types of fabrication methods and service requirements.

Subject to Change – This information is accurate to the best of our knowledge at the time of printing. Please refer to www.lincolnelectric.com for any updated information.

Publication C8.05.7 | Issue Date 03/17

THE LINCOLN ELECTRIC COMPANY
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MATERIAL SAFETY DATA SHEET

E90W501
14 00

DATE OF PREPARATION
Aug 9, 2017

SECTION 1 — PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NUMBER
E90W501
PRODUCT NAME
MIL-DTL-53030D Type II Two Component Waterborne Epoxy Primer, Off White Q1917
MANUFACTURER'S NAME
THE SHERWIN-WILLIAMS CO.
101 W. Prospect Avenue
Cleveland, OH 44115

Telephone Numbers and Websites

Regulatory Information	(216) 566-2902
Medical Emergency	(216) 566-2917
Transportation Emergency*	(800) 424-9300
**for Chemical Emergency ONLY (spill, leak, fire, exposure, or accident)*	

SECTION 2 — COMPOSITION/INFORMATION ON INGREDIENTS

% by Weight	CAS Number	Ingredient	Units		Vapor Pressure
3	**107-98-2**	**1-Methoxy-2-propanol**			
		ACGIH TLV	100	PPM	10.9 mm
		ACGIH TLV	150	PPM STEL	
		OSHA PEL	100	PPM	
		OSHA PEL	150	PPM STEL	
2	**1569-01-3**	**1-Propoxy-2-propanol**			
		ACGIH TLV		Not Available	1.7 mm
		OSHA PEL		Not Available	
2	**123-42-2**	**Diacetone Alcohol**			
		ACGIH TLV	50	PPM	1.2 mm
		OSHA PEL	50	PPM	
21	**25036-25-3**	**Epoxy Polymer**			
		ACGIH TLV		Not Available	
		OSHA PEL		Not Available	
4	**7727-43-7**	**Barium Sulfate**			
		ACGIH TLV	10	mg/m3 as Dust	
		OSHA PEL	10	mg/m3 Total Dust	
		OSHA PEL	5	mg/m3 Respirable Fraction	
0.3	**14808-60-7**	**Crystalline Silica, respirable powder**			
		ACGIH TLV	0.025	mg/m3 as Resp. Dust	
		OSHA PEL	0.1	mg/m3 as Resp. Dust	
1	**Proprietary**	**Silane Hydrolysis Products with Silica**			
		ACGIH TLV	10	mg/m3 as Dust	
		OSHA PEL	6	mg/m3 as Dust	
3	**12001-26-2**	**Mica**			
		ACGIH TLV	3	mg/m3 as Resp. Dust	
		OSHA PEL	3	mg/m3 as Resp. Dust	
14	**13463-67-7**	**Titanium Dioxide**			
		ACGIH TLV	10	mg/m3 as Dust	
		OSHA PEL	10	mg/m3 Total Dust	
		OSHA PEL	5	mg/m3 Respirable Fraction	
2	**1314-13-2**	**Zinc Oxide**			
		ACGIH TLV		Not Available	
		OSHA PEL		Not Available	

SECTION 3 — HAZARDS IDENTIFICATION

HMIS Codes	
Health	2*
Flammability	0
Reactivity	0

ROUTES OF EXPOSURE
INHALATION of vapor or spray mist.
EYE or SKIN contact with the product, vapor or spray mist.

EFFECTS OF OVEREXPOSURE
EYES: Irritation.
SKIN: Prolonged or repeated exposure may cause irritation.
INHALATION: Irritation of the upper respiratory system.

In a confined area vapors in high concentration may cause headache, nausea or dizziness.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
Redness and itching or burning sensation may indicate eye or excessive skin exposure.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
May cause allergic skin reaction in susceptible persons or skin sensitization.

CANCER INFORMATION
For complete discussion of toxicology data refer to Section 11.

SECTION 4 — FIRST AID MEASURES

EYES: Flush eyes with large amounts of water for 15 minutes. Get medical attention.
SKIN: Wash affected area thoroughly with soap and water.
If irritation persists or occurs later, get medical attention.
Remove contaminated clothing and launder before re-use.
INHALATION: If affected, remove from exposure. Restore breathing. Keep warm and quiet.
INGESTION: Do not induce vomiting. Get medical attention immediately.

SECTION 5 — FIRE FIGHTING MEASURES

FLASH POINT	LEL	UEL	FLAMMABILITY CLASSIFICATION
> 200 °F PMCC	Not Applicable	Not Applicable	Not Applicable

EXTINGUISHING MEDIA
Carbon Dioxide, Dry Chemical, Alcohol Foam

UNUSUAL FIRE AND EXPLOSION HAZARDS
Closed containers may explode (due to the build-up of pressure) when exposed to extreme heat.
During emergency conditions overexposure to decomposition products may cause a health hazard. Symptoms may not be immediately apparent. Obtain medical attention.

SPECIAL FIRE FIGHTING PROCEDURES
Full protective equipment including self-contained breathing apparatus should be used.
Water spray may be ineffective. If water is used, fog nozzles are preferable. Water may be used to cool closed containers to prevent pressure build-up and possible autoignition or explosion when exposed to extreme heat.

SECTION 6 — ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Remove all sources of ignition. Ventilate the area.
Remove with inert absorbent.

SECTION 7 — HANDLING AND STORAGE

STORAGE CATEGORY
DOL Storage Class IIIB

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE
Keep container closed when not in use. Transfer only to approved containers with complete and appropriate labeling. Do not take internally. Keep out of the reach of children.

SECTION 8 — EXPOSURE CONTROLS/PERSONAL PROTECTION

PRECAUTIONS TO BE TAKEN IN USE
Use only with adequate ventilation.
Avoid contact with skin and eyes. Avoid breathing vapor and spray mist.
Wash hands after using.
This coating may contain materials classified as nuisance particulates (listed "as Dust" in Section 2) which may be present at hazardous levels only during sanding or abrading of the dried film. If no specific dusts are listed in Section 2, the applicable limits for nuisance dusts are ACGIH TLV 10 mg/m3 (total dust), 3 mg/m3 (respirable fraction), OSHA PEL 15 mg/m3 (total dust), 5 mg/m3 (respirable fraction).

VENTILATION
Local exhaust preferable. General exhaust acceptable if the exposure to materials in Section 2 is maintained below applicable exposure limits. Refer to OSHA Standards 1910.94, 1910.107, 1910.108.

RESPIRATORY PROTECTION

If personal exposure cannot be controlled below applicable limits by ventilation, wear a properly fitted organic vapor/particulate respirator approved by NIOSH/MSHA for protection against materials in Section 2.

When sanding or abrading the dried film, wear a dust/mist respirator approved by NIOSH/MSHA for dust which may be generated from this product, underlying paint, or the abrasive.

PROTECTIVE GLOVES

Wear gloves which are recommended by glove supplier for protection against materials in Section 2.

EYE PROTECTION

Wear safety spectacles with unperforated sideshields.

OTHER PROTECTIVE EQUIPMENT

Use of barrier cream on exposed skin is recommended.

OTHER PRECAUTIONS

This product must be mixed with other components before use. Before opening the packages, READ AND FOLLOW WARNING LABELS ON ALL COMPONENTS.

SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES

PRODUCT WEIGHT	11.96 lb/gal	1432 g/l
SPECIFIC GRAVITY	1.44	
BOILING POINT	212 - 342 °F	100 - 172 °C
MELTING POINT	Not Available	
VOLATILE VOLUME	57%	
EVAPORATION RATE	Slower than ether	
VAPOR DENSITY	Heavier than air	
SOLUBILITY IN WATER	Not Available	
pH	> 2.0, < 11.5	

VOLATILE ORGANIC COMPOUNDS (VOC Theoretical - As Packaged)

1.58 lb/gal	190 g/l	Less Water and Federally Exempt Solvents
0.85 lb/gal	102 g/l	Emitted VOC

VOLATILE ORGANIC COMPOUNDS (VOC - As Applied)

<2.79 lb/gal	<335 g/l	Less Water and Federally Exempt Solvents

SECTION 10 — STABILITY AND REACTIVITY

STABILITY — Stable

CONDITIONS TO AVOID

None known.

INCOMPATIBILITY

None known.

HAZARDOUS DECOMPOSITION PRODUCTS

By fire: Carbon Dioxide, Carbon Monoxide , Phosphoric Acid Fumes, Oxides of Phosphorus

HAZARDOUS POLYMERIZATION

Will not occur

SECTION 11 — TOXICOLOGICAL INFORMATION

CHRONIC HEALTH HAZARDS

Crystalline Silica (Quartz, Cristobalite) is listed by IARC and NTP. Long term exposure to high levels of silica dust, which can occur only when sanding or abrading the dry film, may cause lung damage (silicosis) and possibly cancer.

IARC's Monograph No. 93 reports there is sufficient evidence of carcinogenicity in experimental rats exposed to titanium dioxide but inadequate evidence for carcinogenicity in humans and has assigned a Group 2B rating. In addition, the IARC summary concludes, "No significant exposure to titanium dioxide is thought to occur during the use of products in which titanium is bound to other materials, such as paint."

TOXICOLOGY DATA

CAS No.	Ingredient Name			
107-98-2	**1-Methoxy-2-propanol**			
		LC50 RAT	4HR	Not Available
		LD50 RAT		6600 mg/kg
1569-01-3	**1-Propoxy-2-propanol**			
		LC50 RAT	4HR	Not Available
		LD50 RAT		2800 mg/kg
123-42-2	**Diacetone Alcohol**			
		LC50 RAT	4HR	Not Available
		LD50 RAT		4000. mg/kg
25036-25-3	**Epoxy Polymer**			
		LC50 RAT	4HR	Not Available
		LD50 RAT		Not Available
7727-43-7	**Barium Sulfate**			
		LC50 RAT	4HR	Not Available
		LD50 RAT		Not Available
14808-60-7	**Crystalline Silica, respirable powder**			
		LC50 RAT	4HR	Not Available
		LD50 RAT		Not Available
Proprietary	**Silane Hydrolysis Products with Silica**			
		LC50 RAT	4HR	Not Available
		LD50 RAT		Not Available
12001-26-2	**Mica**			
		LC50 RAT	4HR	Not Available
		LD50 RAT		Not Available
13463-67-7	**Titanium Dioxide**			
		LC50 RAT	4HR	Not Available
		LD50 RAT		Not Available
1314-13-2	**Zinc Oxide**			
		LC50 RAT	4HR	Not Available
		LD50 RAT		Not Available

SECTION 12 — ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION

No data available.

SECTION 13 — DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD

Waste from this product is not hazardous as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR 261.

Incinerate in approved facility. Do not incinerate closed container. Dispose of in accordance with Federal, State/Provincial, and Local regulations regarding pollution.

SECTION 14 — TRANSPORT INFORMATION

Multi-modal shipping descriptions are provided for informational purposes and do not consider container sizes. The presence of a shipping description for a particular mode of transport (ocean, air, etc.), does not indicate that the product is packaged suitably for that mode of transport. All packaging must be reviewed for suitability prior to shipment, and compliance with the applicable regulations is the sole responsibility of the person offering the product for transport.

US Ground (DOT)

Not Regulated for Transportation.

Canada (TDG)

Not Regulated for Transportation.

IMO

UN3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S. (ZINC OXIDE), 9, PG III, MARINE POLLUTANT, EmS F-A, S-F, ** DO NOT FREEZE **

IMO

UN3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S. (ZINC OXIDE, TITANIUM DIOXIDE), 9, PG III, MARINE POLLUTANT, EmS F-A, S-F, ** DO NOT FREEZE **

IATA/ICAO

Not Regulated for Transportation.

SECTION 15 — REGULATORY INFORMATION

SARA 313 *(40 CFR 372.65C)* SUPPLIER NOTIFICATION

CAS No.	CHEMICAL/COMPOUND	% by WT	% Element
	Zinc Compound	3	1.7

CALIFORNIA PROPOSITION 65

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

TSCA CERTIFICATION

All chemicals in this product are listed, or are exempt from listing, on the TSCA Inventory.

SECTION 16 — OTHER INFORMATION

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

The above information pertains to this product as currently formulated, and is based on the information available at this time. Addition of reducers or other additives to this product may substantially alter the composition and hazards of the product. Since conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information.

SAFETY DATA SHEET

V93V00505

Section 1. Identification

Product name : V93V00505 MIL-DTL-53030D 2K WATERBORNE EPOXY PRIMER HAPS FREE CATALYST

Product code : V93V00505

Other means of identification : Not available.

Product type : Liquid.

Relevant identified uses of the substance or mixture and uses advised against

Not applicable.

Manufacturer : THE SHERWIN-WILLIAMS COMPANY
101 W. Prospect Avenue
Cleveland, OH 44115

Emergency telephone number of the company : US / Canada: (216) 566-2917
Mexico: SETIQ 01-800-00-214-00 / (52) 55-5559-1588 24 hours / 365 days a year

Product Information Telephone Number : US / Canada: Not Available
Mexico: Not Available

Regulatory Information Telephone Number : US / Canada: (216) 566-2902
Mexico: Not Available

Transportation Emergency Telephone Number : US / Canada: (216) 566-2917
Mexico: SETIQ 01-800-00-214-00 / (52) 55-5559-1588 24 hours / 365 days a year

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 2
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
SKIN SENSITIZATION - Category 1
TOXIC TO REPRODUCTION (Fertility) - Category 2
TOXIC TO REPRODUCTION (Unborn child) - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2

Percentage of the mixture consisting of ingredient(s) of unknown oral toxicity: 14%
Percentage of the mixture consisting of ingredient(s) of unknown dermal toxicity: 17.1%
Percentage of the mixture consisting of ingredient(s) of unknown inhalation toxicity: 81.6%

GHS label elements

Hazard pictograms :

Signal word : Danger

Section 2. Hazards identification

Hazard statements : Highly flammable liquid and vapor.
Causes serious eye damage.
Causes skin irritation.
May cause an allergic skin reaction.
Suspected of damaging fertility or the unborn child.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May cause damage to organs through prolonged or repeated exposure.

Precautionary statements

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Use only outdoors or in a well-ventilated area. Do not breathe vapor. Wash hands thoroughly after handling. Contaminated work clothing must not be allowed out of the workplace.

Response : Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF ON SKIN: Wash with plenty of soap and water. Wash contaminated clothing before reuse. If skin irritation or rash occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.

Storage : Store locked up. Store in a well-ventilated place. Keep cool.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements

DELAYED EFFECTS FROM LONG TERM OVEREXPOSURE. Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal. FOR INDUSTRIAL USE ONLY. This product must be mixed with other components before use. Before opening the packages, READ AND FOLLOW WARNING LABELS ON ALL COMPONENTS.

This product contains a Significant New Use Rule (SNUR) Chemical. Do not allow this product to enter drains, sewers, wastewater treatment systems, groundwater, streams, lakes or ponds. See Environmental Data Sheet (EDS) for additional details.

Please refer to the SDS for additional information. Keep out of reach of children. Do not transfer contents to other containers for storage.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Not available.

CAS number/other identifiers

Ingredient name	% by weight	CAS number
2-Propanol	≥50 - ≤75	67-63-0
Polyamide	≥10 - ≤25	68410-23-1
Phenylmethanol	≤10	100-51-6
1-Methoxy-2-propanol	≤5	107-98-2
4-Nonylphenol	≤3.2	84852-15-3
Triethyoxysilyl Propylamine	≤1.7	919-30-2

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

Section 3. Composition/information on ingredients

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact	: Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.
Inhalation	: Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
Skin contact	: Get medical attention immediately. Call a poison center or physician. Wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.
Ingestion	: Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact	: Causes serious eye damage.
Inhalation	: Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. May cause respiratory irritation.
Skin contact	: Causes skin irritation. May cause an allergic skin reaction.
Ingestion	: Can cause central nervous system (CNS) depression.

Over-exposure signs/symptoms

Eye contact	: Adverse symptoms may include the following: pain watering redness
Inhalation	: Adverse symptoms may include the following: respiratory tract irritation coughing nausea or vomiting headache drowsiness/fatigue dizziness/vertigo unconsciousness

Section 4. First aid measures

	reduced fetal weight increase in fetal deaths skeletal malformations
Skin contact	: Adverse symptoms may include the following: pain or irritation redness blistering may occur reduced fetal weight increase in fetal deaths skeletal malformations
Ingestion	: Adverse symptoms may include the following: stomach pains reduced fetal weight increase in fetal deaths skeletal malformations

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	: In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
Specific treatments	: No specific treatment.
Protection of first-aiders	: No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media	: Use dry chemical, CO_2, water spray (fog) or foam.
Unsuitable extinguishing media	: Do not use water jet.
Specific hazards arising from the chemical	: Highly flammable liquid and vapor. Runoff to sewer may create fire or explosion hazard. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back.
Hazardous thermal decomposition products	: Decomposition products may include the following materials: carbon dioxide carbon monoxide nitrogen oxides metal oxide/oxides
Special protective actions for fire-fighters	: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
Special protective equipment for fire-fighters	: Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : **This product contains a Significant New Use Rule (SNUR) Chemical. Do not allow this product to enter drains, sewers, wastewater treatment systems, groundwater, streams, lakes or ponds. See Environmental Data Sheet (EDS) for additional details.**

Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Avoid exposure - obtain special instructions before use. Avoid exposure during pregnancy. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Section 7. Handling and storage

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits (OSHA United States)

Ingredient name	Exposure limits
2-Propanol	**ACGIH TLV (United States, 3/2017).** TWA: 200 ppm 8 hours. STEL: 400 ppm 15 minutes. **NIOSH REL (United States, 10/2016).** TWA: 400 ppm 10 hours. TWA: 980 mg/m³ 10 hours. STEL: 500 ppm 15 minutes. STEL: 1225 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 400 ppm 8 hours. TWA: 980 mg/m³ 8 hours.
Polyamide	None.
Phenylmethanol	**AIHA WEEL (United States, 10/2011).** TWA: 10 ppm 8 hours.
1-Methoxy-2-propanol	**ACGIH TLV (United States, 3/2017).** TWA: 50 ppm 8 hours. TWA: 184 mg/m³ 8 hours. STEL: 100 ppm 15 minutes. STEL: 369 mg/m³ 15 minutes. **NIOSH REL (United States, 10/2016).** TWA: 100 ppm 10 hours. TWA: 360 mg/m³ 10 hours. STEL: 150 ppm 15 minutes. STEL: 540 mg/m³ 15 minutes.
4-Nonylphenol	None.
Triethyoxysilyl Propylamine	None.

Occupational exposure limits (Canada)

Ingredient name	Exposure limits
2-Propanol	**CA Alberta Provincial (Canada, 4/2009).** 15 min OEL: 984 mg/m³ 15 minutes. 8 hrs OEL: 200 ppm 8 hours. 15 min OEL: 400 ppm 15 minutes. 8 hrs OEL: 492 mg/m³ 8 hours. **CA British Columbia Provincial (Canada, 6/2017).** TWA: 200 ppm 8 hours. STEL: 400 ppm 15 minutes. **CA Ontario Provincial (Canada, 7/2015).** TWA: 200 ppm 8 hours. STEL: 400 ppm 15 minutes. **CA Quebec Provincial (Canada, 1/2014).** TWAEV: 400 ppm 8 hours. TWAEV: 983 mg/m³ 8 hours. STEV: 500 ppm 15 minutes. STEV: 1230 mg/m³ 15 minutes.

	CA Saskatchewan Provincial (Canada, 7/2013). STEL: 400 ppm 15 minutes. TWA: 200 ppm 8 hours.
benzyl alcohol	**AIHA WEEL (United States, 10/2011).** TWA: 10 ppm 8 hours.
1-Methoxy-2-propanol	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 100 ppm 8 hours. 15 min OEL: 553 mg/m³ 15 minutes. 8 hrs OEL: 369 mg/m³ 8 hours. 15 min OEL: 150 ppm 15 minutes. **CA British Columbia Provincial (Canada, 6/2017).** STEL: 75 ppm 15 minutes. TWA: 50 ppm 8 hours. **CA Ontario Provincial (Canada, 7/2015).** TWA: 50 ppm 8 hours. STEL: 100 ppm 15 minutes. **CA Quebec Provincial (Canada, 1/2014).** TWAEV: 100 ppm 8 hours. TWAEV: 369 mg/m³ 8 hours. STEV: 150 ppm 15 minutes. STEV: 553 mg/m³ 15 minutes. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 150 ppm 15 minutes. TWA: 100 ppm 8 hours.

Occupational exposure limits (Mexico)

Ingredient name	Exposure limits
2-Propanol	**NOM-010-STPS-2014 (Mexico, 4/2016).** TWA: 200 ppm 8 hours. STEL: 400 ppm 15 minutes.
1-Methoxy-2-propanol	**NOM-010-STPS-2014 (Mexico, 4/2016).** STEL: 150 ppm 15 minutes. TWA: 100 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : **This product contains a Significant New Use Rule (SNUR) Chemical. Do not allow this product to enter drains, sewers, wastewater treatment systems, groundwater, streams, lakes or ponds. See Environmental Data Sheet (EDS) for additional details.**

Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 8. Exposure controls/personal protection

Eye/face protection	: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/ or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
Skin protection	
Hand protection	: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Body protection	: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
Other skin protection	: Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory protection	: Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance	
Physical state	: Liquid.
Color	: Not available.
Odor	: Not available.
Odor threshold	: Not available.
pH	: Not available.
Melting point/freezing point	: Not available.
Boiling point/boiling range	: 81°C (177.8°F)
Flash point	: Closed cup: 10°C (50°F) [Pensky-Martens Closed Cup]
Evaporation rate	: 1.44 (butyl acetate = 1)
Flammability (solid, gas)	: Not available.
Lower and upper explosive (flammable) limits	: Lower: 1.3% Upper: 13.74%
Vapor pressure	: 4.4 kPa (33 mm Hg) [at 20°C]
Vapor density	: 2.07 [Air = 1]
Relative density	: 0.85
Solubility	: Not available.
Partition coefficient: n-octanol/water	: Not available.
Auto-ignition temperature	: Not available.
Decomposition temperature	: Not available.
Viscosity	: Kinematic (40°C (104°F)): >0.205 cm^2/s (>20.5 cSt)
Molecular weight	: Not applicable.
Aerosol product	
Heat of combustion	: 25.663 kJ/g

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

Incompatible materials : Reactive or incompatible with the following materials: oxidizing materials

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
2-Propanol	LD50 Dermal	Rabbit	12800 mg/kg	-
	LD50 Oral	Rat	5000 mg/kg	-
Phenylmethanol	LD50 Dermal	Rabbit	2000 mg/kg	-
	LD50 Oral	Rat	1230 mg/kg	-
1-Methoxy-2-propanol	LD50 Dermal	Rabbit	13 g/kg	-
	LD50 Oral	Rat	6600 mg/kg	-
4-Nonylphenol	LD50 Oral	Rat	1300 mg/kg	-
Triethyoxysilyl Propylamine	LD50 Dermal	Rabbit	4.29 g/kg	-
	LD50 Oral	Rat	1.57 g/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
2-Propanol	Eyes - Moderate irritant	Rabbit	-	24 hours 100 milligrams	-
	Eyes - Moderate irritant	Rabbit	-	10 milligrams	-
	Eyes - Severe irritant	Rabbit	-	100 milligrams	-
	Skin - Mild irritant	Rabbit	-	500 milligrams	-
Phenylmethanol	Skin - Mild irritant	Man	-	48 hours 16 milligrams	-
	Skin - Moderate irritant	Pig	-	100 Percent	-
	Skin - Moderate irritant	Rabbit	-	24 hours 100 milligrams	-
1-Methoxy-2-propanol	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Mild irritant	Rabbit	-	500 milligrams	-
4-Nonylphenol	Eyes - Severe irritant	Rabbit	-	100 milligrams	-
	Skin - Severe irritant	Rabbit	-	24 hours 500 milligrams	-
Triethyoxysilyl Propylamine	Eyes - Mild irritant	Rabbit	-	100 milligrams	-
	Eyes - Severe irritant	Rabbit	-	24 hours 750 Micrograms	-

Section 11. Toxicological information

	Skin - Severe irritant	Rabbit	-	24 hours 5 milligrams	-

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
2-Propanol	-	3	-

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
2-Propanol	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
Phenylmethanol	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
1-Methoxy-2-propanol	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
2-Propanol	Category 2	Not determined	Not determined
Phenylmethanol	Category 2	Not determined	Not determined
1-Methoxy-2-propanol	Category 2	Not determined	Not determined

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. May cause respiratory irritation.

Skin contact : Causes skin irritation. May cause an allergic skin reaction.

Ingestion : Can cause central nervous system (CNS) depression.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact	:	Adverse symptoms may include the following: pain watering redness
Inhalation	:	Adverse symptoms may include the following: respiratory tract irritation coughing nausea or vomiting headache drowsiness/fatigue dizziness/vertigo unconsciousness reduced fetal weight increase in fetal deaths skeletal malformations
Skin contact	:	Adverse symptoms may include the following: pain or irritation redness blistering may occur reduced fetal weight increase in fetal deaths skeletal malformations
Ingestion	:	Adverse symptoms may include the following: stomach pains reduced fetal weight increase in fetal deaths skeletal malformations

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General	:	May cause damage to organs through prolonged or repeated exposure. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.
Carcinogenicity	:	No known significant effects or critical hazards.
Mutagenicity	:	No known significant effects or critical hazards.
Teratogenicity	:	Suspected of damaging the unborn child.
Developmental effects	:	No known significant effects or critical hazards.
Fertility effects	:	Suspected of damaging fertility.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Oral	3714.3 mg/kg
Dermal	15694 mg/kg
Inhalation (vapors)	20.69 mg/l

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
2-Propanol	Acute EC50 10100 mg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 1400000 µg/l Marine water	Crustaceans - Crangon crangon	48 hours
	Acute LC50 4200 mg/l Fresh water	Fish - Rasbora heteromorpha	96 hours
Phenylmethanol	Acute LC50 10000 µg/l Fresh water	Fish - Lepomis macrochirus	96 hours
4-Nonylphenol	Acute EC50 0.03 mg/l Marine water	Algae - Skeletonema costatum	72 hours
	Acute EC50 0.027 mg/l Marine water	Algae - Skeletonema costatum	96 hours
	Acute EC50 137 µg/l Marine water	Crustaceans - Eohaustorius estuarius - Adult	48 hours
	Acute LC50 17 µg/l Marine water	Fish - Pleuronectes americanus - Larvae	96 hours
	Chronic EC10 0.012 mg/l Marine water	Algae - Skeletonema costatum	96 hours
	Chronic NOEC 5 µg/l Fresh water	Crustaceans - Gammarus fossarum - Adult	21 days
	Chronic NOEC 7.4 µg/l Fresh water	Fish - Pimephales promelas - Embryo	33 days

Persistence and degradability

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
2-Propanol	-	-	Readily
Phenylmethanol	-	-	Readily

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
4-Nonylphenol	-	740	high
Triethyoxysilyl Propylamine	-	3.4	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : **This product contains a Significant New Use Rule (SNUR) Chemical. Do not allow this product to enter drains, sewers, wastewater treatment systems, groundwater, streams, lakes or ponds. See Environmental Data Sheet (EDS) for additional details.**

The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	TDG Classification	Mexico Classification	IATA	IMDG
UN number	UN2924	UN2924	UN2924	UN2924	UN2924
UN proper shipping name	FLAMMABLE LIQUID, CORROSIVE, N. O.S. (2-Propanol)	FLAMMABLE LIQUID, CORROSIVE, N. O.S. (2-Propanol)	FLAMMABLE LIQUID, CORROSIVE, N. O.S. (2-Propanol)	FLAMMABLE LIQUID, CORROSIVE, N. O.S. (2-Propanol)	FLAMMABLE LIQUID, CORROSIVE, N. O.S. (2-Propanol)
Transport hazard class(es)	3 (8)	3 (8)	3 (8)	3 (8)	3 (8)
Packing group	II	II	II	II	II
Environmental hazards	No.	No.	No.	No.	No.
Additional information	- **ERG No.** 132	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2. 18-2.19 (Class 3), 2.40-2.42 (Class 8). **ERG No.** 132	- **ERG No.** 132	-	**Emergency schedules** F-E, S-C

Special precautions for user : Multi-modal shipping descriptions are provided for informational purposes and do not consider container sizes. The presence of a shipping description for a particular mode of transport (sea, air, etc.), does not indicate that the product is packaged suitably for that mode of transport. All packaging must be reviewed for suitability prior to shipment, and compliance with the applicable regulations is the sole responsibility of the person offering the product for transport. People loading and unloading dangerous goods must be trained on all of the risks deriving from the substances and on all actions in case of emergency situations.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Proper shipping name : Not available.
Ship type : Not available.
Pollution category : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 5(a)2 final significant new use rules**: 4-Nonylphenol

This product contains a Significant New Use Rule (SNUR) Chemical. Do not allow this product to enter drains, sewers, wastewater treatment systems, groundwater, streams, lakes or ponds. See Environmental Data Sheet (EDS) for additional details.

SARA 313

SARA 313 (40 CFR 372.45) supplier notification can be found on the Environmental Data Sheet.

California Prop. 65

Not applicable.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health	*	3
Flammability		3
Physical hazards		0

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

Procedure used to derive the classification

Classification	Justification
FLAMMABLE LIQUIDS - Category 2	On basis of test data
SKIN CORROSION/IRRITATION - Category 2	Calculation method
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1	Calculation method
SKIN SENSITIZATION - Category 1	Calculation method
TOXIC TO REPRODUCTION (Fertility) - Category 2	Calculation method
TOXIC TO REPRODUCTION (Unborn child) - Category 2	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2	Calculation method

History

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Version : 10

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Notice to reader

Section 16. Other information

It is recommended that each customer or recipient of this Safety Data Sheet (SDS) study it carefully and consult resources, as necessary or appropriate, to become aware of and understand the data contained in this SDS and any hazards associated with the product. This information is provided in good faith and believed to be accurate as of the effective date herein. However, no warranty, express or implied, is given. The information presented here applies only to the product as shipped. The addition of any material can change the composition, hazards and risks of the product. Products shall not be repackaged, modified, or tinted except as specifically instructed by Sherwin-Williams, including but not limited to the incorporation of non Sherwin-Williams products or the use or addition of products in proportions not specified by Sherwin-Williams. Regulatory requirements are subject to change and may differ between various locations and jurisdictions. The customer/buyer/user is responsible to ensure that his activities comply with all country, federal, state, provincial or local laws. The conditions for use of the product are not under the control of the manufacturer; the customer/buyer/user is responsible to determine the conditions necessary for the safe use of this product. The customer/buyer/user should not use the product for any purpose other than the purpose shown in the applicable section of this SDS without first referring to the supplier and obtaining written handling instructions. Due to the proliferation of sources for information such as manufacturer-specific SDS, the manufacturer cannot be responsible for SDSs obtained from any other source.

SAFETY DATA SHEET

E90W501

Section 1. Identification

Product name : MIL-DTL-53030D Type II Two Component Waterborne Epoxy Primer, Off White Q1917

Product code : E90W501

Other means of identification : Not available.

Product type : Liquid.

Relevant identified uses of the substance or mixture and uses advised against

Not applicable.

Manufacturer : THE SHERWIN-WILLIAMS COMPANY
101 W. Prospect Avenue
Cleveland, OH 44115

Emergency telephone number of the company : US / Canada: (216) 566-2917
Mexico: SETIQ 01-800-00-214-00 / (52) 55-5559-1588 24 hours / 365 days a year

Product Information Telephone Number : US / Canada: Not Available
Mexico: Not Available

Regulatory Information Telephone Number : US / Canada: (216) 566-2902
Mexico: Not Available

Transportation Emergency Telephone Number : US / Canada: (216) 566-2917
Mexico: SETIQ 01-800-00-214-00 / (52) 55-5559-1588 24 hours / 365 days a year

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A
CARCINOGENICITY - Category 1A
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (lungs) - Category 1

Percentage of the mixture consisting of ingredient(s) of unknown oral toxicity: 23.4%
Percentage of the mixture consisting of ingredient(s) of unknown dermal toxicity: 23.4%
Percentage of the mixture consisting of ingredient(s) of unknown inhalation toxicity: 30.6%

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Causes serious eye irritation.
May cause cancer.
Causes damage to organs through prolonged or repeated exposure. (lungs)

Precautionary statements

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. Wear eye or face protection. Wear protective clothing. Do not breathe vapor. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling.

Section 2. Hazards identification

Response	: Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.
Storage	: Store locked up.
Disposal	: Dispose of contents and container in accordance with all local, regional, national and international regulations.
Supplemental label elements	WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. FOR INDUSTRIAL USE ONLY. This product must be mixed with other components before use. Before opening the packages, READ AND FOLLOW WARNING LABELS ON ALL COMPONENTS. Please refer to the SDS for additional information. Keep out of reach of children. Do not transfer contents to other containers for storage.
Hazards not otherwise classified	: None known.

Section 3. Composition/information on ingredients

Substance/mixture	: Mixture
Other means of identification	: Not available.

CAS number/other identifiers

Ingredient name	% by weight	CAS number
Titanium Dioxide	≥10 - ≤25	13463-67-7
Wollastonite	≤10	13983-17-0
Aluminum Triphosphate	≤10	13939-25-8
Barium Sulfate	≤5	7727-43-7
1-Methoxy-2-propanol	≤5	107-98-2
Mica	≤3	12001-26-2
Zinc Oxide	≤3	1314-13-2
Diacetone Alcohol	≤3	123-42-2
1-Propoxy-2-propanol	≤3	1569-01-3
Crystalline Silica, respirable powder	≤0.3	14808-60-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact	: Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.
Inhalation	: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
Skin contact	: Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Section 4. First aid measures

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : In a fire or if heated, a pressure increase will occur and the container may burst.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
nitrogen oxides
sulfur oxides
phosphorus oxides
metal oxide/oxides

Section 5. Fire-fighting measures

Special protective actions for fire-fighters	: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
Special protective equipment for fire-fighters	: Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	: No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
For emergency responders	: If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".
Environmental precautions	: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill	: Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.
Large spill	: Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures	: Put on appropriate personal protective equipment (see Section 8). Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.
Advice on general occupational hygiene	: Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.
Conditions for safe storage, including any incompatibilities	: Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits (OSHA United States)

Ingredient name	Exposure limits
Titanium Dioxide	**ACGIH TLV (United States, 3/2017).** TWA: 10 mg/m³ 8 hours. **OSHA PEL (United States, 6/2016).** TWA: 15 mg/m³ 8 hours. Form: Total dust
Wollastonite	**ACGIH TLV (United States, 3/2017).** TWA: 1 mg/m³ 8 hours. Form: Inhalable fraction
Aluminum Triphosphate	**NIOSH REL (United States, 10/2016).** TWA: 2 mg/m³, (as Al) 10 hours.
Barium Sulfate	**ACGIH TLV (United States, 3/2017).** TWA: 5 mg/m³ 8 hours. Form: Inhalable fraction **NIOSH REL (United States, 10/2016).** TWA: 5 mg/m³ 10 hours. Form: Respirable fraction TWA: 10 mg/m³ 10 hours. Form: Total **OSHA PEL (United States, 6/2016).** TWA: 5 mg/m³ 8 hours. Form: Respirable fraction TWA: 15 mg/m³ 8 hours. Form: Total dust
1-Methoxy-2-propanol	**ACGIH TLV (United States, 3/2017).** TWA: 50 ppm 8 hours. TWA: 184 mg/m³ 8 hours. STEL: 100 ppm 15 minutes. STEL: 369 mg/m³ 15 minutes. **NIOSH REL (United States, 10/2016).** TWA: 100 ppm 10 hours. TWA: 360 mg/m³ 10 hours. STEL: 150 ppm 15 minutes. STEL: 540 mg/m³ 15 minutes.
Mica	**ACGIH TLV (United States, 3/2017).** TWA: 3 mg/m³ 8 hours. Form: Respirable fraction **NIOSH REL (United States, 10/2016).** TWA: 3 mg/m³ 10 hours. Form: Respirable fraction **OSHA PEL Z3 (United States, 6/2016).** TWA: 20 mppcf 8 hours.
Zinc Oxide	**NIOSH REL (United States, 10/2016).** CEIL: 15 mg/m³ Form: Dust TWA: 5 mg/m³ 10 hours. Form: Dust and fumes STEL: 10 mg/m³ 15 minutes. Form: Fume **OSHA PEL (United States, 6/2016).** TWA: 5 mg/m³ 8 hours. Form: Fume TWA: 5 mg/m³ 8 hours. Form: Respirable fraction TWA: 15 mg/m³ 8 hours. Form: Total dust **ACGIH TLV (United States, 3/2017).** TWA: 2 mg/m³ 8 hours. Form: Respirable fraction STEL: 10 mg/m³ 15 minutes. Form: Respirable fraction
Diacetone Alcohol	**ACGIH TLV (United States, 3/2017).** TWA: 50 ppm 8 hours. TWA: 238 mg/m³ 8 hours.

Section 8. Exposure controls/personal protection

	NIOSH REL (United States, 10/2016). TWA: 50 ppm 10 hours. TWA: 240 mg/m³ 10 hours. **OSHA PEL (United States, 6/2016).** TWA: 50 ppm 8 hours. TWA: 240 mg/m³ 8 hours.
1-Propoxy-2-propanol	None.
Crystalline Silica, respirable powder	**OSHA PEL Z3 (United States, 6/2016).** TWA: 250 mppcf / (%SiO2+5) 8 hours. Form: Respirable TWA: 10 mg/m³ / (%SiO2+2) 8 hours. Form: Respirable **OSHA PEL (United States, 6/2016).** TWA: 50 µg/m³ 8 hours. Form: Respirable dust **ACGIH TLV (United States, 3/2017).** TWA: 0.025 mg/m³ 8 hours. Form: Respirable fraction **NIOSH REL (United States, 10/2016).** TWA: 0.05 mg/m³ 10 hours. Form: respirable dust

Occupational exposure limits (Canada)

Ingredient name	Exposure limits
Aluminum Triphosphate	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 2 mg/m³, (as Al) 8 hours. **CA Quebec Provincial (Canada, 1/2014).** TWAEV: 2 mg/m³, (as Al) 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 4 mg/m³, (measured as Al) 15 minutes. TWA: 2 mg/m³, (measured as Al) 8 hours.
1-Methoxy-2-propanol	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 100 ppm 8 hours. 15 min OEL: 553 mg/m³ 15 minutes. 8 hrs OEL: 369 mg/m³ 8 hours. 15 min OEL: 150 ppm 15 minutes. **CA British Columbia Provincial (Canada, 6/2017).** STEL: 75 ppm 15 minutes. TWA: 50 ppm 8 hours. **CA Ontario Provincial (Canada, 7/2015).** TWA: 50 ppm 8 hours. STEL: 100 ppm 15 minutes. **CA Quebec Provincial (Canada, 1/2014).** TWAEV: 100 ppm 8 hours. TWAEV: 369 mg/m³ 8 hours. STEV: 150 ppm 15 minutes. STEV: 553 mg/m³ 15 minutes. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 150 ppm 15 minutes. TWA: 100 ppm 8 hours.
Zinc Oxide	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 2 mg/m³ 8 hours. Form: Respirable 15 min OEL: 10 mg/m³ 15 minutes. Form: Respirable

	CA British Columbia Provincial (Canada, 6/2017). TWA: 2 mg/m³ 8 hours. Form: Respirable STEL: 10 mg/m³ 15 minutes. Form: Respirable **CA Ontario Provincial (Canada, 7/2015).** TWA: 2 mg/m³ 8 hours. Form: Respirable fraction. STEL: 10 mg/m³ 15 minutes. Form: Respirable fraction. **CA Quebec Provincial (Canada, 1/2014).** TWAEV: 5 mg/m³ 8 hours. Form: fume STEV: 10 mg/m³ 15 minutes. Form: fume **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 10 mg/m³ 15 minutes. Form: respirable dust and fume TWA: 2 mg/m³ 8 hours. Form: respirable dust and fume
Diacetone Alcohol	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 50 ppm 8 hours. 8 hrs OEL: 238 mg/m³ 8 hours. **CA British Columbia Provincial (Canada, 6/2017).** TWA: 50 ppm 8 hours. **CA Ontario Provincial (Canada, 7/2015).** TWA: 50 ppm 8 hours. **CA Quebec Provincial (Canada, 1/2014).** TWAEV: 50 ppm 8 hours. TWAEV: 238 mg/m³ 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 60 ppm 15 minutes. TWA: 50 ppm 8 hours.

Occupational exposure limits (Mexico)

Ingredient name	Exposure limits
1-Methoxy-2-propanol	**NOM-010-STPS-2014 (Mexico, 4/2016).** STEL: 150 ppm 15 minutes. TWA: 100 ppm 8 hours.
Zinc Oxide	**NOM-010-STPS-2014 (Mexico, 4/2016).** TWA: 2 mg/m³ 8 hours. Form: Respirable fraction STEL: 10 mg/m³ 15 minutes. Form: Respirable fraction
Diacetone Alcohol	**NOM-010-STPS-2014 (Mexico, 4/2016).** TWA: 50 ppm 8 hours.

Appropriate engineering controls : If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Section 8. Exposure controls/personal protection

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state	: Liquid.
Color	: Not available.
Odor	: Not available.
Odor threshold	: Not available.
pH	: 7.6
Melting point/freezing point	: Not available.
Boiling point/boiling range	: 100°C (212°F)
Flash point	: Closed cup: 110°C (230°F) [Pensky-Martens Closed Cup]
Evaporation rate	: 0.66 (butyl acetate = 1)
Flammability (solid, gas)	: Not available.
Lower and upper explosive (flammable) limits	: Lower: 1.3% Upper: 16.9%
Vapor pressure	: 2.3 kPa (17.5 mm Hg) [at 20°C]
Vapor density	: 1 [Air = 1]
Relative density	: 1.43
Solubility	: Not available.
Partition coefficient: n-octanol/water	: Not available.
Auto-ignition temperature	: Not available.
Decomposition temperature	: Not available.
Viscosity	: Kinematic (40°C (104°F)): >0.205 cm^2/s (>20.5 cSt)
Molecular weight	: Not applicable.

Aerosol product

Section 9. Physical and chemical properties

Heat of combustion : 2.159 kJ/g

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
1-Methoxy-2-propanol	LD50 Dermal	Rabbit	13 g/kg	-
	LD50 Oral	Rat	6600 mg/kg	-
Diacetone Alcohol	LD50 Dermal	Rabbit	13500 mg/kg	-
	LD50 Oral	Rat	2520 mg/kg	-
1-Propoxy-2-propanol	LD50 Dermal	Rabbit	3550 mg/kg	-
	LD50 Oral	Rat	2504 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Titanium Dioxide	Skin - Mild irritant	Human	-	72 hours 300 Micrograms Intermittent	-
1-Methoxy-2-propanol	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Mild irritant	Rabbit	-	500 milligrams	-
Zinc Oxide	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
Diacetone Alcohol	Eyes - Severe irritant	Rabbit	-	20 milligrams	-
	Eyes - Severe irritant	Rabbit	-	24 hours 100 microliters	-
	Skin - Mild irritant	Rabbit	-	500 milligrams	-
1-Propoxy-2-propanol	Eyes - Moderate irritant	Rabbit	-	100 milligrams	-

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Section 11. Toxicological information

Classification

Product/ingredient name	OSHA	IARC	NTP
Titanium Dioxide	-	2B	-
Wollastonite	-	3	-
Crystalline Silica, respirable powder	-	1	Known to be a human carcinogen.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
1-Methoxy-2-propanol	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
Diacetone Alcohol	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
1-Propoxy-2-propanol	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
1-Methoxy-2-propanol	Category 2	Not determined	Not determined
Mica	Category 1	Inhalation	lungs
Diacetone Alcohol	Category 2	Not determined	Not determined
1-Propoxy-2-propanol	Category 2	Not determined	Not determined
Crystalline Silica, respirable powder	Category 1	Inhalation	Not determined

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : Causes damage to organs through prolonged or repeated exposure.

Carcinogenicity : May cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Oral	51119.2 mg/kg
Dermal	162489.8 mg/kg

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Titanium Dioxide	Acute LC50 >1000000 µg/l Marine water	Fish - Fundulus heteroclitus	96 hours
Barium Sulfate	Acute EC50 634 mg/l Fresh water	Crustaceans - Cypris subglobosa	48 hours
Zinc Oxide	Acute IC50 1.85 mg/l Marine water	Algae - Skeletonema costatum	96 hours
	Acute IC50 46 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata - Exponential growth phase	72 hours
	Acute LC50 98 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 1.1 ppm Fresh water	Fish - Oncorhynchus mykiss	96 hours
Diacetone Alcohol	Acute LC50 420000 µg/l Marine water	Fish - Menidia beryllina	96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Zinc Oxide	-	60960	high

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	TDG Classification	Mexico Classification	IATA	IMDG
UN number	Not regulated.	Not regulated.	Not regulated.	UN3082	UN3082
UN proper shipping name	-	-	-	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Zinc Oxide)	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Zinc Oxide). Marine pollutant (Zinc Oxide)
Transport hazard class(es)	-	-	-	9  	9  
Packing group	-	-	-	III	III
Environmental hazards	No.	No.	No.	Yes.	Yes.
Additional information	-	-	-	This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 5.0.2.4.1, 5.0.2.6.1.1 and 5.0.2.8.	This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8. **Emergency schedules** F-A, S-F

Section 14. Transport information

Special precautions for user : Multi-modal shipping descriptions are provided for informational purposes and do not consider container sizes. The presence of a shipping description for a particular mode of transport (sea, air, etc.), does not indicate that the product is packaged suitably for that mode of transport. All packaging must be reviewed for suitability prior to shipment, and compliance with the applicable regulations is the sole responsibility of the person offering the product for transport. People loading and unloading dangerous goods must be trained on all of the risks deriving from the substances and on all actions in case of emergency situations.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Proper shipping name : Not available.

Ship type : Not available.

Pollution category : Not available.

Section 15. Regulatory information

SARA 313

SARA 313 (40 CFR 372.45) supplier notification can be found on the Environmental Data Sheet.

California Prop. 65

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health	*	3
Flammability		0
Physical hazards		0

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

Procedure used to derive the classification

Classification	Justification
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A	Calculation method
CARCINOGENICITY - Category 1A	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (lungs) - Category 1	Calculation method

History

Date of printing : 7/4/2018

Date of issue/Date of revision : 7/4/2018

Date of previous issue : 4/10/2018

Version : 10.01

Section 16. Other information

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Notice to reader

It is recommended that each customer or recipient of this Safety Data Sheet (SDS) study it carefully and consult resources, as necessary or appropriate, to become aware of and understand the data contained in this SDS and any hazards associated with the product. This information is provided in good faith and believed to be accurate as of the effective date herein. However, no warranty, express or implied, is given. The information presented here applies only to the product as shipped. The addition of any material can change the composition, hazards and risks of the product. Products shall not be repackaged, modified, or tinted except as specifically instructed by Sherwin-Williams, including but not limited to the incorporation of non Sherwin-Williams products or the use or addition of products in proportions not specified by Sherwin-Williams. Regulatory requirements are subject to change and may differ between various locations and jurisdictions. The customer/buyer/user is responsible to ensure that his activities comply with all country, federal, state, provincial or local laws. The conditions for use of the product are not under the control of the manufacturer; the customer/buyer/user is responsible to determine the conditions necessary for the safe use of this product. The customer/buyer/user should not use the product for any purpose other than the purpose shown in the applicable section of this SDS without first referring to the supplier and obtaining written handling instructions. Due to the proliferation of sources for information such as manufacturer-specific SDS, the manufacturer cannot be responsible for SDSs obtained from any other source.

SAFETY DATA SHEET

E90W501

Section 1. Identification

Product name : MIL-DTL-53030D Type II Two Component Waterborne Epoxy Primer, Off White Q1917

Product code : E90W501

Other means of identification : Not available.

Product type : Liquid.

Relevant identified uses of the substance or mixture and uses advised against

Not applicable.

Manufacturer : THE SHERWIN-WILLIAMS COMPANY
101 W. Prospect Avenue
Cleveland, OH 44115

Emergency telephone number of the company : US / Canada: (216) 566-2917
Mexico: SETIQ 01-800-00-214-00 / (52) 55-5559-1588 24 hours / 365 days a year

Product Information Telephone Number : US / Canada: Not Available
Mexico: Not Available

Regulatory Information Telephone Number : US / Canada: (216) 566-2902
Mexico: Not Available

Transportation Emergency Telephone Number : US / Canada: (216) 566-2917
Mexico: SETIQ 01-800-00-214-00 / (52) 55-5559-1588 24 hours / 365 days a year

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A
CARCINOGENICITY - Category 1A
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (lungs) - Category 1

Percentage of the mixture consisting of ingredient(s) of unknown oral toxicity: 23.4%
Percentage of the mixture consisting of ingredient(s) of unknown dermal toxicity: 23.4%
Percentage of the mixture consisting of ingredient(s) of unknown inhalation toxicity: 30.6%

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Causes serious eye irritation.
May cause cancer.
Causes damage to organs through prolonged or repeated exposure. (lungs)

Precautionary statements

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. Wear eye or face protection. Wear protective clothing. Do not breathe vapor. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling.

Section 2. Hazards identification

Response : Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Store locked up.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. FOR INDUSTRIAL USE ONLY. This product must be mixed with other components before use. Before opening the packages, READ AND FOLLOW WARNING LABELS ON ALL COMPONENTS.

Please refer to the SDS for additional information. Keep out of reach of children. Do not transfer contents to other containers for storage.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Not available.

CAS number/other identifiers

Ingredient name	% by weight	CAS number
Titanium Dioxide	≥10 - ≤25	13463-67-7
Wollastonite	≤10	13983-17-0
Aluminum Triphosphate	≤10	13939-25-8
Barium Sulfate	≤5	7727-43-7
1-Methoxy-2-propanol	≤5	107-98-2
Mica	≤3	12001-26-2
Zinc Oxide	≤3	1314-13-2
Diacetone Alcohol	≤3	123-42-2
1-Propoxy-2-propanol	≤3	1569-01-3
Crystalline Silica, respirable powder	≤0.3	14808-60-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Section 4. First aid measures

Ingestion	: Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact	: Causes serious eye irritation.
Inhalation	: No known significant effects or critical hazards.
Skin contact	: No known significant effects or critical hazards.
Ingestion	: No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact	: Adverse symptoms may include the following: pain or irritation watering redness
Inhalation	: No specific data.
Skin contact	: No specific data.
Ingestion	: No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	: In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
Specific treatments	: No specific treatment.
Protection of first-aiders	: No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media	: Use an extinguishing agent suitable for the surrounding fire.
Unsuitable extinguishing media	: None known.

Specific hazards arising from the chemical	: In a fire or if heated, a pressure increase will occur and the container may burst.
Hazardous thermal decomposition products	: Decomposition products may include the following materials: carbon dioxide carbon monoxide nitrogen oxides sulfur oxides phosphorus oxides metal oxide/oxides

Section 5. Fire-fighting measures

Special protective actions for fire-fighters	:	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
Special protective equipment for fire-fighters	:	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	:	No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
For emergency responders	:	If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".
Environmental precautions	:	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill	:	Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.
Large spill	:	Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures	:	Put on appropriate personal protective equipment (see Section 8). Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.
Advice on general occupational hygiene	:	Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.
Conditions for safe storage, including any incompatibilities	:	Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits (OSHA United States)

Ingredient name	Exposure limits
Titanium Dioxide	**ACGIH TLV (United States, 3/2017).** TWA: 10 mg/m³ 8 hours. **OSHA PEL (United States, 6/2016).** TWA: 15 mg/m³ 8 hours. Form: Total dust
Wollastonite	**ACGIH TLV (United States, 3/2017).** TWA: 1 mg/m³ 8 hours. Form: Inhalable fraction
Aluminum Triphosphate	**NIOSH REL (United States, 10/2016).** TWA: 2 mg/m³, (as Al) 10 hours.
Barium Sulfate	**ACGIH TLV (United States, 3/2017).** TWA: 5 mg/m³ 8 hours. Form: Inhalable fraction **NIOSH REL (United States, 10/2016).** TWA: 5 mg/m³ 10 hours. Form: Respirable fraction TWA: 10 mg/m³ 10 hours. Form: Total **OSHA PEL (United States, 6/2016).** TWA: 5 mg/m³ 8 hours. Form: Respirable fraction TWA: 15 mg/m³ 8 hours. Form: Total dust
1-Methoxy-2-propanol	**ACGIH TLV (United States, 3/2017).** TWA: 50 ppm 8 hours. TWA: 184 mg/m³ 8 hours. STEL: 100 ppm 15 minutes. STEL: 369 mg/m³ 15 minutes. **NIOSH REL (United States, 10/2016).** TWA: 100 ppm 10 hours. TWA: 360 mg/m³ 10 hours. STEL: 150 ppm 15 minutes. STEL: 540 mg/m³ 15 minutes.
Mica	**ACGIH TLV (United States, 3/2017).** TWA: 3 mg/m³ 8 hours. Form: Respirable fraction **NIOSH REL (United States, 10/2016).** TWA: 3 mg/m³ 10 hours. Form: Respirable fraction **OSHA PEL Z3 (United States, 6/2016).** TWA: 20 mppcf 8 hours.
Zinc Oxide	**NIOSH REL (United States, 10/2016).** CEIL: 15 mg/m³ Form: Dust TWA: 5 mg/m³ 10 hours. Form: Dust and fumes STEL: 10 mg/m³ 15 minutes. Form: Fume **OSHA PEL (United States, 6/2016).** TWA: 5 mg/m³ 8 hours. Form: Fume TWA: 5 mg/m³ 8 hours. Form: Respirable fraction TWA: 15 mg/m³ 8 hours. Form: Total dust **ACGIH TLV (United States, 3/2017).** TWA: 2 mg/m³ 8 hours. Form: Respirable fraction STEL: 10 mg/m³ 15 minutes. Form: Respirable fraction
Diacetone Alcohol	**ACGIH TLV (United States, 3/2017).** TWA: 50 ppm 8 hours. TWA: 238 mg/m³ 8 hours.

	NIOSH REL (United States, 10/2016). TWA: 50 ppm 10 hours. TWA: 240 mg/m³ 10 hours. **OSHA PEL (United States, 6/2016).** TWA: 50 ppm 8 hours. TWA: 240 mg/m³ 8 hours.
1-Propoxy-2-propanol	None.
Crystalline Silica, respirable powder	**OSHA PEL Z3 (United States, 6/2016).** TWA: 250 mppcf / (%SiO2+5) 8 hours. Form: Respirable TWA: 10 mg/m³ / (%SiO2+2) 8 hours. Form: Respirable **OSHA PEL (United States, 6/2016).** TWA: 50 µg/m³ 8 hours. Form: Respirable dust **ACGIH TLV (United States, 3/2017).** TWA: 0.025 mg/m³ 8 hours. Form: Respirable fraction **NIOSH REL (United States, 10/2016).** TWA: 0.05 mg/m³ 10 hours. Form: respirable dust

Occupational exposure limits (Canada)

Ingredient name	Exposure limits
Aluminum Triphosphate	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 2 mg/m³, (as Al) 8 hours. **CA Quebec Provincial (Canada, 1/2014).** TWAEV: 2 mg/m³, (as Al) 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 4 mg/m³, (measured as Al) 15 minutes. TWA: 2 mg/m³, (measured as Al) 8 hours.
1-Methoxy-2-propanol	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 100 ppm 8 hours. 15 min OEL: 553 mg/m³ 15 minutes. 8 hrs OEL: 369 mg/m³ 8 hours. 15 min OEL: 150 ppm 15 minutes. **CA British Columbia Provincial (Canada, 6/2017).** STEL: 75 ppm 15 minutes. TWA: 50 ppm 8 hours. **CA Ontario Provincial (Canada, 7/2015).** TWA: 50 ppm 8 hours. STEL: 100 ppm 15 minutes. **CA Quebec Provincial (Canada, 1/2014).** TWAEV: 100 ppm 8 hours. TWAEV: 369 mg/m³ 8 hours. STEV: 150 ppm 15 minutes. STEV: 553 mg/m³ 15 minutes. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 150 ppm 15 minutes. TWA: 100 ppm 8 hours.
Zinc Oxide	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 2 mg/m³ 8 hours. Form: Respirable 15 min OEL: 10 mg/m³ 15 minutes. Form: Respirable

	CA British Columbia Provincial (Canada, 6/2017). TWA: 2 mg/m³ 8 hours. Form: Respirable STEL: 10 mg/m³ 15 minutes. Form: Respirable **CA Ontario Provincial (Canada, 7/2015).** TWA: 2 mg/m³ 8 hours. Form: Respirable fraction. STEL: 10 mg/m³ 15 minutes. Form: Respirable fraction. **CA Quebec Provincial (Canada, 1/2014).** TWAEV: 5 mg/m³ 8 hours. Form: fume STEV: 10 mg/m³ 15 minutes. Form: fume **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 10 mg/m³ 15 minutes. Form: respirable dust and fume TWA: 2 mg/m³ 8 hours. Form: respirable dust and fume
Diacetone Alcohol	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 50 ppm 8 hours. 8 hrs OEL: 238 mg/m³ 8 hours. **CA British Columbia Provincial (Canada, 6/2017).** TWA: 50 ppm 8 hours. **CA Ontario Provincial (Canada, 7/2015).** TWA: 50 ppm 8 hours. **CA Quebec Provincial (Canada, 1/2014).** TWAEV: 50 ppm 8 hours. TWAEV: 238 mg/m³ 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 60 ppm 15 minutes. TWA: 50 ppm 8 hours.

Occupational exposure limits (Mexico)

Ingredient name	Exposure limits
1-Methoxy-2-propanol	**NOM-010-STPS-2014 (Mexico, 4/2016).** STEL: 150 ppm 15 minutes. TWA: 100 ppm 8 hours.
Zinc Oxide	**NOM-010-STPS-2014 (Mexico, 4/2016).** TWA: 2 mg/m³ 8 hours. Form: Respirable fraction STEL: 10 mg/m³ 15 minutes. Form: Respirable fraction
Diacetone Alcohol	**NOM-010-STPS-2014 (Mexico, 4/2016).** TWA: 50 ppm 8 hours.

Appropriate engineering controls : If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Section 8. Exposure controls/personal protection

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state	: Liquid.
Color	: Not available.
Odor	: Not available.
Odor threshold	: Not available.
pH	: 7.6
Melting point/freezing point	: Not available.
Boiling point/boiling range	: 100°C (212°F)
Flash point	: Closed cup: 110°C (230°F) [Pensky-Martens Closed Cup]
Evaporation rate	: 0.66 (butyl acetate = 1)
Flammability (solid, gas)	: Not available.
Lower and upper explosive (flammable) limits	: Lower: 1.3% Upper: 16.9%
Vapor pressure	: 2.3 kPa (17.5 mm Hg) [at 20°C]
Vapor density	: 1 [Air = 1]
Relative density	: 1.43
Solubility	: Not available.
Partition coefficient: n-octanol/water	: Not available.
Auto-ignition temperature	: Not available.
Decomposition temperature	: Not available.
Viscosity	: Kinematic (40°C (104°F)): >0.205 cm^2/s (>20.5 cSt)
Molecular weight	: Not applicable.

Aerosol product

Section 9. Physical and chemical properties

Heat of combustion : 2.159 kJ/g

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
1-Methoxy-2-propanol	LD50 Dermal	Rabbit	13 g/kg	-
	LD50 Oral	Rat	6600 mg/kg	-
Diacetone Alcohol	LD50 Dermal	Rabbit	13500 mg/kg	-
	LD50 Oral	Rat	2520 mg/kg	-
1-Propoxy-2-propanol	LD50 Dermal	Rabbit	3550 mg/kg	-
	LD50 Oral	Rat	2504 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Titanium Dioxide	Skin - Mild irritant	Human	-	72 hours 300 Micrograms Intermittent	-
1-Methoxy-2-propanol	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Mild irritant	Rabbit	-	500 milligrams	-
Zinc Oxide	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
Diacetone Alcohol	Eyes - Severe irritant	Rabbit	-	20 milligrams	-
	Eyes - Severe irritant	Rabbit	-	24 hours 100 microliters	-
	Skin - Mild irritant	Rabbit	-	500 milligrams	-
1-Propoxy-2-propanol	Eyes - Moderate irritant	Rabbit	-	100 milligrams	-

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Section 11. Toxicological information

Classification

Product/ingredient name	OSHA	IARC	NTP
Titanium Dioxide	-	2B	-
Wollastonite	-	3	-
Crystalline Silica, respirable powder	-	1	Known to be a human carcinogen.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
1-Methoxy-2-propanol	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
Diacetone Alcohol	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
1-Propoxy-2-propanol	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
1-Methoxy-2-propanol	Category 2	Not determined	Not determined
Mica	Category 1	Inhalation	lungs
Diacetone Alcohol	Category 2	Not determined	Not determined
1-Propoxy-2-propanol	Category 2	Not determined	Not determined
Crystalline Silica, respirable powder	Category 1	Inhalation	Not determined

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : Causes damage to organs through prolonged or repeated exposure.

Carcinogenicity : May cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Oral	51119.2 mg/kg
Dermal	162489.8 mg/kg

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Titanium Dioxide	Acute LC50 >1000000 µg/l Marine water	Fish - Fundulus heteroclitus	96 hours
Barium Sulfate	Acute EC50 634 mg/l Fresh water	Crustaceans - Cypris subglobosa	48 hours
Zinc Oxide	Acute IC50 1.85 mg/l Marine water	Algae - Skeletonema costatum	96 hours
	Acute IC50 46 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata - Exponential growth phase	72 hours
	Acute LC50 98 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 1.1 ppm Fresh water	Fish - Oncorhynchus mykiss	96 hours
Diacetone Alcohol	Acute LC50 420000 µg/l Marine water	Fish - Menidia beryllina	96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Zinc Oxide	-	60960	high

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	TDG Classification	Mexico Classification	IATA	IMDG
UN number	Not regulated.	Not regulated.	Not regulated.	UN3082	UN3082
UN proper shipping name	-	-	-	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Zinc Oxide)	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Zinc Oxide). Marine pollutant (Zinc Oxide)
Transport hazard class(es)	-	-	-	9  	9  
Packing group	-	-	-	III	III
Environmental hazards	No.	No.	No.	Yes.	Yes.
Additional information	-	-	-	This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 5.0.2.4.1, 5.0.2.6.1.1 and 5.0.2.8.	This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8. **Emergency schedules** F-A, S-F

Section 14. Transport information

Special precautions for user : Multi-modal shipping descriptions are provided for informational purposes and do not consider container sizes. The presence of a shipping description for a particular mode of transport (sea, air, etc.), does not indicate that the product is packaged suitably for that mode of transport. All packaging must be reviewed for suitability prior to shipment, and compliance with the applicable regulations is the sole responsibility of the person offering the product for transport. People loading and unloading dangerous goods must be trained on all of the risks deriving from the substances and on all actions in case of emergency situations.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Proper shipping name : Not available.
Ship type : Not available.
Pollution category : Not available.

Section 15. Regulatory information

SARA 313

SARA 313 (40 CFR 372.45) supplier notification can be found on the Environmental Data Sheet.

California Prop. 65

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health	*	3
Flammability		0
Physical hazards		0

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

Procedure used to derive the classification

Classification	Justification
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A	Calculation method
CARCINOGENICITY - Category 1A	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (lungs) - Category 1	Calculation method

History

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Section 16. Other information

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Notice to reader

It is recommended that each customer or recipient of this Safety Data Sheet (SDS) study it carefully and consult resources, as necessary or appropriate, to become aware of and understand the data contained in this SDS and any hazards associated with the product. This information is provided in good faith and believed to be accurate as of the effective date herein. However, no warranty, express or implied, is given. The information presented here applies only to the product as shipped. The addition of any material can change the composition, hazards and risks of the product. Products shall not be repackaged, modified, or tinted except as specifically instructed by Sherwin-Williams, including but not limited to the incorporation of non Sherwin-Williams products or the use or addition of products in proportions not specified by Sherwin-Williams. Regulatory requirements are subject to change and may differ between various locations and jurisdictions. The customer/buyer/user is responsible to ensure that his activities comply with all country, federal, state, provincial or local laws. The conditions for use of the product are not under the control of the manufacturer; the customer/buyer/user is responsible to determine the conditions necessary for the safe use of this product. The customer/buyer/user should not use the product for any purpose other than the purpose shown in the applicable section of this SDS without first referring to the supplier and obtaining written handling instructions. Due to the proliferation of sources for information such as manufacturer-specific SDS, the manufacturer cannot be responsible for SDSs obtained from any other source.

MATERIAL SAFETY DATA SHEET

F93G504
20 00

DATE OF PREPARATION
Mar 28, 2017

SECTION 1 — PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NUMBER
F93G504
PRODUCT NAME
MIL-DTL-64159B Type II 2K Waterborne Polyurethane CARC Green 383 34094 Q1653
MANUFACTURER'S NAME
THE SHERWIN-WILLIAMS CO.
101 W. Prospect Avenue
Cleveland, OH 44115

Telephone Numbers and Websites

Regulatory Information	(216) 566-2902
Medical Emergency	(216) 566-2917
Transportation Emergency*	(800) 424-9300
**for Chemical Emergency ONLY (spill, leak, fire, exposure, or accident)*	

SECTION 2 — COMPOSITION/INFORMATION ON INGREDIENTS

% by Weight	CAS Number	Ingredient	Units		Vapor Pressure
3	**872-50-4**	**1-Methyl-2-Pyrrolidone**			
		ACGIH TLV		Not Available	1 mm
		OSHA PEL		Not Available	
2	**4420-74-0**	**Mercaptopropyl Trimethoxysilane**			
		ACGIH TLV		Not Available	
		OSHA PEL		Not Available	
9	**1308-38-9**	**Chromium Oxide**			
		ACGIH TLV	0.5	MG/M3	
		OSHA PEL	0.5	MG/M3	
11	**68187-49-5**	**Cobalt Chromite Green Spinel**			
		ACGIH TLV	0.02	MG/M3	
		OSHA PEL	0.1	MG/M3	

% by Weight	Ingredient
11.54	Chromium III (as Cr)

SECTION 3 — HAZARDS IDENTIFICATION

ROUTES OF EXPOSURE
INHALATION of vapor or spray mist.
EYE or SKIN contact with the product, vapor or spray mist.

EFFECTS OF OVEREXPOSURE
EYES: Irritation.
SKIN: Prolonged or repeated exposure may cause irritation.
INHALATION: Irritation of the upper respiratory system.

In a confined area vapors in high concentration may cause headache, nausea or dizziness.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
Redness and itching or burning sensation may indicate eye or excessive skin exposure.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
May cause allergic respiratory and/or skin reaction in susceptible persons or sensitization. This effect may be delayed several hours after exposure.
Persons sensitive to isocyanates will experience increased allergic reaction on repeated exposure.

CANCER INFORMATION
For complete discussion of toxicology data refer to Section 11.

HMIS Codes

Health	2*
Flammability	0
Reactivity	0

SECTION 4 — FIRST AID MEASURES

EYES: Flush eyes with large amounts of water for 15 minutes. Get medical attention.
SKIN: Wash affected area thoroughly with soap and water.
If irritation persists or occurs later, get medical attention.
Remove contaminated clothing and launder before re-use.
INHALATION: If any breathing problems occur during use, **LEAVE THE AREA** and get fresh air. If problems remain or occur later, **IMMEDIATELY** get medical attention.
INGESTION: Do not induce vomiting. Get medical attention immediately.

SECTION 5 — FIRE FIGHTING MEASURES

FLASH POINT	LEL	UEL	FLAMMABILITY CLASSIFICATION
Not Applicable	Not Applicable	Not Applicable	Not Applicable

EXTINGUISHING MEDIA
Carbon Dioxide, Dry Chemical, Alcohol Foam
UNUSUAL FIRE AND EXPLOSION HAZARDS
Closed containers may explode (due to the build-up of pressure) when exposed to extreme heat.
During emergency conditions overexposure to decomposition products may cause a health hazard. Symptoms may not be immediately apparent. Obtain medical attention.
SPECIAL FIRE FIGHTING PROCEDURES
Full protective equipment including self-contained breathing apparatus should be used.
Water spray may be ineffective. If water is used, fog nozzles are preferable. Water may be used to cool closed containers to prevent pressure build-up and possible autoignition or explosion when exposed to extreme heat.

SECTION 6 — ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Remove all sources of ignition. Ventilate the area.
Remove with inert absorbent.

SECTION 7 — HANDLING AND STORAGE

STORAGE CATEGORY
Not Applicable
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE
Keep container closed when not in use. Transfer only to approved containers with complete and appropriate labeling. Do not take internally. Keep out of the reach of children.

SECTION 8 — EXPOSURE CONTROLS/PERSONAL PROTECTION

PRECAUTIONS TO BE TAKEN IN USE
NO PERSON SHOULD USE THIS PRODUCT, OR BE IN THE AREA WHERE IT IS BEING USED, IF THEY HAVE CHRONIC (LONG-TERM) LUNG OR BREATHING PROBLEMS OR IF THEY EVER HAD A REACTION TO ISOCYANATES.
Use only with adequate ventilation.
Avoid contact with skin and eyes. Avoid breathing vapor and spray mist.
Wash hands after using.
This coating may contain materials classified as nuisance particulates (listed "as Dust" in Section 2) which may be present at hazardous levels only during sanding or abrading of the dried film. If no specific dusts are listed in Section 2, the applicable limits for nuisance dusts are ACGIH TLV 10 mg/m3 (total dust), 3 mg/m3 (respirable fraction), OSHA PEL 15 mg/m3 (total dust), 5 mg/m3 (respirable fraction).
VENTILATION
Local exhaust preferable. General exhaust acceptable if the exposure to materials in Section 2 is maintained below applicable exposure limits. Refer to OSHA Standards 1910.94, 1910.107, 1910.108.
RESPIRATORY PROTECTION
Where overspray is present, a positive pressure air supplied respirator (TC19C NIOSH/MSHA approved) should be worn. If unavailable, a properly fitted organic vapor/particulate respirator approved by NIOSH/MSHA for protection against materials in Section 2 may be effective. Follow respirator manufacturers directions for use. Wear the respirator for the whole time of spraying and until all vapors and mists are gone. **NO PERSONS SHOULD BE ALLOWED IN THE AREA WHERE THIS PRODUCT IS BEING USED UNLESS EQUIPPED WITH THE SAME RESPIRATOR PROTECTION RECOMMENDED FOR THE PAINTERS.**
When sanding, wirebrushing, abrading, burning or welding the dried film, wear a particulate respirator approved by NIOSH/MSHA for protection against non-volatile materials in Section 2.
PROTECTIVE GLOVES
To prevent skin contact, wear gloves which are recommended by glove supplier for protection against materials in Section 2.
EYE PROTECTION
Wear safety spectacles with unperforated sideshields.

OTHER PROTECTIVE EQUIPMENT
Use barrier cream on exposed skin.
OTHER PRECAUTIONS
This product must be mixed with other components before use. Before opening the packages, READ AND FOLLOW WARNING LABELS ON ALL COMPONENTS.

SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES

PRODUCT WEIGHT	10.96 lb/gal	1312 g/l
SPECIFIC GRAVITY	1.32	
BOILING POINT	212 - 396 °F	100 - 202 °C
MELTING POINT	Not Available	
VOLATILE VOLUME	64%	
EVAPORATION RATE	Slower than ether	
VAPOR DENSITY	Heavier than air	
SOLUBILITY IN WATER	Not Available	
pH	> 2.0, < 11.5	

VOLATILE ORGANIC COMPOUNDS (VOC Theoretical - As Packaged)

1.01 lb/gal	122 g/l	Less Water and Federally Exempt Solvents
0.40 lb/gal	49 g/l	Emitted VOC

SECTION 10 — STABILITY AND REACTIVITY

STABILITY — Stable
CONDITIONS TO AVOID
None known.
INCOMPATIBILITY
None known.
HAZARDOUS DECOMPOSITION PRODUCTS
By fire: Carbon Dioxide, Carbon Monoxide , Oxides of Nitrogen, possibility of Hydrogen Cyanide , Oxides of Metals in Section 2
HAZARDOUS POLYMERIZATION
Will not occur

SECTION 11 — TOXICOLOGICAL INFORMATION

CHRONIC HEALTH HAZARDS
Cobalt and cobalt compounds are classified by IARC as possibly carcinogenic to humans (group 2B) based on experimental animal data, however, there is inadequate evidence in humans for its carcinogenicity.
Chromium III is considered the active species in cancer induction, but Chromium III compounds do not cross the cell wall. However, there is some evidence that Chromium III compounds of respirable particle size may be taken up by the cells in the lung.
TOXICOLOGY DATA

CAS No.	Ingredient Name				
872-50-4	**1-Methyl-2-Pyrrolidone**				
		LC50	RAT	4HR	Not Available
		LD50	RAT		4200 mg/kg
4420-74-0	**Mercaptopropyl Trimethoxysilane**				
		LC50	RAT	4HR	Not Available
		LD50	RAT		Not Available
1308-38-9	**Chromium Oxide**				
		LC50	RAT	4HR	Not Available
		LD50	RAT		Not Available
68187-49-5	**Cobalt Chromite Green Spinel**				
		LC50	RAT	4HR	Not Available
		LD50	RAT		Not Available

SECTION 12 — ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION
No data available.

SECTION 13 — DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD
Waste from this product may be hazardous as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR 261.
Waste must be tested for extractability to determine the applicable EPA hazardous waste numbers.
Incinerate in approved facility. Do not incinerate closed container. Dispose of in accordance with Federal, State/Provincial, and Local regulations regarding pollution.

SECTION 14 — TRANSPORT INFORMATION

Multi-modal shipping descriptions are provided for informational purposes and do not consider container sizes. The presence of a shipping description for a particular mode of transport (ocean, air, etc.), does not indicate that the product is packaged suitably for that mode of transport. All packaging must be reviewed for suitability prior to shipment, and compliance with the applicable regulations is the sole responsibility of the person offering the product for transport.

US Ground (DOT)
Not Regulated for Transportation.

Canada (TDG)
Not Regulated for Transportation.

IMO
Not Regulated for Transportation.

IMO
Not Regulated for Transportation.

IATA/ICAO
Not Regulated for Transportation.

SECTION 15 — REGULATORY INFORMATION

SARA 313 *(40 CFR 372.65C)* SUPPLIER NOTIFICATION

CAS No.	CHEMICAL/COMPOUND	% by WT	% Element
872-50-4	1-Methyl-2-Pyrrolidone	3	
	Chromium Compound	21	11.5
	Cobalt Compound	11	1.6
	Zinc Compound	11	2.3

CALIFORNIA PROPOSITION 65
WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

TSCA CERTIFICATION
All chemicals in this product are listed, or are exempt from listing, on the TSCA Inventory.

SECTION 16 — OTHER INFORMATION

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

MATERIAL SAFETY DATA SHEET

F93H504
20 00

DATE OF PREPARATION
Sep 5, 2017

SECTION 1 — PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NUMBER
F93H504
PRODUCT NAME
MIL-DTL-64159B Type II 2K Waterborne Polyurethane CARC Tan 686A 33446 Q1660
MANUFACTURER'S NAME
THE SHERWIN-WILLIAMS CO.
101 W. Prospect Avenue
Cleveland, OH 44115

Telephone Numbers and Websites

Regulatory Information	(216) 566-2902
Medical Emergency	(216) 566-2917
Transportation Emergency*	(800) 424-9300
**for Chemical Emergency ONLY (spill, leak, fire, exposure, or accident)*	

SECTION 2 — COMPOSITION/INFORMATION ON INGREDIENTS

% by Weight	CAS Number	Ingredient		Units	Vapor Pressure
4	**872-50-4**	**1-Methyl-2-Pyrrolidone**			
		ACGIH TLV		Not Available	1 mm
		OSHA PEL		Not Available	
2	**4420-74-0**	**Mercaptopropyl Trimethoxysilane**			
		ACGIH TLV		Not Available	
		OSHA PEL		Not Available	
14	**13463-67-7**	**Titanium Dioxide**			
		ACGIH TLV	10	mg/m3 as Dust	
		OSHA PEL	10	mg/m3 Total Dust	
		OSHA PEL	5	mg/m3 Respirable Fraction	
0.7	**68187-49-5**	**Cobalt Chromite Green Spinel**			
		ACGIH TLV	0.02	MG/M3	
		OSHA PEL	0.1	MG/M3	

% by Weight	Ingredient
0.39	Chromium III (as Cr)

SECTION 3 — HAZARDS IDENTIFICATION

HMIS Codes

Health	2*
Flammability	0
Reactivity	0

ROUTES OF EXPOSURE
INHALATION of vapor or spray mist.
EYE or SKIN contact with the product, vapor or spray mist.
EFFECTS OF OVEREXPOSURE
EYES: Irritation.
SKIN: Prolonged or repeated exposure may cause irritation.
INHALATION: Irritation of the upper respiratory system.

In a confined area vapors in high concentration may cause headache, nausea or dizziness.
SIGNS AND SYMPTOMS OF OVEREXPOSURE
Redness and itching or burning sensation may indicate eye or excessive skin exposure.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
May cause allergic respiratory and/or skin reaction in susceptible persons or sensitization. This effect may be delayed several hours after exposure.
Persons sensitive to isocyanates will experience increased allergic reaction on repeated exposure.
CANCER INFORMATION
For complete discussion of toxicology data refer to Section 11.

SECTION 4 — FIRST AID MEASURES

EYES: Flush eyes with large amounts of water for 15 minutes. Get medical attention.
SKIN: Wash affected area thoroughly with soap and water.
If irritation persists or occurs later, get medical attention.
Remove contaminated clothing and launder before re-use.
INHALATION: If any breathing problems occur during use, **LEAVE THE AREA** and get fresh air. If problems remain or occur later, **IMMEDIATELY** get medical attention.
INGESTION: Do not induce vomiting. Get medical attention immediately.

SECTION 5 — FIRE FIGHTING MEASURES

FLASH POINT	LEL	UEL	FLAMMABILITY CLASSIFICATION
> 200 °F PMCC	Not Applicable	Not Applicable	Not Applicable

EXTINGUISHING MEDIA
Carbon Dioxide, Dry Chemical, Alcohol Foam
UNUSUAL FIRE AND EXPLOSION HAZARDS
Closed containers may explode (due to the build-up of pressure) when exposed to extreme heat.
During emergency conditions overexposure to decomposition products may cause a health hazard. Symptoms may not be immediately apparent. Obtain medical attention.
SPECIAL FIRE FIGHTING PROCEDURES
Full protective equipment including self-contained breathing apparatus should be used.
Water spray may be ineffective. If water is used, fog nozzles are preferable. Water may be used to cool closed containers to prevent pressure build-up and possible autoignition or explosion when exposed to extreme heat.

SECTION 6 — ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Remove all sources of ignition. Ventilate the area.
Remove with inert absorbent.

SECTION 7 — HANDLING AND STORAGE

STORAGE CATEGORY
DOL Storage Class IIIB
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE
Keep container closed when not in use. Transfer only to approved containers with complete and appropriate labeling. Do not take internally. Keep out of the reach of children.

SECTION 8 — EXPOSURE CONTROLS/PERSONAL PROTECTION

PRECAUTIONS TO BE TAKEN IN USE
NO PERSON SHOULD USE THIS PRODUCT, OR BE IN THE AREA WHERE IT IS BEING USED, IF THEY HAVE CHRONIC (LONG-TERM) LUNG OR BREATHING PROBLEMS OR IF THEY EVER HAD A REACTION TO ISOCYANATES.
Use only with adequate ventilation.
Avoid contact with skin and eyes. Avoid breathing vapor and spray mist.
Wash hands after using.
This coating may contain materials classified as nuisance particulates (listed "as Dust" in Section 2) which may be present at hazardous levels only during sanding or abrading of the dried film. If no specific dusts are listed in Section 2, the applicable limits for nuisance dusts are ACGIH TLV 10 mg/m3 (total dust), 3 mg/m3 (respirable fraction), OSHA PEL 15 mg/m3 (total dust), 5 mg/m3 (respirable fraction).
VENTILATION
Local exhaust preferable. General exhaust acceptable if the exposure to materials in Section 2 is maintained below applicable exposure limits. Refer to OSHA Standards 1910.94, 1910.107, 1910.108.
RESPIRATORY PROTECTION
Where overspray is present, a positive pressure air supplied respirator (TC19C NIOSH/MSHA approved) should be worn. If unavailable, a properly fitted organic vapor/particulate respirator approved by NIOSH/MSHA for protection against materials in Section 2 may be effective. Follow respirator manufacturers directions for use. Wear the respirator for the whole time of spraying and until all vapors and mists are gone. **NO PERSONS SHOULD BE ALLOWED IN THE AREA WHERE THIS PRODUCT IS BEING USED UNLESS EQUIPPED WITH THE SAME RESPIRATOR PROTECTION RECOMMENDED FOR THE PAINTERS.**
When sanding, wirebrushing, abrading, burning or welding the dried film, wear a particulate respirator approved by NIOSH/MSHA for protection against non-volatile materials in Section 2.
PROTECTIVE GLOVES
To prevent skin contact, wear gloves which are recommended by glove supplier for protection against materials in Section 2.
EYE PROTECTION
Wear safety spectacles with unperforated sideshields.

OTHER PROTECTIVE EQUIPMENT
Use barrier cream on exposed skin.
OTHER PRECAUTIONS
This product must be mixed with other components before use. Before opening the packages, READ AND FOLLOW WARNING LABELS ON ALL COMPONENTS.

SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES

PRODUCT WEIGHT	10.22 lb/gal	1225 g/l
SPECIFIC GRAVITY	1.23	
BOILING POINT	212 - 396 °F	100 - 202 °C
MELTING POINT	Not Available	
VOLATILE VOLUME	64%	
EVAPORATION RATE	Slower than ether	
VAPOR DENSITY	Heavier than air	
SOLUBILITY IN WATER	Not Available	
pH	> 2.0, < 11.5	

VOLATILE ORGANIC COMPOUNDS (VOC Theoretical - As Packaged)

1.05 lb/gal	126 g/l	Less Water and Federally Exempt Solvents
0.43 lb/gal	51 g/l	Emitted VOC

SECTION 10 — STABILITY AND REACTIVITY

STABILITY — Stable
CONDITIONS TO AVOID
None known.
INCOMPATIBILITY
None known.
HAZARDOUS DECOMPOSITION PRODUCTS
By fire: Carbon Dioxide, Carbon Monoxide , Oxides of Nitrogen, possibility of Hydrogen Cyanide , Oxides of Metals in Section 2
HAZARDOUS POLYMERIZATION
Will not occur

SECTION 11 — TOXICOLOGICAL INFORMATION

CHRONIC HEALTH HAZARDS
Cobalt and cobalt compounds are classified by IARC as possibly carcinogenic to humans (group 2B) based on experimental animal data, however, there is inadequate evidence in humans for its carcinogenicity.
IARC's Monograph No. 93 reports there is sufficient evidence of carcinogenicity in experimental rats exposed to titanium dioxide but inadequate evidence for carcinogenicity in humans and has assigned a Group 2B rating. In addition, the IARC summary concludes, "No significant exposure to titanium dioxide is thought to occur during the use of products in which titanium is bound to other materials, such as paint."
TOXICOLOGY DATA

CAS No.	Ingredient Name			
872-50-4	**1-Methyl-2-Pyrrolidone**			
		LC50 RAT	4HR	Not Available
		LD50 RAT		4200 mg/kg
4420-74-0	**Mercaptopropyl Trimethoxysilane**			
		LC50 RAT	4HR	Not Available
		LD50 RAT		Not Available
13463-67-7	**Titanium Dioxide**			
		LC50 RAT	4HR	Not Available
		LD50 RAT		Not Available
68187-49-5	**Cobalt Chromite Green Spinel**			
		LC50 RAT	4HR	Not Available
		LD50 RAT		Not Available

SECTION 12 — ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION
No data available.

SECTION 13 — DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD
Waste from this product may be hazardous as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR 261.
Waste must be tested for extractability to determine the applicable EPA hazardous waste numbers.

Incinerate in approved facility. Do not incinerate closed container. Dispose of in accordance with Federal, State/Provincial, and Local regulations regarding pollution.

SECTION 14 — TRANSPORT INFORMATION

Multi-modal shipping descriptions are provided for informational purposes and do not consider container sizes. The presence of a shipping description for a particular mode of transport (ocean, air, etc.), does not indicate that the product is packaged suitably for that mode of transport. All packaging must be reviewed for suitability prior to shipment, and compliance with the applicable regulations is the sole responsibility of the person offering the product for transport.

US Ground (DOT)

Not Regulated for Transportation.

Canada (TDG)

Not Regulated for Transportation.

IMO

Not Regulated for Transportation.

IMO

Not Regulated for Transportation.

IATA/ICAO

Not Regulated for Transportation.

SECTION 15 — REGULATORY INFORMATION

SARA 313 *(40 CFR 372.65C)* SUPPLIER NOTIFICATION

CAS No.	CHEMICAL/COMPOUND	% by WT	% Element
872-50-4	1-Methyl-2-Pyrrolidone	4	
	Chromium Compound	0.6	0.3
	Cobalt Compound	0.6	0.09

CALIFORNIA PROPOSITION 65

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

TSCA CERTIFICATION

All chemicals in this product are listed, or are exempt from listing, on the TSCA Inventory.

SECTION 16 — OTHER INFORMATION

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

The above information pertains to this product as currently formulated, and is based on the information available at this time. Addition of reducers or other additives to this product may substantially alter the composition and hazards of the product. Since conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information.

SAFETY DATA SHEET

V93V00502

Section 1. Identification

Product name : MIL-DTL-64159 Type II, 2K Waterborne Polyurethane Catalyst

Product code : V93V00502

Other means of identification : Not available.

Product type : Liquid.

Relevant identified uses of the substance or mixture and uses advised against

Not applicable.

Manufacturer : THE SHERWIN-WILLIAMS COMPANY
101 W. Prospect Avenue
Cleveland, OH 44115

Emergency telephone number of the company : US / Canada: (216) 566-2917
Mexico: SETIQ 01-800-00-214-00 / (52) 55-5559-1588 24 hours / 365 days a year

Product Information Telephone Number : US / Canada: Not Available
Mexico: Not Available

Regulatory Information Telephone Number : US / Canada: (216) 566-2902
Mexico: Not Available

Transportation Emergency Telephone Number : US / Canada: (216) 566-2917
Mexico: SETIQ 01-800-00-214-00 / (52) 55-5559-1588 24 hours / 365 days a year

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 3
ACUTE TOXICITY (inhalation) - Category 4
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A
RESPIRATORY SENSITIZATION - Category 1
SKIN SENSITIZATION - Category 1
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

Percentage of the mixture consisting of ingredient(s) of unknown oral toxicity: 87.3%
Percentage of the mixture consisting of ingredient(s) of unknown dermal toxicity: 74.8%
Percentage of the mixture consisting of ingredient(s) of unknown inhalation toxicity: 25.1%

GHS label elements

Hazard pictograms :

Signal word : Danger

Section 2. Hazards identification

Hazard statements : Flammable liquid and vapor.
Harmful if inhaled.
Causes serious eye irritation.
Causes skin irritation.
May cause allergy or asthma symptoms or breathing difficulties if inhaled.
May cause an allergic skin reaction.
May cause respiratory irritation.

Precautionary statements

Prevention : Wear protective gloves. Wear eye or face protection. Wear respiratory protection. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Use only outdoors or in a well-ventilated area. Avoid breathing vapor. Wash hands thoroughly after handling. Contaminated work clothing must not be allowed out of the workplace.

Response : IF INHALED: If breathing is difficult, remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. If experiencing respiratory symptoms: Call a POISON CENTER or physician. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF ON SKIN: Wash with plenty of soap and water. Wash contaminated clothing before reuse. If skin irritation or rash occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Store locked up. Store in a well-ventilated place. Keep cool.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements

DELAYED EFFECTS FROM LONG TERM OVEREXPOSURE. Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal. FOR INDUSTRIAL USE ONLY. This product must be mixed with other components before use. Before opening the packages, READ AND FOLLOW WARNING LABELS ON ALL COMPONENTS. VAPOR AND SPRAY MIST HARMFUL. Gives off harmful vapor of solvents and isocyanates. DO NOT USE IF YOU HAVE CHRONIC (LONG-TERM) LUNG OR BREATHING PROBLEMS, OR IF YOU HAVE EVER HAD A REACTION TO ISOCYANATES. USE ONLY WITH ADEQUATE VENTILATION. WHERE OVERSPRAY IS PRESENT, A POSITIVE PRESSURE AIR SUPPLIED RESPIRATOR (NIOSH approved) SHOULD BE WORN TO PREVENT EXPOSURE. IF UNAVAILABLE, AN APPROPRIATE PROPERLY FITTED APPROVED NIOSH VAPOR/PARTICULATE RESPIRATOR MAY BE EFFECTIVE. Follow directions for respirator use. Wear the respirator for the whole time of spraying and until all vapors and mists are gone. If you have any breathing problems during use, LEAVE THE AREA and get fresh air. If problems remain or happen later, IMMEDIATELY call a doctor - If not available get emergency medical treatment. Have this label with you. Reacts with water in closed container to produce pressure which may cause container to burst.

Please refer to the SDS for additional information. Keep out of reach of children. Do not transfer contents to other containers for storage.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Not available.

CAS number/other identifiers

Section 3. Composition/information on ingredients

Ingredient name	% by weight	CAS number
Hexamethylene Diisocyanate Polymer	≥50 - ≤75	28182-81-2
Oxo-Hexyl Acetate	≥10 - ≤25	142-92-7
n-Amyl Propionate	≥10 - ≤25	624-54-4
Hexamethylene Diisocyanate (max.)	≤0.3	822-06-0

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours. In the event of any complaints or symptoms, avoid further exposure.

Skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Harmful if inhaled. May cause respiratory irritation. May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Skin contact : Causes skin irritation. May cause an allergic skin reaction.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Section 4. First aid measures

Inhalation	:	Adverse symptoms may include the following: respiratory tract irritation coughing wheezing and breathing difficulties asthma
Skin contact	:	Adverse symptoms may include the following: irritation redness
Ingestion	:	No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	:	In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
Specific treatments	:	No specific treatment.
Protection of first-aiders	:	No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media	:	Use dry chemical, CO_2, water spray (fog) or foam.
Unsuitable extinguishing media	:	Do not use water jet.
Specific hazards arising from the chemical	:	Flammable liquid and vapor. Runoff to sewer may create fire or explosion hazard. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back.
Hazardous thermal decomposition products	:	Decomposition products may include the following materials: carbon dioxide carbon monoxide nitrogen oxides
Special protective actions for fire-fighters	:	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
Special protective equipment for fire-fighters	:	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	:	No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
For emergency responders	:	If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Section 6. Accidental release measures

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems or asthma, allergies or chronic or recurrent respiratory disease should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapor or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits (OSHA United States)

Section 8. Exposure controls/personal protection

Ingredient name	Exposure limits
Hexamethylene Diisocyanate Polymer Oxo-Hexyl Acetate n-Amyl Propionate Hexamethylene Diisocyanate (max.)	None. None. None. **ACGIH TLV (United States, 3/2017).** TWA: 0.005 ppm 8 hours. TWA: 0.03 mg/m³ 8 hours. **NIOSH REL (United States, 10/2016).** TWA: 0.005 ppm 10 hours. TWA: 0.035 mg/m³ 10 hours. CEIL: 0.02 ppm 10 minutes. CEIL: 0.14 mg/m³ 10 minutes. **OSHA PEL (United States, 6/2016).** **Absorbed through skin.** TWA: 5 mg/m³, (as CN) 8 hours.

Occupational exposure limits (Canada)

Ingredient name	Exposure limits
Hexamethylene Diisocyanate (max.)	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 0.005 ppm 8 hours. 8 hrs OEL: 0.03 mg/m³ 8 hours. **CA British Columbia Provincial (Canada, 6/2017). Inhalation sensitizer.** TWA: 0.005 ppm 8 hours. C: 0.01 ppm **CA Quebec Provincial (Canada, 1/2014). Skin sensitizer.** TWAEV: 0.005 ppm 8 hours. TWAEV: 0.034 mg/m³ 8 hours. **CA Ontario Provincial (Canada, 7/2015).** TWA: 0.03 mg/m³ 8 hours. TWA: 0.01 ppm 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 0.015 ppm 15 minutes. TWA: 0.005 ppm 8 hours.

Occupational exposure limits (Mexico)

Ingredient name	Exposure limits
None.	

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Section 8. Exposure controls/personal protection

Hygiene measures	: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
Eye/face protection	: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.
Skin protection	
Hand protection	: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Body protection	: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
Other skin protection	: Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory protection	: Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance	
Physical state	: Liquid.
Color	: Not available.
Odor	: Not available.
Odor threshold	: Not available.
pH	: Not available.
Melting point/freezing point	: Not available.
Boiling point/boiling range	: 163°C (325.4°F)
Flash point	: Closed cup: 59°C (138.2°F) [Pensky-Martens Closed Cup]
Evaporation rate	: 0.175 (butyl acetate = 1)
Flammability (solid, gas)	: Not available.
Lower and upper explosive (flammable) limits	: Lower: 1% Upper: 8%
Vapor pressure	: 0.17 kPa (1.26 mm Hg) [at 20°C]
Vapor density	: 4.97 [Air = 1]
Relative density	: 1.06
Solubility	: Not available.
Partition coefficient: n-octanol/water	: Not available.
Auto-ignition temperature	: Not available.
Decomposition temperature	: Not available.
Viscosity	: Kinematic (40°C (104°F)): >0.205 cm^2/s (>20.5 cSt)
Molecular weight	: Not applicable.

Section 9. Physical and chemical properties

Aerosol product

Heat of combustion : 11.022 kJ/g

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

Incompatible materials : Reactive or incompatible with the following materials:
oxidizing materials

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Hexamethylene Diisocyanate Polymer	LC50 Inhalation Vapor	Rat	18500 mg/m³	1 hours
Oxo-Hexyl Acetate	LD50 Dermal	Rabbit	>5 g/kg	-
n-Amyl Propionate	LD50 Dermal	Rabbit	>14 g/kg	-
	LD50 Oral	Rat	>14 g/kg	-
Hexamethylene Diisocyanate (max.)	LC50 Inhalation Dusts and mists	Rat	124 mg/m³	4 hours

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Hexamethylene Diisocyanate Polymer	Eyes - Moderate irritant	Rabbit	-	100 milligrams	-
	Skin - Moderate irritant	Rabbit	-	500 milligrams	-
Oxo-Hexyl Acetate	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
n-Amyl Propionate	Eyes - Mild irritant	Rabbit	-	100 milligrams	-

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Section 11. Toxicological information

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Hexamethylene Diisocyanate Polymer	Category 3	Not applicable.	Respiratory tract irritation
Hexamethylene Diisocyanate (max.)	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Harmful if inhaled. May cause respiratory irritation. May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Skin contact : Causes skin irritation. May cause an allergic skin reaction.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
wheezing and breathing difficulties
asthma

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
Teratogenicity : No known significant effects or critical hazards.
Developmental effects : No known significant effects or critical hazards.
Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Inhalation (vapors)	11.02 mg/l

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Oxo-Hexyl Acetate	Acute LC50 4000 µg/l Fresh water	Fish - Pimephales promelas	96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Hexamethylene Diisocyanate (max.)	-	57.63	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	TDG Classification	Mexico Classification	IATA	IMDG
UN number	UN1263	UN1263	UN1263	UN1263	UN1263
UN proper shipping name	PAINT RELATED MATERIAL	PAINT RELATED MATERIAL	PAINT RELATED MATERIAL	PAINT RELATED MATERIAL	PAINT RELATED MATERIAL
Transport hazard class(es)	3	3	3	3	3
Packing group	III	III	III	III	III
Environmental hazards	No.	No.	No.	No.	No.
Additional information	This product may be re-classified as "Combustible Liquid," unless transported by vessel or aircraft. Non-bulk packages (less than or equal to 119 gal) of combustible liquids are not regulated as hazardous materials. **ERG No.** 128	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2. 18-2.19 (Class 3). **ERG No.** 128	- **ERG No.** 128	-	**Emergency schedules** F-E, S-E

Special precautions for user : Multi-modal shipping descriptions are provided for informational purposes and do not consider container sizes. The presence of a shipping description for a particular mode of transport (sea, air, etc.), does not indicate that the product is packaged suitably for that mode of transport. All packaging must be reviewed for suitability prior to shipment, and compliance with the applicable regulations is the sole responsibility of the person offering the product for transport. People loading and unloading dangerous goods must be trained on all of the risks deriving from the substances and on all actions in case of emergency situations.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Proper shipping name : Not available.

Ship type : Not available.

Pollution category : Not available.

Section 15. Regulatory information

SARA 313

SARA 313 (40 CFR 372.45) supplier notification can be found on the Environmental Data Sheet.

California Prop. 65

Not applicable.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health	*	3
Flammability		2
Physical hazards		0

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

Procedure used to derive the classification

Classification	Justification
FLAMMABLE LIQUIDS - Category 3	On basis of test data
ACUTE TOXICITY (inhalation) - Category 4	Calculation method
SKIN CORROSION/IRRITATION - Category 2	Calculation method
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A	Calculation method
RESPIRATORY SENSITIZATION - Category 1	Calculation method
SKIN SENSITIZATION - Category 1	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3	Calculation method

History

Date of printing : 6/21/2018

Date of issue/Date of revision : 6/21/2018

Date of previous issue : 5/9/2018

Version : 8

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Notice to reader

It is recommended that each customer or recipient of this Safety Data Sheet (SDS) study it carefully and consult resources, as necessary or appropriate, to become aware of and understand the data contained in this SDS and any hazards associated with the product. This information is provided in good faith and believed to be accurate as of the effective date herein. However, no warranty, express or implied, is given. The information presented here applies only to the product as shipped. The addition of any material can change the composition, hazards and risks of the product. Products shall not be repackaged, modified, or tinted except as specifically instructed by Sherwin-Williams, including but not limited to the incorporation of non Sherwin-Williams products or the use or addition of products in proportions not specified by Sherwin-Williams. Regulatory requirements are subject to change and may differ between various locations and jurisdictions. The customer/buyer/user is responsible to ensure that his activities comply with all country, federal, state, provincial or local laws. The conditions for use of the product are not under the control of the manufacturer; the customer/buyer/user is responsible to determine the conditions necessary for the safe use of this product. The customer/buyer/user should not use the product for any purpose other than the purpose shown in the applicable section of this SDS without first referring to the supplier and obtaining written handling instructions. Due to the proliferation of sources for

Section 16. Other information

information such as manufacturer-specific SDS, the manufacturer cannot be responsible for SDSs obtained from any other source.

SAFETY DATA SHEET

V93V00502

Section 1. Identification

Product name	:	MIL-DTL-64159 Type II, 2K Waterborne Polyurethane Catalyst
Product code	:	V93V00502
Other means of identification	:	Not available.
Product type	:	Liquid.

<u>Relevant identified uses of the substance or mixture and uses advised against</u>

Not applicable.

Manufacturer	:	THE SHERWIN-WILLIAMS COMPANY 101 W. Prospect Avenue Cleveland, OH 44115
Emergency telephone number of the company	:	US / Canada: (216) 566-2917 Mexico: SETIQ 01-800-00-214-00 / (52) 55-5559-1588 24 hours / 365 days a year
Product Information Telephone Number	:	US / Canada: Not Available Mexico: Not Available
Regulatory Information Telephone Number	:	US / Canada: (216) 566-2902 Mexico: Not Available
Transportation Emergency Telephone Number	:	US / Canada: (216) 566-2917 Mexico: SETIQ 01-800-00-214-00 / (52) 55-5559-1588 24 hours / 365 days a year

Section 2. Hazards identification

OSHA/HCS status	:	This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Classification of the substance or mixture	:	FLAMMABLE LIQUIDS - Category 3 ACUTE TOXICITY (inhalation) - Category 4 SKIN CORROSION/IRRITATION - Category 2 SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A RESPIRATORY SENSITIZATION - Category 1 SKIN SENSITIZATION - Category 1 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
		Percentage of the mixture consisting of ingredient(s) of unknown oral toxicity: 87.3% Percentage of the mixture consisting of ingredient(s) of unknown dermal toxicity: 74.8% Percentage of the mixture consisting of ingredient(s) of unknown inhalation toxicity: 25.1%

<u>GHS label elements</u>

Hazard pictograms :

Signal word : Danger

Section 2. Hazards identification

Hazard statements	:	Flammable liquid and vapor. Harmful if inhaled. Causes serious eye irritation. Causes skin irritation. May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause an allergic skin reaction. May cause respiratory irritation.

Precautionary statements

Prevention	:	Wear protective gloves. Wear eye or face protection. Wear respiratory protection. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Use only outdoors or in a well-ventilated area. Avoid breathing vapor. Wash hands thoroughly after handling. Contaminated work clothing must not be allowed out of the workplace.
Response	:	IF INHALED: If breathing is difficult, remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. If experiencing respiratory symptoms: Call a POISON CENTER or physician. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF ON SKIN: Wash with plenty of soap and water. Wash contaminated clothing before reuse. If skin irritation or rash occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.
Storage	:	Store locked up. Store in a well-ventilated place. Keep cool.
Disposal	:	Dispose of contents and container in accordance with all local, regional, national and international regulations.
Supplemental label elements		DELAYED EFFECTS FROM LONG TERM OVEREXPOSURE. Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal. FOR INDUSTRIAL USE ONLY. This product must be mixed with other components before use. Before opening the packages, READ AND FOLLOW WARNING LABELS ON ALL COMPONENTS. VAPOR AND SPRAY MIST HARMFUL. Gives off harmful vapor of solvents and isocyanates. DO NOT USE IF YOU HAVE CHRONIC (LONG-TERM) LUNG OR BREATHING PROBLEMS, OR IF YOU HAVE EVER HAD A REACTION TO ISOCYANATES. USE ONLY WITH ADEQUATE VENTILATION. WHERE OVERSPRAY IS PRESENT, A POSITIVE PRESSURE AIR SUPPLIED RESPIRATOR (NIOSH approved) SHOULD BE WORN TO PREVENT EXPOSURE. IF UNAVAILABLE, AN APPROPRIATE PROPERLY FITTED APPROVED NIOSH VAPOR/PARTICULATE RESPIRATOR MAY BE EFFECTIVE. Follow directions for respirator use. Wear the respirator for the whole time of spraying and until all vapors and mists are gone. If you have any breathing problems during use, LEAVE THE AREA and get fresh air. If problems remain or happen later, IMMEDIATELY call a doctor - If not available get emergency medical treatment. Have this label with you. Reacts with water in closed container to produce pressure which may cause container to burst. Please refer to the SDS for additional information. Keep out of reach of children. Do not transfer contents to other containers for storage.
Hazards not otherwise classified	:	None known.

Section 3. Composition/information on ingredients

Substance/mixture	:	Mixture
Other means of identification	:	Not available.

CAS number/other identifiers

Section 3. Composition/information on ingredients

Ingredient name	% by weight	CAS number
Hexamethylene Diisocyanate Polymer	≥50 - ≤75	28182-81-2
Oxo-Hexyl Acetate	≥10 - ≤25	142-92-7
n-Amyl Propionate	≥10 - ≤25	624-54-4
Hexamethylene Diisocyanate (max.)	≤0.3	822-06-0

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours. In the event of any complaints or symptoms, avoid further exposure.

Skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Harmful if inhaled. May cause respiratory irritation. May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Skin contact : Causes skin irritation. May cause an allergic skin reaction.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Section 4. First aid measures

Inhalation	:	Adverse symptoms may include the following: respiratory tract irritation coughing wheezing and breathing difficulties asthma
Skin contact	:	Adverse symptoms may include the following: irritation redness
Ingestion	:	No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	:	In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
Specific treatments	:	No specific treatment.
Protection of first-aiders	:	No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media	:	Use dry chemical, CO_2, water spray (fog) or foam.
Unsuitable extinguishing media	:	Do not use water jet.
Specific hazards arising from the chemical	:	Flammable liquid and vapor. Runoff to sewer may create fire or explosion hazard. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back.
Hazardous thermal decomposition products	:	Decomposition products may include the following materials: carbon dioxide carbon monoxide nitrogen oxides
Special protective actions for fire-fighters	:	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
Special protective equipment for fire-fighters	:	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	:	No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
For emergency responders	:	If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Section 6. Accidental release measures

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems or asthma, allergies or chronic or recurrent respiratory disease should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapor or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits (OSHA United States)

Section 8. Exposure controls/personal protection

Ingredient name	Exposure limits
Hexamethylene Diisocyanate Polymer Oxo-Hexyl Acetate n-Amyl Propionate Hexamethylene Diisocyanate (max.)	None. None. None. **ACGIH TLV (United States, 3/2017).** TWA: 0.005 ppm 8 hours. TWA: 0.03 mg/m³ 8 hours. **NIOSH REL (United States, 10/2016).** TWA: 0.005 ppm 10 hours. TWA: 0.035 mg/m³ 10 hours. CEIL: 0.02 ppm 10 minutes. CEIL: 0.14 mg/m³ 10 minutes. **OSHA PEL (United States, 6/2016).** **Absorbed through skin.** TWA: 5 mg/m³, (as CN) 8 hours.

Occupational exposure limits (Canada)

Ingredient name	Exposure limits
Hexamethylene Diisocyanate (max.)	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 0.005 ppm 8 hours. 8 hrs OEL: 0.03 mg/m³ 8 hours. **CA British Columbia Provincial (Canada, 6/2017). Inhalation sensitizer.** TWA: 0.005 ppm 8 hours. C: 0.01 ppm **CA Quebec Provincial (Canada, 1/2014). Skin sensitizer.** TWAEV: 0.005 ppm 8 hours. TWAEV: 0.034 mg/m³ 8 hours. **CA Ontario Provincial (Canada, 7/2015).** TWA: 0.03 mg/m³ 8 hours. TWA: 0.01 ppm 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 0.015 ppm 15 minutes. TWA: 0.005 ppm 8 hours.

Occupational exposure limits (Mexico)

Ingredient name	Exposure limits
None.	

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Section 8. Exposure controls/personal protection

Hygiene measures	: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
Eye/face protection	: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.
Skin protection	
Hand protection	: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Body protection	: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
Other skin protection	: Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory protection	: Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance	
Physical state	: Liquid.
Color	: Not available.
Odor	: Not available.
Odor threshold	: Not available.
pH	: Not available.
Melting point/freezing point	: Not available.
Boiling point/boiling range	: 163°C (325.4°F)
Flash point	: Closed cup: 59°C (138.2°F) [Pensky-Martens Closed Cup]
Evaporation rate	: 0.175 (butyl acetate = 1)
Flammability (solid, gas)	: Not available.
Lower and upper explosive (flammable) limits	: Lower: 1% Upper: 8%
Vapor pressure	: 0.17 kPa (1.26 mm Hg) [at 20°C]
Vapor density	: 4.97 [Air = 1]
Relative density	: 1.06
Solubility	: Not available.
Partition coefficient: n-octanol/water	: Not available.
Auto-ignition temperature	: Not available.
Decomposition temperature	: Not available.
Viscosity	: Kinematic (40°C (104°F)): >0.205 cm^2/s (>20.5 cSt)
Molecular weight	: Not applicable.

Section 9. Physical and chemical properties

Aerosol product

Heat of combustion : 11.022 kJ/g

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

Incompatible materials : Reactive or incompatible with the following materials: oxidizing materials

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Hexamethylene Diisocyanate Polymer	LC50 Inhalation Vapor	Rat	18500 mg/m³	1 hours
Oxo-Hexyl Acetate	LD50 Dermal	Rabbit	>5 g/kg	-
n-Amyl Propionate	LD50 Dermal	Rabbit	>14 g/kg	-
	LD50 Oral	Rat	>14 g/kg	-
Hexamethylene Diisocyanate (max.)	LC50 Inhalation Dusts and mists	Rat	124 mg/m³	4 hours

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Hexamethylene Diisocyanate Polymer	Eyes - Moderate irritant	Rabbit	-	100 milligrams	-
	Skin - Moderate irritant	Rabbit	-	500 milligrams	-
Oxo-Hexyl Acetate	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
n-Amyl Propionate	Eyes - Mild irritant	Rabbit	-	100 milligrams	-

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Section 11. Toxicological information

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Hexamethylene Diisocyanate Polymer	Category 3	Not applicable.	Respiratory tract irritation
Hexamethylene Diisocyanate (max.)	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Harmful if inhaled. May cause respiratory irritation. May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Skin contact : Causes skin irritation. May cause an allergic skin reaction.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
wheezing and breathing difficulties
asthma

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
Teratogenicity : No known significant effects or critical hazards.
Developmental effects : No known significant effects or critical hazards.
Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Inhalation (vapors)	11.02 mg/l

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Oxo-Hexyl Acetate	Acute LC50 4000 µg/l Fresh water	Fish - Pimephales promelas	96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Hexamethylene Diisocyanate (max.)	-	57.63	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	TDG Classification	Mexico Classification	IATA	IMDG
UN number	UN1263	UN1263	UN1263	UN1263	UN1263
UN proper shipping name	PAINT RELATED MATERIAL	PAINT RELATED MATERIAL	PAINT RELATED MATERIAL	PAINT RELATED MATERIAL	PAINT RELATED MATERIAL
Transport hazard class(es)	3 	3 	3 	3 	3 
Packing group	III	III	III	III	III
Environmental hazards	No.	No.	No.	No.	No.
Additional information	This product may be re-classified as "Combustible Liquid," unless transported by vessel or aircraft. Non-bulk packages (less than or equal to 119 gal) of combustible liquids are not regulated as hazardous materials. **ERG No.** 128	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2. 18-2.19 (Class 3). **ERG No.** 128	- **ERG No.** 128	-	**Emergency schedules** F-E, S-E

Special precautions for user : Multi-modal shipping descriptions are provided for informational purposes and do not consider container sizes. The presence of a shipping description for a particular mode of transport (sea, air, etc.), does not indicate that the product is packaged suitably for that mode of transport. All packaging must be reviewed for suitability prior to shipment, and compliance with the applicable regulations is the sole responsibility of the person offering the product for transport. People loading and unloading dangerous goods must be trained on all of the risks deriving from the substances and on all actions in case of emergency situations.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Proper shipping name : Not available.
Ship type : Not available.
Pollution category : Not available.

Section 15. Regulatory information

SARA 313

SARA 313 (40 CFR 372.45) supplier notification can be found on the Environmental Data Sheet.

California Prop. 65

Not applicable.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health	*	3
Flammability		2
Physical hazards		0

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

Procedure used to derive the classification

Classification	Justification
FLAMMABLE LIQUIDS - Category 3	On basis of test data
ACUTE TOXICITY (inhalation) - Category 4	Calculation method
SKIN CORROSION/IRRITATION - Category 2	Calculation method
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2A	Calculation method
RESPIRATORY SENSITIZATION - Category 1	Calculation method
SKIN SENSITIZATION - Category 1	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3	Calculation method

History

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Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Notice to reader

It is recommended that each customer or recipient of this Safety Data Sheet (SDS) study it carefully and consult resources, as necessary or appropriate, to become aware of and understand the data contained in this SDS and any hazards associated with the product. This information is provided in good faith and believed to be accurate as of the effective date herein. However, no warranty, express or implied, is given. The information presented here applies only to the product as shipped. The addition of any material can change the composition, hazards and risks of the product. Products shall not be repackaged, modified, or tinted except as specifically instructed by Sherwin-Williams, including but not limited to the incorporation of non Sherwin-Williams products or the use or addition of products in proportions not specified by Sherwin-Williams. Regulatory requirements are subject to change and may differ between various locations and jurisdictions. The customer/buyer/user is responsible to ensure that his activities comply with all country, federal, state, provincial or local laws. The conditions for use of the product are not under the control of the manufacturer; the customer/buyer/user is responsible to determine the conditions necessary for the safe use of this product. The customer/buyer/user should not use the product for any purpose other than the purpose shown in the applicable section of this SDS without first referring to the supplier and obtaining written handling instructions. Due to the proliferation of sources for

information such as manufacturer-specific SDS, the manufacturer cannot be responsible for SDSs obtained from any other source.

SAFETY DATA SHEET

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name : MIL-PRF-32550 TYPE I, FORM A, CLASS S ZINC RICH EPOXY PRIMER, Q2251

Product code : E90G17

1.2 Relevant identified uses of the substance or mixture and uses advised against

Material uses : Paint or paint related material.
: Industrial use only.

1.3 Details of the supplier of the safety data sheet

Mfg. in U.S.A. and exported by:
The Sherwin-Williams Company
101 Prospect Avenue N.W.
Cleveland, OHIO 44115

e-mail address of person responsible for this SDS : sds@sherwin.com

1.4 Emergency telephone number

National advisory body/Poison Center

Telephone number : +431 406 43 43

Supplier

Telephone number : (216) 566-2917

Hours of operation : Emergency contact available 24 hours a day

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition : Mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Flam. Liq. 3, H226
Skin Sens. 1, H317
Aquatic Acute 1, H400
Aquatic Chronic 1, H410

The product is classified as hazardous according to Regulation (EC) 1272/2008 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Hazard pictograms :

Signal word : Warning

SECTION 2: Hazards identification

Hazard statements : Flammable liquid and vapor.
May cause an allergic skin reaction.
Very toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention : Wear protective gloves. Wear protective clothing. Wear eye or face protection. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Avoid release to the environment.

Response : IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.

Storage : Not applicable.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazardous ingredients : Epoxy Polymer

Supplemental label elements : FOR INDUSTRIAL USE ONLY

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Not applicable.

Special packaging requirements

Not applicable.

2.3 Other hazards

Other hazards which do not result in classification : None known.

SECTION 3: Composition/information on ingredients

3.2 Mixture :

Product/ingredient name	Identifiers	%	Regulation (EC) No. 1272/2008 [CLP]	Type
Zinc	REACH #: 01-2119467174-37 EC: 231-175-3 CAS: 7440-66-6 Index: 030-001-01-9	≥75 - ≤90	Aquatic Acute 1, H400 (M=10) Aquatic Chronic 1, H410 (M=10)	[1]
Solvent naphtha (petroleum), light arom.	Index: 649-356-00-4	≤10	Flam. Liq. 3, H226 STOT SE 3, H335 STOT SE 3, H336 Asp. Tox. 1, H304 Aquatic Chronic 2, H411 EUH066	[1]
Epoxy Polymer	CAS: 67924-34-9	≤7.7	Skin Irrit. 2, H315 Eye Irrit. 2, H319 Skin Sens. 1, H317	[1]
Xylene mixed isomers	REACH #: 01-2119488216-32 EC: 215-535-7 CAS: 1330-20-7 Index: 601-022-00-9	≤2.2	Flam. Liq. 3, H226 Acute Tox. 4, H312 Acute Tox. 4, H332 Skin Irrit. 2, H315 Eye Irrit. 2, H319 STOT SE 3, H335 STOT RE 2, H373 Asp. Tox. 1, H304	[1] [2]
				[1] [2]

SECTION 3: Composition/information on ingredients

Methyl n-Amyl Ketone	REACH #: 01-2119902391-49 EC: 203-767-1 CAS: 110-43-0 Index: 606-024-00-3	≤3	Flam. Liq. 3, H226 Acute Tox. 4, H302 Acute Tox. 4, H332	
Di-isobutyl Ketone	EC: 203-620-1 CAS: 108-83-8 Index: 606-005-00-X	≤2.8	Flam. Liq. 3, H226 STOT SE 3, H335	[1] [2]
			See Section 16 for the full text of the H statements declared above.	

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs or vPvBs or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit
[3] Substance meets the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII
[4] Substance meets the criteria for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII
[5] Substance of equivalent concern
[6] Additional disclosure due to company policy

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

General : In all cases of doubt, or when symptoms persist, seek medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and seek medical advice.

Eye contact : Remove contact lenses, irrigate copiously with clean, fresh water, holding the eyelids apart for at least 10 minutes and seek immediate medical advice.

Inhalation : Remove to fresh air. Keep person warm and at rest. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel.

Skin contact : Remove contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognized skin cleanser. Do NOT use solvents or thinners.

Ingestion : If swallowed, seek medical advice immediately and show this container or label. Keep person warm and at rest. Do NOT induce vomiting.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

4.2 Most important symptoms and effects, both acute and delayed

There are no data available on the mixture itself. Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]. See Sections 2 and 3 for details.

Exposure to component solvent vapor concentrations in excess of the stated occupational exposure limit may result in adverse health effects such as mucous membrane and respiratory system irritation and adverse effects on the kidneys, liver and central nervous system. Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and, in extreme cases, loss of consciousness.
Solvents may cause some of the above effects by absorption through the skin. Repeated or prolonged contact with the mixture may cause removal of natural fat from the skin, resulting in non-allergic contact dermatitis and absorption through the skin.
If splashed in the eyes, the liquid may cause irritation and reversible damage.
Ingestion may cause nausea, diarrhea and vomiting.
This takes into account, where known, delayed and immediate effects and also chronic effects of components from short-term and long-term exposure by oral, inhalation and dermal routes of exposure and eye contact.

SECTION 4: First aid measures

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician	:	Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
Specific treatments	:	No specific treatment.

See toxicological information (Section 11)

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media	:	Recommended: alcohol-resistant foam, carbon dioxide, powders.
Unsuitable extinguishing media	:	Do not use water jet.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture	:	Fire will produce dense black smoke. Exposure to decomposition products may cause a health hazard.
Hazardous combustion products	:	Decomposition products may include the following materials: carbon monoxide, carbon dioxide, smoke, oxides of nitrogen.

5.3 Advice for firefighters

Special protective actions for fire-fighters	:	Cool closed containers exposed to fire with water. Do not release runoff from fire to drains or watercourses.
Special protective equipment for fire-fighters	:	Fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	:	Exclude sources of ignition and ventilate the area. Avoid breathing vapor or mist. Refer to protective measures listed in sections 7 and 8. Keep unnecessary and unprotected personnel from entering.
For emergency responders	:	If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions	:	Do not allow to enter drains or watercourses. If the product contaminates lakes, rivers, or sewers, inform the appropriate authorities in accordance with local regulations.
6.3 Methods and materials for containment and cleaning up	:	Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Preferably clean with a detergent. Avoid using solvents.
6.4 Reference to other sections	:	See Section 1 for emergency contact information. See Section 8 for information on appropriate personal protective equipment. See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

7.1 Precautions for safe handling	:	Prevent the creation of flammable or explosive concentrations of vapors in air and avoid vapor concentrations higher than the occupational exposure limits. In addition, the product should only be used in areas from which all naked lights and other sources of ignition have been excluded. Electrical equipment should be protected to the appropriate standard. Mixture may charge electrostatically: always use earthing leads when transferring from one container to another. Operators should wear antistatic footwear and clothing and floors should be of the conducting type. Keep away from heat, sparks and flame. No sparking tools should be used. Avoid contact with skin and eyes. Avoid the inhalation of dust, particulates, spray or mist arising from the application of this mixture. Avoid inhalation of dust from sanding. Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Put on appropriate personal protective equipment (see Section 8). Never use pressure to empty. Container is not a pressure vessel. Always keep in containers made from the same material as the original one. Comply with the health and safety at work laws. Do not allow to enter drains or watercourses. **Information on fire and explosion protection** Vapors are heavier than air and may spread along floors. Vapors may form explosive mixtures with air. When operators, whether spraying or not, have to work inside the spray booth, ventilation is unlikely to be sufficient to control particulates and solvent vapors in all cases. In such circumstances, they should wear a compressed-air-fed respirator during the spraying process and until the particulate and solvent vapor concentrations have fallen below the exposure limits.
7.2 Conditions for safe storage, including any incompatibilities	:	Store in accordance with local regulations. **Notes on joint storage** Keep away from: oxidizing agents, strong alkalis, strong acids. **Additional information on storage conditions** Observe label precautions. Store in a dry, cool and well-ventilated area. Keep away from heat and direct sunlight. Keep away from sources of ignition. No smoking. Prevent unauthorized access. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Contaminated absorbent material may pose the same hazard as the spilled product.

7.3 Specific end use(s)

Recommendations	:	Not available.
Industrial sector specific solutions	:	Not available.

Good housekeeping standards, regular safe removal of waste materials and regular maintenance of spray booth filters will minimise the risks of spontaneous combustion and other fire hazards.

Before use of this material please refer to the Exposure Scenario(s) if attached for the specific end use, control measures and additional PPE considerations.

SECTION 8: Exposure controls/personal protection

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

8.1 Control parameters

Occupational exposure limits

Product/ingredient name	Exposure limit values
Xylene mixed isomers	**Regulation on Limit Values - MAC (Austria, 10/2017). Absorbed through skin.** PEAK: 442 mg/m³, 4 times per shift, 15 minutes. TWA: 50 ppm 8 hours. PEAK: 100 ppm, 4 times per shift, 15 minutes. TWA: 221 mg/m³ 8 hours.
Methyl n-Amyl Ketone	**Regulation on Limit Values - MAC (Austria, 10/2017). Absorbed through skin.** TWA: 50 ppm 8 hours. TWA: 237 mg/m³ 8 hours. PEAK: 100 ppm, 4 times per shift, 15 minutes. PEAK: 473 mg/m³, 4 times per shift, 15 minutes.
Di-isobutyl Ketone	**Regulation on Limit Values - MAC (Austria, 12/2011).** TWA: 50 ppm 8 hours. TWA: 290 mg/m³ 8 hours.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to monitoring standards, such as the following: European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

: Regular monitoring of all work areas should be carried out at all times, including areas that may not be equally ventilated.

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
Solvent naphtha (petroleum), light arom.	DNEL	Long term Dermal	25 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Inhalation	150 mg/m³	Workers	Systemic
	DNEL	Long term Dermal	11 mg/kg bw/day	Consumers	Systemic
	DNEL	Long term Inhalation	32 mg/m³	Consumers	Systemic
	DNEL	Long term Oral	11 mg/kg bw/day	Consumers	Systemic
Xylene mixed isomers	DNEL	Long term Dermal	180 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Dermal	108 mg/kg bw/day	Human via the environment	Systemic
	DNEL	Long term Inhalation	77 mg/m³	Workers	Systemic
	DNEL	Short term Inhalation	289 mg/m³	Workers	Systemic
	DNEL	Short term	289 mg/m³	Workers	Local

SECTION 8: Exposure controls/personal protection

		Inhalation			
	DNEL	Long term Inhalation	14.8 mg/m³	Human via the environment	Systemic
	DNEL	Short term Inhalation	174 mg/m³	Consumers	Systemic
	DNEL	Short term Inhalation	174 mg/m³	Consumers	Local

PNECs

Product/ingredient name	Compartment Detail	Value	Method Detail
Xylene mixed isomers	Fresh water	0.327 mg/l	-
	Marine water	0.327 mg/l	-
	Fresh water sediment	12.46 mg/l	-
	Sewage Treatment Plant	6.58 mg/l	-
	Soil	2.31 mg/kg	-
	Marine water sediment	12.46 mg/l	-

8.2 Exposure controls

Appropriate engineering controls : Provide adequate ventilation. Where reasonably practicable, this should be achieved by the use of local exhaust ventilation and good general extraction. If these are not sufficient to maintain concentrations of particulates and solvent vapors below the OEL, suitable respiratory protection must be worn.

: Users are advised to consider national Occupational Exposure Limits or other equivalent values.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Use safety eyewear designed to protect against splash of liquids.

Skin protection

Hand protection : Wear suitable gloves tested to EN374.

Gloves : Gloves for short term exposure/splash protection (less than 10 min.): Nitrile>0.12 mm
Gloves for splash protection need to be changed immediately when in contact with chemicals.
Gloves for repeated or prolonged exposure (breakthrough time > 240 min.)
When the hazardous ingredients in Section 3 contain any of the following: Aromatic solvents (Xylene, Toluene) or Aliphatic solvents or Mineral Oil use: Polyvinyl alcohol (PVA) gloves 0.2-0.3 mm
Otherwise use: Butyl gloves >0.3 mm
For long term exposure or spills (breakthrough time >480 min.): Use PE laminated gloves as under gloves
Due to many conditions (e.g. temperature, abrasion) the practical usage of a chemical protective glove in practice may be much shorter than the permeation time determined through testing.
The recommendation for the type or types of glove to use when handling this product is based on information from the following source: Solvent resin manufacturers and European Solvents Industry Group (ESIG)

SECTION 8: Exposure controls/personal protection

There is no one glove material or combination of materials that will give unlimited resistance to any individual or combination of chemicals.
The breakthrough time must be greater than the end use time of the product.
The instructions and information provided by the glove manufacturer on use, storage, maintenance and replacement must be followed.
Gloves should be replaced regularly and if there is any sign of damage to the glove material.
Always ensure that gloves are free from defects and that they are stored and used correctly.
The performance or effectiveness of the glove may be reduced by physical/chemical damage and poor maintenance.
Barrier creams may help to protect the exposed areas of the skin but should not be applied once exposure has occurred.

The user must check that the final choice of type of glove selected for handling this product is the most appropriate and takes into account the particular conditions of use, as included in the user's risk assessment.

Body protection : Personnel should wear antistatic clothing made of natural fibers or of high-temperature-resistant synthetic fibers.

: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves. Refer to European Standard EN 1149 for further information on material and design requirements and test methods.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Recommended: A2P2 (EN14387). Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Environmental exposure controls : Do not allow to enter drains or watercourses.

Before use of this material please refer to the Exposure Scenario(s) if attached for the specific end use, control measures and additional PPE considerations. The information contained in this safety data sheet does not constitute the user’s own assessment of workplace risks, as required by other health and safety legislation. The provisions of the national health and safety at work regulations apply to the use of this product at work.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

<u>**Appearance**</u>

Physical state	: Liquid.
Color	: Not available.
Odor	: Solvent.
Odor threshold	: Not Available (Not Tested).
pH	: Not relevant/applicable due to nature of the product.
Melting point/freezing point	: Not relevant/applicable due to nature of the product.
Initial boiling point and boiling range	: 138°C
Flash point	: Closed cup: 27°C [Pensky-Martens Closed Cup]
Evaporation rate	: 0.53 (butyl acetate = 1)
Flammability (solid, gas)	: Not relevant/applicable due to nature of the product.

SECTION 9: Physical and chemical properties

Upper/lower flammability or explosive limits	: LEL: 0.7% (Light Aromatic Hydrocarbons) UEL: 7.9% (Methyl n-Amyl Ketone)
Vapor pressure	: 0.79 kPa [at 20°C]
Vapor density	: 3.66 [Air = 1]
Relative density	: 3.31
Solubility(ies)	: Not relevant/applicable due to nature of the product.
Partition coefficient: n-octanol/ water	: Not relevant/applicable due to nature of the product.
Auto-ignition temperature	: Not relevant/applicable due to nature of the product.
Decomposition temperature	Not relevant/applicable due to nature of the product.
Viscosity	: Kinematic (40°C): >0.205 cm^2/s
Explosive properties	: Under normal conditions of storage and use, hazardous reactions will not occur.
Oxidizing properties	: Under normal conditions of storage and use, hazardous reactions will not occur.

SECTION 10: Stability and reactivity

10.1 Reactivity	: No specific test data related to reactivity available for this product or its ingredients.
10.2 Chemical stability	: Stable under recommended storage and handling conditions (see Section 7).
10.3 Possibility of hazardous reactions	: Under normal conditions of storage and use, hazardous reactions will not occur.
10.4 Conditions to avoid	: When exposed to high temperatures may produce hazardous decomposition products.
10.5 Incompatible materials	: Keep away from the following materials to prevent strong exothermic reactions: oxidizing agents, strong alkalis, strong acids.
10.6 Hazardous decomposition products	: Decomposition products may include the following materials: carbon monoxide, carbon dioxide, smoke, oxides of nitrogen.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

There are no data available on the mixture itself. Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]. See Sections 2 and 3 for details.

Exposure to component solvent vapor concentrations in excess of the stated occupational exposure limit may result in adverse health effects such as mucous membrane and respiratory system irritation and adverse effects on the kidneys, liver and central nervous system. Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and, in extreme cases, loss of consciousness.
Solvents may cause some of the above effects by absorption through the skin. Repeated or prolonged contact with the mixture may cause removal of natural fat from the skin, resulting in non-allergic contact dermatitis and absorption through the skin.
If splashed in the eyes, the liquid may cause irritation and reversible damage.
Ingestion may cause nausea, diarrhea and vomiting.
This takes into account, where known, delayed and immediate effects and also chronic effects of components from short-term and long-term exposure by oral, inhalation and dermal routes of exposure and eye contact.

Acute toxicity

SECTION 11: Toxicological information

Product/ingredient name	Result	Species	Dose	Exposure
Solvent naphtha (petroleum), light arom.	LD50 Oral	Rat	8400 mg/kg	-
Xylene mixed isomers	LC50 Inhalation Gas.	Rat	5000 ppm	4 hours
	LD50 Oral	Rat	4300 mg/kg	-
Methyl n-Amyl Ketone	LD50 Oral	Rat	1600 mg/kg	-
Di-isobutyl Ketone	LD50 Dermal	Rabbit	16120 mg/kg	-
	LD50 Oral	Rat	5750 mg/kg	-

Acute toxicity estimates

Route	ATE value
Oral	107396.1 mg/kg
Dermal	66804.8 mg/kg
Inhalation (gases)	303658 ppm
Inhalation (vapors)	738.3 mg/l

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Zinc	Skin - Mild irritant	Human	-	72 hours 300 Micrograms Intermittent	-
Solvent naphtha (petroleum), light arom.	Eyes - Mild irritant	Rabbit	-	24 hours 100 microliters	-
Xylene mixed isomers	Eyes - Mild irritant	Rabbit	-	87 milligrams	-
	Eyes - Severe irritant	Rabbit	-	24 hours 5 milligrams	-
	Skin - Mild irritant	Rat	-	8 hours 60 microliters	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Moderate irritant	Rabbit	-	100 Percent	-
Methyl n-Amyl Ketone	Skin - Mild irritant	Rabbit	-	24 hours 14 milligrams	-
Di-isobutyl Ketone	Eyes - Mild irritant	Human	-	15 minutes 25 parts per million	-
	Eyes - Mild irritant	Rabbit	-	500 milligrams	-
	Skin - Mild irritant	Rabbit	-	24 hours 10 milligrams	-
	Skin - Mild irritant	Rabbit	-	500 milligrams	-

Conclusion/Summary : Not available.

Sensitization

No data available

Conclusion/Summary : Not available.

Mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

Teratogenicity

No data available

SECTION 11: Toxicological information

Specific target organ toxicity (single exposure)

Product/ingredient name	Category	Route of exposure	Target organs
Solvent naphtha (petroleum), light arom.	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
Xylene mixed isomers	Category 3	Not applicable.	Respiratory tract irritation
Di-isobutyl Ketone	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Product/ingredient name	Category	Route of exposure	Target organs
Xylene mixed isomers	Category 2	Not determined	Not determined

Aspiration hazard

Product/ingredient name	Result
Solvent naphtha (petroleum), light arom.	ASPIRATION HAZARD - Category 1
Xylene mixed isomers	ASPIRATION HAZARD - Category 1

Other information : Not available.

SECTION 12: Ecological information

12.1 Toxicity

There are no data available on the mixture itself.
Do not allow to enter drains or watercourses.

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]. See Sections 2 and 3 for details.

Product/ingredient name	Result	Species	Exposure
Zinc	Acute EC50 106 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata - Exponential growth phase	72 hours
	Acute EC50 10000 µg/l Fresh water	Aquatic plants - Lemna minor	4 days
	Acute IC50 65 µg/l Marine water	Algae - Nitzschia closterium - Exponential growth phase	4 days
	Acute LC50 65 µg/l Fresh water	Crustaceans - Ceriodaphnia dubia - Neonate	48 hours
	Acute LC50 68 µg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 12.21 µg/l Marine water	Fish - Periophthalmus waltoni - Adult	96 hours
	Chronic EC10 27.3 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata - Exponential growth phase	72 hours
	Chronic EC10 59.2 µg/l Fresh water	Daphnia - Daphnia magna	21 days
	Chronic NOEC 9 mg/l Fresh water	Aquatic plants - Ceratophyllum demersum	3 days
	Chronic NOEC 178 µg/l Marine water	Crustaceans - Palaemon elegans	21 days
	Chronic NOEC 2.6 µg/l Fresh water	Fish - Cyprinus carpio	4 weeks
Xylene mixed isomers	Acute LC50 8500 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
	Acute LC50 13400 µg/l Fresh water	Fish - Pimephales promelas	96 hours
Methyl n-Amyl Ketone	Acute LC50 131000 µg/l Fresh water	Fish - Pimephales promelas	96 hours

12.2 Persistence and degradability

SECTION 12: Ecological information

Product/ingredient name	Test	Result	Dose	Inoculum
No data available				

Conclusion/Summary : Not available.

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
Xylene mixed isomers	-	-	Readily
Methyl n-Amyl Ketone	-	-	Readily

12.3 Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Solvent naphtha (petroleum), light arom.	-	10 to 2500	high
Xylene mixed isomers	-	8.1 to 25.9	low

12.4 Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

PBT : Not applicable.

vPvB : Not applicable.

12.6 Other adverse effects : No known significant effects or critical hazards.

: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Methods of disposal : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.

Hazardous waste : Yes.

European waste catalogue (EWC) : waste paint and varnish containing organic solvents or other hazardous substances 08 01 11*

Disposal considerations : Do not allow to enter drains or watercourses.
Dispose of according to all federal, state and local applicable regulations.
If this product is mixed with other wastes, the original waste product code may no longer apply and the appropriate code should be assigned.
For further information, contact your local waste authority.

Packaging

Methods of disposal : The generation of waste should be avoided or minimized wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

SECTION 13: Disposal considerations

Disposal considerations : Using information provided in this safety data sheet, advice should be obtained from the relevant waste authority on the classification of empty containers. Empty containers must be scrapped or reconditioned. Dispose of containers contaminated by the product in accordance with local or national legal provisions.

European waste catalogue (EWC) : packaging containing residues of or contaminated by hazardous substances 15 01 10*

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

	ADR/RID	IMDG	IATA
14.1 UN number	UN1263	UN1263	UN1263
14.2 UN proper shipping name	PAINT	PAINT. Marine pollutant (Zinc, Cumene)	PAINT
14.3 Transport Hazard Class(es)/ Label(s)	3  	3  	3 
14.4 Packing group	III	III	III
14.5 Environmental hazards	Yes.	Yes.	No.
Additional information	The environmentally hazardous substance mark is not required when transported in sizes of ≤5 L or ≤5 kg. **Tunnel code** D/E	The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg. **Emergency schedules** F-E, S-E	The environmentally hazardous substance mark may appear if required by other transportation regulations.

14.6 Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code : Not applicable.

Multi-modal shipping descriptions are provided for informational purposes and do not consider container sizes. The presence of a shipping description for a particular mode of transport (sea, air, etc.), does not indicate that the product is packaged suitably for that mode of transport. All packaging must be reviewed for suitability prior to shipment, and compliance with the applicable regulations is the sole responsibility of the person offering the product for transport. People loading and unloading dangerous goods must be trained on all of the risks deriving from the substances and on all actions in case of emergency situations.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EU Regulation (EC) No. 1907/2006 (REACH)

Annex XIV - List of substances subject to authorization

Annex XIV

None of the components are listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Not applicable.

Other EU regulations

VOC content *(2010/75/EU)* : 11.1 **w/w**
368 **g/l**

Industrial emissions (integrated pollution prevention and control) - Air : Listed

Industrial emissions (integrated pollution prevention and control) - Water : Listed

Seveso Directive

This product may add to the calculation for determining whether a site is within the scope of the Seveso Directive on major accident hazards.

National regulations

15.2 Chemical Safety Assessment : No Chemical Safety Assessment has been carried out.

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms :
ATE = Acute Toxicity Estimate
CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EUH statement = CLP-specific Hazard statement
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
vPvB = Very Persistent and Very Bioaccumulative

Key literature references and sources for data :
Regulation (EC) No. 1272/2008 [CLP]
ADR = The European Agreement concerning the International Carriage of Dangerous Goods by Road
IATA = International Air Transport Association
IMDG = International Maritime Dangerous Goods
Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by Commission Regulation (EU) 2015/830
Directive 2012/18/EU, and relative amendments & additions
Directive 2008/98/EC, and relative amendments & additions
Directive 2009/161/EU, and relative amendments & additions

SECTION 16: Other information

CEPE Guidelines

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Classification	Justification
Flam. Liq. 3, H226	On basis of test data
Skin Sens. 1, H317	Calculation method
Aquatic Acute 1, H400	Calculation method
Aquatic Chronic 1, H410	Calculation method

Full text of abbreviated H statements :

H226	Flammable liquid and vapor.
H302	Harmful if swallowed.
H304	May be fatal if swallowed and enters airways.
H312	Harmful in contact with skin.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
H373	May cause damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
H411	Toxic to aquatic life with long lasting effects.

Full text of classifications [CLP/GHS] :

Acute Tox. 4, H302	ACUTE TOXICITY (oral) - Category 4
Acute Tox. 4, H312	ACUTE TOXICITY (dermal) - Category 4
Acute Tox. 4, H332	ACUTE TOXICITY (inhalation) - Category 4
Aquatic Acute 1, H400	AQUATIC HAZARD (ACUTE) - Category 1
Aquatic Chronic 1, H410	AQUATIC HAZARD (LONG-TERM) - Category 1
Aquatic Chronic 2, H411	AQUATIC HAZARD (LONG-TERM) - Category 2
Asp. Tox. 1, H304	ASPIRATION HAZARD - Category 1
EUH066	Repeated exposure may cause skin dryness or cracking.
Eye Irrit. 2, H319	SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2
Flam. Liq. 3, H226	FLAMMABLE LIQUIDS - Category 3
Skin Irrit. 2, H315	SKIN CORROSION/IRRITATION - Category 2
Skin Sens. 1, H317	SKIN SENSITIZATION - Category 1
STOT RE 2, H373	SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2
STOT SE 3, H335	SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
STOT SE 3, H336	SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3

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Date of issue/ Date of revision : 23, Jan, 2019

Date of previous issue : 17, Dec, 2018

: If there is no previous validation date please contact your supplier for more information.

Version : 3.01

Notice to reader

SECTION 16: Other information

It is recommended that each customer or recipient of this Safety Data Sheet (SDS) study it carefully and consult resources, as necessary or appropriate, to become aware of and understand the data contained in this SDS and any hazards associated with the product. This information is provided in good faith and believed to be accurate as of the effective date herein. However, no warranty, express or implied, is given. The information presented here applies only to the product as shipped. The addition of any material can change the composition, hazards and risks of the product. Products shall not be repackaged, modified, or tinted except as specifically instructed by the manufacturer, including but not limited to the incorporation of products not specified by the manufacturer, or the use or addition of products in proportions not specified by the manufacturer. Regulatory requirements are subject to change and may differ between various locations and jurisdictions. The customer/buyer/user is responsible to ensure that his activities comply with all country, federal, state, provincial or local laws. The conditions for use of the product are not under the control of the manufacturer; the customer/buyer/user is responsible to determine the conditions necessary for the safe use of this product. The customer/buyer/user should not use the product for any purpose other than the purpose shown in the applicable section of this SDS without first referring to the supplier and obtaining written handling instructions. Due to the proliferation of sources for information such as manufacturer-specific SDS, the manufacturer cannot be responsible for SDSs obtained from any other source.

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Oakite® 61 B

Substance number : REL_0612

Chemical usage : Cleaning Compound

Manufacturer or supplier's details

Company : Chemetall US, Inc.

Address : 675 Central Avenue
New Providence NJ 07974

Telephone : (800) 526-4473
Telefax : (908) 464-4658
Emergency telephone no : CHEMTREC - 800-424-9300, 1-703-527-3887 (International)

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	powder
Colour	yellow
Odour	none
Hazard Summary	Harmful by inhalation and if swallowed. Causes irritation of eyes and skin.

GHS Classification

Acute toxicity (Dermal) : Category 4

Skin corrosion : Category 1A

Serious eye damage : Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Harmful in contact with skin.
Causes severe skin burns and eye damage.

Precautionary statements : **Prevention:**

Do not breathe dust or mist.
Wash skin thoroughly after handling.
Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response:
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
Wash contaminated clothing before reuse.
Storage:
Store locked up.
Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Potential Health Effects

Inhalation : yes

Skin : yes

Ingestion : yes

Aggravated Medical Condition : None known.

Carcinogenicity:

IARC No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

OSHA No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

NTP No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture :

Hazardous components

Component	CAS-No.	Weight percent
Trade Secret Registry	735517-5122P	30 - 50
Trade Secret Registry	735517-5148P	10 - 20
Trisodium phosphate	10101-89-0	10 - 20
Tetrasodium pyrophosphate	7722-88-5	5 - 10
Sodium disilicate	1344-09-8	5 - 10

Unidentified ingredients are considered not hazardous, or not required to be listed under Federal Hazard Communication Standard (29CFR 1910.1200).

Specific chemical identity of composition has been withheld as a trade secret.

Exact percentage of composition has been withheld as a trade secret.

SECTION 4. FIRST AID MEASURES

If inhaled : Remove to fresh air.
If symptoms persist, call a physician.

In case of skin contact : Wash off immediately with plenty of water for at least 15 minutes.
If skin irritation persists, call a physician.

In case of eye contact : Rinse immediately with plenty of water for at least 15 minutes.
Keep eye wide open while rinsing.
Seek medical advice.

If swallowed : Rinse mouth.
Drink plenty of water.
Obtain medical attention.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media : Water spray
Dry powder
Foam
Carbon dioxide (CO2)

Special protective equipment for firefighters : In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures : Ensure adequate ventilation.
Avoid dust formation.
Material can create slippery conditions.

Methods and materials for containment and cleaning up : Ventilate area.
Avoid dust generation
Sweep up and remove immediately.
Keep in suitable, closed containers for disposal.
Flush with plenty of water.

Additional advice : Never return spills in original containers for re-use.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling : Use only with adequate ventilation.
Do not breathe dust.

Conditions for safe storage : Keep containers dry and tightly closed to avoid moisture absorption and contamination.
Store indoors in a cool, well-ventilated place
Protect from direct contact with water or excessive moisture.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Trisodium phosphate	10101-89-0	STEL	5.000000 mg/m3	US WEEL
Tetrasodium pyrophosphate	7722-88-5	TWA	5.000000 mg/m3	NIOSH REL
		TWA	5.000000 mg/m3	OSHA P0
		PEL	5.000000 mg/m3	CAL PEL

Personal protective equipment

Respiratory protection : If the occupational exposure limits cannot be met, suitable respirator equipment shall be worn.

Hand protection
Remarks : Impervious gloves

Eye protection : Chemical resistant goggles must be worn.

Skin and body protection : Rubber or plastic apron

Hygiene measures : Avoid contact with skin, eyes and clothing.
Wear suitable gloves and eye/face protection.
Wear suitable protective clothing.
Wash hands before breaks and immediately after handling the product.
Provide adequate ventilation.
Avoid breathing dust or vapor.
Keep away from food and drink.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : powder

Colour : yellow

Odour	:	none
pH	:	11.5 - 12.5, Concentration: 40.00000 g/l
Freezing point	:	Not applicable
Boiling point/boiling range	:	Not applicable
Flash point	:	does not flash
Evaporation rate	:	Not applicable
Upper explosion limit	:	Not applicable.
Lower explosion limit	:	Not applicable.
Vapour pressure	:	No data available
Relative density	:	Not applicable
Bulk density	:	56.19 lb/ft3
Solubility(ies)		
Water solubility	:	41.00000 g/l
Auto-ignition temperature	:	No data available
Thermal decomposition	:	No data available
Viscosity, dynamic	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Exposure to moisture
Incompatible materials	:	Acids
Hazardous decomposition products	:	Oxides of phosphorus Carbon oxides Silicon Oxides

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity	:	Acute toxicity estimate : 2,893.000000 mg/kg Method: Calculation method
Acute inhalation toxicity	:	Acute toxicity estimate : 7.490000 mg/l Exposure time: 4 h Test atmosphere: dust/mist Method: Calculation method

Acute dermal toxicity	:	Acute toxicity estimate : 1,948.000000 mg/kg Method: Calculation method

Components:

Trade Secret Registry:

Acute oral toxicity	:	LD50 Rat: 4,090.000000 mg/kg
		LD50 Mouse: 6,600.000000 mg/kg
Acute inhalation toxicity	:	LC50 Rat: 2.300000 mg/l Exposure time: 4 h Test atmosphere: dust/mist
		LC50 Mouse: 1.200000 mg/l Exposure time: 2 h Test atmosphere: dust/mist

Trade Secret Registry:

Acute oral toxicity	:	LD50 Rat: 1,153.000000 mg/kg
		LD50 Mouse: 770.000000 mg/kg

Trisodium phosphate:

Acute oral toxicity	:	LD50 Rat: 7,400.000000 mg/kg
Acute dermal toxicity	:	LD50 Rabbit: > 300.000000 mg/kg

Tetrasodium pyrophosphate:

Acute oral toxicity	:	LD50 Mouse: 2,980.000000 mg/kg
		LD50 Rat: 4,000.000000 mg/kg
Acute dermal toxicity	:	LD50 Rabbit: > 7,940.000000 mg/kg

Sodium disilicate:

Acute oral toxicity	:	LD50 Mouse: 1,100.000000 mg/kg
		LD50 Rat: 1,100.000000 mg/kg
		LD50 Rat: 1,960.000000 mg/kg

Skin corrosion/irritation

Components:

Trade Secret Registry:
Result: Corrosive after 1 to 4 hours of exposure

Sodium disilicate:

Result: Severe skin irritation

Serious eye damage/eye irritation

Components:

Trade Secret Registry:
Result: Corrosive

Tetrasodium pyrophosphate:
Result: Corrosive

Sodium disilicate:
Result: Eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

No data available

Other adverse effects

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Refer to all federal, provincial, state and local regulation prior to disposition of container and unused contents by reuse, recycle or disposal.

SECTION 14. TRANSPORT INFORMATION

International Regulations

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

National Regulations

SECTION 15. REGULATORY INFORMATION

TSCA Status : All components of this material comply with US TSCA requirements.

OSHA Hazards : Combustible dust, Harmful by ingestion., Toxic by skin absorption, Severe skin irritant, Moderate eye irritant

WHMIS Classification : D2B: Toxic Material Causing Other Toxic Effects
E: Corrosive Material

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Trade Secret Registry	735517-5156P	5,000	31,250

SARA 311/312 Hazards : Acute Health Hazard

SARA 302 : No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

US State Regulations

Massachusetts Right To Know

Trade Secret Registry	735517-5156P
Trisodium phosphate	10101-89-0
Tetrasodium pyrophosphate	7722-88-5
Disodium phosphate	7558-79-4

Pennsylvania Right To Know

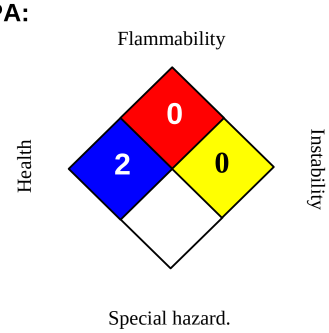
Trade Secret Registry	735517-5122P
Trade Secret Registry	735517-5148P
Trade Secret Registry	735517-5156P

Trisodium phosphate	10101-89-0
Tetrasodium pyrophosphate	7722-88-5
Sodium disilicate	1344-09-8
Disodium phosphate	7558-79-4
Coco amido sulfonate	68139-30-0

New Jersey Right To Know

Trade Secret Registry	735517-5122P
Trade Secret Registry	735517-5148P
Trade Secret Registry	735517-5156P
Trisodium phosphate	10101-89-0
Tetrasodium pyrophosphate	7722-88-5
Disodium phosphate	7558-79-4

NFPA:



HMIS III:

HEALTH	2
FLAMMABILITY	0
PHYSICAL HAZARD	0

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

Corrosive Alkaline

Safety Glasses, Gloves, Dust Respirator

SECTION 16. OTHER INFORMATION

Further information

Version *1.1*
Revision Date 01/06/2018

Chemetall US, Inc. warrants that the products described herein will conform with its published specifications.

The products supplied by Chemetall and information related to them are intended for use by buyers having necessary industrial skill and knowledge. Buyers should undertake sufficient verification and testing to determine the suitability of the Chemetall materials for their own particular purpose. Since buyer's conditions of use of products are beyond Chemetall's control, Chemetall does not warrant any recommendations and information for the use of such products. CHEMETALL DISCLAIMS ALL OTHER WARRANTIES INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY AND FITNESS FOR ANY PARTICULAR PURPOSE IN CONNECTION WITH THE USE OF ITS PRODUCTS.

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Printing date 12/04/2017 Reviewed on 12/04/2017

1 Identification

. **Product identifier**

. **Trade name** **SEALKOR BLACK SM SGL**

. **Article number:** 223/80001

. **Manufacturer/Supplier:**

USA:
TIGER Drylac U.S.A., Inc.
3945 Swenson Ave
St. Charles, IL 60174
Phone: +1- 630-587-2918
Fax: +1-630-587-2923

Canada:
TIGER Drylac Canada Inc.
110 Southgate Drive
Guelph, Ontario, N1G 4P5
Phone: +1-519-766-4781
Fax: +1-519-766-4787

Mexico
TIGER Drylac Mexico S.A. de C.V.
Circuito Exportación 212, Parque Industrial Tres Naciones
San Luis Potosí, SLP, C.P. 78395
Phone +52-444-799-7243
Fax +52-444-799-7244

. **Informing department:** Product Safety Department

. **Emergency telephone number:** 24/7:1-800-255-3924; International:+01 or +001-813-248-0585

2 Hazard(s) identification

. **Classification of the substance or mixture**

GHS08 Health hazard

Muta. 1B	H340	May cause genetic defects.
STOT RE 2	H373	May cause damage to organs through prolonged or repeated exposure.

GHS05 Corrosion

Eye Dam. 1	H318	Causes serious eye damage.

GHS07

Skin Sens. 1	H317	May cause an allergic skin reaction.
Combustible Dust		May form combustible dust concentrations in air.

. **Label elements**

. **GHS label elements**

The product is classified and labeled according to the Globally Harmonized System (GHS).

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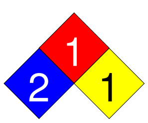
. **Hazard pictograms**

GHS05 GHS07 GHS08

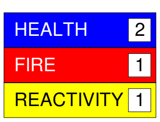
. **Signal word** Danger

. **Hazard-determining components of labeling:**
1,3,5-tris(oxiranylmethyl)-1,3,5-triazine-2,4,6(1H,3H,5H)-trione
. **Hazard statements**
Causes serious eye damage.
May cause an allergic skin reaction.
May cause genetic defects.
May cause damage to organs through prolonged or repeated exposure.
May form combustible dust concentrations in air.
. **Precautionary statements**
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe dust/fume/gas/mist/vapors/spray.
Contaminated work clothing must not be allowed out of the workplace.
Wear protective gloves/protective clothing/eye protection/face protection.
If on skin: Wash with plenty of water.
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If exposed or concerned: Get medical advice/attention.
Immediately call a poison center/doctor.
Get medical advice/attention if you feel unwell.
Specific treatment (see on this label).
If skin irritation or rash occurs: Get medical advice/attention.
Wash contaminated clothing before reuse.
Store locked up.
Dispose of contents/container in accordance with local/regional/national/international regulations.
. **Classification system**
. **NFPA ratings (scale 0-4)**



Health = 2
Fire = 1
Reactivity = 1

. **HMIS-RATINGS (SCALE 0 - 4)**



Health = 2
Fire = 1
Reactivity = 1

. **Other hazards**
. **Results of PBT and vPvB assessment**
. **PBT:** Not applicable.
. **vPvB:** Not applicable.

3 Composition/information on ingredients

. **Chemical characterization: Mixtures**
. **Description:** Mixture consisting of the following components with harmless additives.

. **Hazardous ingredients:**		
7727-43-7	barium sulphate, natural	25-50%

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2451-62-9	1,3,5-tris(oxiranylmethyl)-1,3,5-triazine-2,4,6(1H,3H,5H)-trione Acute Tox. 3, H301; Acute Tox. 3, H331; Muta. 1B, H340; STOT RE 2, H373; Eye Dam. 1, H318; Skin Sens. 1, H317	2.5-10%

. **Additional information** For the wording of the listed hazard phrases refer to section 16.

4 First-aid measures

. **Description of first aid measures**
. **General information**
Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.
. **After inhalation**
Supply fresh air and call for doctor for safety reasons.
In case of unconsciousness bring patient into stable side position for transport.
. **After skin contact** Instantly wash with water and soap and rinse thoroughly.
. **After eye contact** Rinse opened eye for several minutes under running water.
. **After swallowing** Instantly call for doctor.
. **Information for doctor**
. **Most important symptoms and effects, both acute and delayed**
No further relevant information available.
. **Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

5 Fire Fighting Measures

. **Extinguishing media**
. **Suitable extinguishing agents**
CO2, extinguishing powder or water jet. Fight larger fires with water jet or alcohol-resistant foam.
. **Special hazards arising from the substance or mixture**
No further relevant information available.
. **Advice for firefighters**
. **Protective equipment:** Put on breathing apparatus.

6 Accidental release measures

. **Personal precautions, protective equipment and emergency procedures**
Wear protective equipment. Keep unprotected persons away.
Avoid causing dust.
. **Environmental precautions:** Do not allow product to reach sewage system or water bodies.
. **Methods and material for containment and cleaning up:**
Collect mechanically.
Ensure adequate ventilation.
. **Reference to other sections**
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for information on disposal.
. **Protective Action Criteria for Chemicals**

. **PAC-1:**		
7727-43-7	barium sulphate, natural	15 mg/m³
1333-86-4	carbon black	9 mg/m³
20344-49-4	iron hydroxide oxide	24 mg/m³
112926-00-8	Silicon dioxide	18 mg/m³
9002-88-4	Ethene, homopolymer	16 mg/m³
13463-67-7	titanium dioxide	30 mg/m³
1309-37-1	diiron trioxide	15 mg/m³
14808-60-7	quartz (SiO2)	0.075 mg/m³

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7631-86-9	silicon dioxide, chemically prepared	18 mg/m³
1344-28-1	aluminium oxide	15 mg/m³
1314-23-4	zirconium dioxide	14 mg/m³
. PAC-2:		
7727-43-7	barium sulphate, natural	170 mg/m³
1333-86-4	carbon black	99 mg/m³
20344-49-4	iron hydroxide oxide	260 mg/m³
112926-00-8	Silicon dioxide	200 mg/m³
9002-88-4	Ethene, homopolymer	170 mg/m³
13463-67-7	titanium dioxide	330 mg/m³
1309-37-1	diiron trioxide	360 mg/m³
14808-60-7	quartz (SiO2)	33 mg/m³
7631-86-9	silicon dioxide, chemically prepared	740 mg/m³
1344-28-1	aluminium oxide	170 mg/m³
1314-23-4	zirconium dioxide	110 mg/m³
. PAC-3:		
7727-43-7	barium sulphate, natural	990 mg/m³
1333-86-4	carbon black	590 mg/m³
20344-49-4	iron hydroxide oxide	1,600 mg/m³
112926-00-8	Silicon dioxide	1,200 mg/m³
9002-88-4	Ethene, homopolymer	1,000 mg/m³
13463-67-7	titanium dioxide	2,000 mg/m³
1309-37-1	diiron trioxide	2,200 mg/m³
14808-60-7	quartz (SiO2)	200 mg/m³
7631-86-9	silicon dioxide, chemically prepared	4,500 mg/m³
1344-28-1	aluminium oxide	990 mg/m³
1314-23-4	zirconium dioxide	680 mg/m³

7 Handling and storage

- **Handling**
- **Precautions for safe handling**
  No special measures required.
  Thorough dedusting.
  Keep containers tightly sealed.
  Ensure good ventilation/exhaustion at the workplace.
  Open and handle container with care.
- **Information about protection against explosions and fires:**

Keep ignition sources away - Do not smoke.

Keep breathing equipment ready.
Dust can combine with air to form an explosive mixture.

- **Conditions for safe storage, including any incompatibilities**
- **Storage**
- **Requirements to be met by storerooms and containers:**
  Store only in the original container.
  Static charges may build up in the powder
- **Information about storage in one common storage facility:** Not required.
- **Further information about storage conditions:** Keep container tightly sealed.
- **Specific end use(s)** No further relevant information available.

(Contd. on page 5)

(Contd. of page 4)

8 Exposure controls/personal protection

. **Additional information about design of technical systems:** No further data; see item 7.

. **Control parameters**

. Components with critical values that require monitoring at the workplace:	
7727-43-7 barium sulphate, natural	
PEL (U.S.A)	Long-term value: 15* 5** mg/m³ *total dust **respirable fraction
REL (U.S.A)	Long-term value: 10* 5** mg/m³ *total dust **respirable fraction
TLV (U.S.A)	Long-term value: 5* mg/m³ *inhalable fraction; E
EL (Canada)	Long-term value: 10* 3** mg/m³ *total dust, **respirable fraction
EV (Canada)	Long-term value: 10 mg/m³ total dust
LMPE (Mexico)	Long-term value: 10 mg/m³
2451-62-9 1,3,5-tris(oxiranylmethyl)-1,3,5-triazine-2,4,6(1H,3H,5H)-trione	
TLV (U.S.A)	Long-term value: 0.05 mg/m³
EL (Canada)	Long-term value: 0.05 mg/m³ R; S
EV (Canada)	Long-term value: 0.05 mg/m³
LMPE (Mexico)	Long-term value: 0.05 mg/m³

. **Additional information:**
The lists that were valid during the compilation were used as basis.

. **Exposure controls**
.
.
. **Personal protective equipment**
. **General protective and hygienic measures**
Keep away from foodstuffs, beverages and food.
Instantly remove any soiled and impregnated garments.
Wash hands during breaks and at the end of the work.
Store protective clothing separately.
. **Breathing equipment:**

In case of brief exposure or low pollution use breathing filter apparatus. In case of intensive or longer exposure use breathing apparatus that is independent of circulating air.

. **Protection of hands:**

Protective gloves.

. **Material of gloves**
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.
. **Penetration time of glove material**
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.

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. **Eye protection:**

Safety Glasses

. **Body protection:** *Protective work clothing.*

9 Physical and Chemical Properties

. **Information on basic physical and chemical properties**	
. **General Information**	
. **Appearance:**	
Form:	*Solid*
Colour:	*According to Trade Name*
. **Smell:**	*Characteristic*
. **Odor threshold:**	*Not determined*
. **pH-value:**	*Not applicable*
. **Change in condition**	
Melting point/Melting range:	*> 50 C / 120F*
Boiling point/Boiling range:	*Not applicable*
. **Flash point:**	*Not applicable*
. **Inflammability (solid, gaseous)**	*Not determined*
. **Decomposition temperature:**	*Not determined*
. **Self-inflammability:**	*Product is not selfigniting.*
. **Danger of explosion:**	*Product is not explosive. However, formation of explosive air/dust mixtures is possible*
. **Critical values for explosion:**	
Lower:	*Not determined.*
Upper:	*Not determined.*
. **Steam pressure:**	*Not applicable.*
. **Density (Specific gravity) at 20 °C (68 °F)**	*1.57 g/cm³ (13.1 lbs/gal)*
. **Relative density**	*Not determined.*
. **Vapor density**	*Not applicable.*
. **Evaporation rate**	*Not applicable.*
. **Solubility in / Miscibility with**	
Water:	*Unsoluble*
. **Partition coefficient (n-octanol/water):**	*Not determined.*
. **Viscosity:**	
dynamic:	*Not applicable.*
kinematic:	*Not applicable.*
. **Solvent content:**	
Organic solvents:	*0.0 %*
Solids content:	*100.0 %*
. **Other information**	*No further relevant information available.*

10 Stability and Reactivity

. **Reactivity** *No further relevant information available.*
. **Chemical stability**
. **Conditions to be avoided:** *No decomposition if used according to specifications.*
. **Possibility of hazardous reactions** *No dangerous reactions known*
. **Conditions to avoid** *No further relevant information available.*

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Trade name SEALKOR BLACK SM SGL

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. **Incompatible materials:** No further relevant information available.
. **Hazardous decomposition products:** In case of fire: CO, CO_2, NOx

11 Toxicological Information

. **Information on toxicological effects**
. **Acute toxicity:**

. LD/LC50 values that are relevant for classification:		
2451-62-9 1,3,5-tris(oxiranylmethyl)-1,3,5-triazine-2,4,6(1H,3H,5H)-trione		
Oral	LD50	188-1,450 mg/kg (rat)
Dermal	LD50	>2,000 mg/kg (rat)
Inhalative	LC50/4 h	0.309-650 mg/l (rat)

. **Primary irritant effect:**
. **on the skin:** No irritant effect.
. **on the eye:** No irritant effect.
. **Sensitization:** Sensitization possible by skin contact.
. **Additional toxicological information:**
The product shows the following dangers according to the calculation method of the General EC Classification Guidelines for Preparations as issued in the latest version:
Irritant
Harmful
The product can cause inheritable damage.

. **Carcinogenic categories**

. IARC (International Agency for Research on Cancer)		
1333-86-4	carbon black	2B
112926-00-8	Silicon dioxide	3
9002-88-4	Ethene, homopolymer	3
13463-67-7	titanium dioxide	2B
1309-37-1	diiron trioxide	3
14808-60-7	quartz (SiO_2)	1
7631-86-9	silicon dioxide, chemically prepared	3

. NTP (National Toxicology Program)		
14808-60-7	quartz (SiO_2)	K

. OSHA-Ca (Occupational Safety & Health Administration)
None of the ingredients is listed.

12 Ecological information

. **Toxicity**
. **Aquatic toxicity:** No further relevant information available.
. **Persistence and degradability** No further relevant information available.
. **Behaviour in environmental systems:**
. **Bioaccumulative potential** No further relevant information available.
. **Mobility in soil** No further relevant information available.
. **Additional ecological information:**
. **General notes:**
Water danger class 3 (Self-assessment): extremely hazardous for water.
Do not allow product to reach ground water, water bodies or sewage system, even in small quantities.
Danger to drinking water if even extremely small quantities leak into soil.
. **Results of PBT and vPvB assessment**
. **PBT:** Not applicable.
. **vPvB:** Not applicable.
. **Other adverse effects** No further relevant information available.

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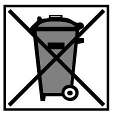
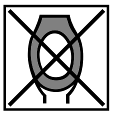
13 Disposal considerations

. **Waste treatment methods**
. **Recommendation**

Must not be disposed of together with household garbage. Do not allow product to reach sewage system.

. **Uncleaned packagings:**
. **Recommendation:** *Disposal must be made according to official regulations.*

14 Transport information

. **UN-Number**	*n/a*
. **UN proper shipping name**	*n/a*
. **Transport hazard class(es)**	
. **DOT, IMDG, IATA**	
. **Class**	*Not regulated.*
. **Packing group**	*n/a*
. **Environmental hazards:**	
. **Marine pollutant:**	*No*
. **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	*Not applicable.*

* 15 Regulatory information

. **Safety, health and environmental regulations/legislation specific for the substance or mixture**

. **SARA (Superfund Amendments and Reauthorization Act):**

. **Section 355 (Extremly hazardous substances):**
None of the ingredients is listed.

. **Section 313 (Specific toxic chemical listings):**	
7727-43-7	*barium sulphate, natural*

. **TSCA (Toxic Substances Control Act):**
All ingredients are listed.

. **TSCA new (21st Century Act) (Substances not listed)**

. **Proposition 65:**

. **Chemicals known to cause cancer:**	
1333-86-4	*carbon black*
13463-67-7	*titanium dioxide*

. **Chemicals known to cause reproductive toxicity for females:**
None of the ingredients is listed.

. **Chemicals known to cause reproductive toxicity for males:**
None of the ingredients is listed.

. **Chemicals known to cause developmental toxicity:**
None of the ingredients is listed.

. **Cancerogenity categories**

. **EPA (Environmental Protection Agency)**		
7727-43-7	*barium sulphate, natural*	*D, CBD(inh), NL(oral)*

. **TLV (Threshold Limit Value established by ACGIH)**		
1333-86-4	*carbon black*	*A4*

(Contd. on page 9)

(Contd. of page 8)

13463-67-7	titanium dioxide	A4
1309-37-1	diiron trioxide	A4
14808-60-7	quartz (SiO2)	A2
1344-28-1	aluminium oxide	A4
1314-23-4	zirconium dioxide	A4

· NIOSH-Ca (National Institute for Occupational Safety and Health)	
1333-86-4	carbon black
13463-67-7	titanium dioxide
14808-60-7	quartz (SiO2)

· **GHS label elements**
The product is classified and labeled according to the Globally Harmonized System (GHS).
· **Hazard pictograms**

GHS05 GHS07 GHS08

· **Signal word** Danger

· **Hazard-determining components of labeling:**
1,3,5-tris(oxiranylmethyl)-1,3,5-triazine-2,4,6(1H,3H,5H)-trione
· **Hazard statements**
Causes serious eye damage.
May cause an allergic skin reaction.
May cause genetic defects.
May cause damage to organs through prolonged or repeated exposure.
May form combustible dust concentrations in air.
· **Precautionary statements**
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe dust/fume/gas/mist/vapors/spray.
Contaminated work clothing must not be allowed out of the workplace.
Wear protective gloves/protective clothing/eye protection/face protection.
If on skin: Wash with plenty of water.
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If exposed or concerned: Get medical advice/attention.
Immediately call a poison center/doctor.
Get medical advice/attention if you feel unwell.
Specific treatment (see on this label).
If skin irritation or rash occurs: Get medical advice/attention.
Wash contaminated clothing before reuse.
Store locked up.
Dispose of contents/container in accordance with local/regional/national/international regulations.
· **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

16 Other information

These data are based on our present knowledge. However, they shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Relevant phrases**
H301 Toxic if swallowed.
H317 May cause an allergic skin reaction.
H318 Causes serious eye damage.
H331 Toxic if inhaled.
H340 May cause genetic defects.
H373 May cause damage to organs through prolonged or repeated exposure.

(Contd. on page 10)

Safety Data Sheet
acc. GHS

(Contd. of page 9)

. **Date of preparation / last revision** *12/04/2017 / -*
. **Abbreviations and acronyms:**
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
EINECS: European Inventory of Existing Commercial Chemical Substances
ELINCS: European List of Notified Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
vPvB: very Persistent and very Bioaccumulative
NIOSH: National Institute for Occupational Safety
OSHA: Occupational Safety & Health
TLV: Threshold Limit Value
PEL: Permissible Exposure Limit
REL: Recommended Exposure Limit
Acute Tox. 3: Acute toxicity - Category 3
Eye Dam. 1: Serious eye damage/eye irritation - Category 1
Skin Sens. 1: Skin sensitisation - Category 1
Muta. 1B: Germ cell mutagenicity - Category 1B
STOT RE 2: Specific target organ toxicity (repeated exposure) - Category 2
. *** Data compared to the previous version altered.***

SAFETY DATA SHEET

= = = = = = = = = = SECTION I - PRODUCT AND MANUFACTURER IDENTIFICATION = = = = = = = = = = =

PRODUCT NAME:	**BLACK**
PRODUCT CODE:	**TBK-9011**
MANUFACTURER:	AMERICOATS
ADDRESS:	3249 N. Runge St., Franklin Park, IL 60131
Product Use:	Powder paint
INFORMATION PHONE:	847-455-1400
MEDICAL EMERGENCY PHONE:	1-866-455-2628
DATE PREPARED:	03/18/2015
NAME OF PREPARER:	Rafal

= = = = = = = = = = = = SECTION II - HAZARD(S) IDENTIFICATION = = = = = = = = = = =

Health	2
Flammability	1
Reactivity	1
PPE	E

SIGNAL WORD: **DANGER**

ROUTES OF ENTRY: INHALATION, EYE, SKIN, INGESTION

EFFECTS OF OVEREXPOSURE

INHALATION: It can cause irritation of respiratory passages.
EYES: Dust and fumes can cause irritation
SKIN: May lead to minor-irritation
INGESTION: Moderately toxic

CARCINOGENICITY INFORMATION - Category 1B
See Section XI for more detail of cancer information.
Serious eye damage/eye irritation - Category 1
Skin sensitization - Category 1
Specific target organ toxicity (repeated exposure) -Category 2
Acute toxicity- oral - Category 4

If converted to small particles during further processing, handling, or by other means, may form combustible dust concentrations in air

= = = = = = = = = = SECTION III - COMPOSITION/INFORMATION ON INGREDIENTS= = = = = = = = = =

COMPONENT	CAS No.	% BY WT	ACGIH TLV.	OSHA PEL
TRIGLYCIDYL ISOCYANURATE	2451-62-9	< 8%	0.025 mg/m3	N/A
CARBON BLACK	1333-86-4	< 3%	3.5 mg/m3	3.5 mg/m3

All components of this product are in compliance with U.S. TSCA chemical substance inventory requirements.
This product should be treated and handled as a nuisance particulate. This product contains no chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act.
*Please see section XI

= = = = = = = = = = = = SECTION IV - FIRST AID MEASURES =

INHALATION HEALTH RISKS AND SYMPTOMS

Overexposure to dust can cause irritation of respiratory passages.
Remove to fresh air immediately.
Symptoms – Difficulties in breathing

SKIN AND EYE CONTACT RISKS AND SYMPTOMS

Eye Contact: Dust and fumes can cause irritation, wash eyes thoroughly with water.
Symptoms -- Redness and tearing
Skin Contact: May lead to minor-irritation
Symptoms -- Skin absorption is unlikely in normal use.

INGESTION: Moderately toxic. Symptoms are not fully known

HEALTH HAZARDS (ACUTE AND CHRONIC)

Inhalation is main source of exposure. Irritation to upper respiratory tract. May lead to nosebleeds.
Potential loss of appetite and bleeding from the nose.
No known chronic effects.

TGIC: This product contains less than EIGHT percent (8%) TGIC which has been incorporated with other resins and pigments into a homogeneous powder. Pure TGIC is a skin sensitizer and eye and respiratory tract irritant. TGIC at levels usually used in powder coatings (approximately 8%) exhibits much lower toxicity levels. Still, good safety practices dictate that exposure levels be minimized through use of recommended personal protective equipment, through proper handling techniques, and through adequate ventilation. Also, pure TGIC is a suspected mutagen based on animal studies in male mouse spermatogonial cells. The impact of these results on humans has not been fully established but prolonged inhalation of high concentrations of dust containing TGIC should be avoided. The manufacturer of TGIC recommends that the permissible internal exposure limit of 0.025 mg/cubic meter (on a pure TGIC basis) should be used for protection of workers using or exposed to TGIC.

Carbon Black: This product contains less than THREE percent (3%) carbon black which has been incorporated with resins into a homogeneous powder. Evidence of carcinogenicity of pure carbon black powder is inconclusive. Based on an International Agency for Research on Cancer (IARC) conclusion that there is "sufficient evidence in experimental animals for the carcinogenicity of carbon black" and insufficient evidence of carcinogenicity in humans, IARC's overall evaluation is that "carbon black is possibly carcinogenic to humans." Carbon black has not been listed as a carcinogen by the National Toxicology Program (NTP) or the Occupational Health and Safety Administration (OSHA).

EMERGENCY AND FIRST AID PROCEDURES

In case of eye contact, flush eyes thoroughly with water for at least 15 minutes and seek medical attention if symptoms persist.
For skin contact, wash with plenty of water.
If inhaled, obtain fresh air. If breathing difficulty continues, obtain medical help.

= = = = = = = = = = = = SECTION V - FIRE FIGHTING MEASURE =

EXTINGUISHING MEDIA: FOAM, CO2, DRY CHEMICAL, WATER FOG

UNUSUAL FIRE AND EXPLOSION HAZARDS

Dust suspended in air creates potential fire hazard. Containers must be kept closed when not in use.

SPECIAL FIREFIGHTING PROCEDURES

Firefighters should use full protective equipment including breathing apparatus.
Prevent dispersing dust to avoid further fire or explosion.

HAZAROUDOUS COMBUSTION PRODUCT: Heat will produce fumes possibly containing carbon monoxide, aldehydes, and carboxylic acids.

FLASH POINT: N/A **FLAMMABLE LIMITS IN AIR BY VOLUME**: LOWER: N/A HIGHER: N/A

= = = = = = = = = = = = SECTION VI - ACCIDENTAL RELEASE MEASURES = = = = = = = = = = = = = = = = =

NECESSARY STEPS IN CASE OF MATERIAL SPILLED OR RELEASED

Remove all sources of ignition. Use vacuum equipment. Avoid breathing dust.

WASTE DISPOSAL METHOD

Dispose in accordance with federal, state, local laws.

OTHER PRECAUTIONS

Prevent prolonged exposure to skin and contact with eyes.
Do not take internally.
Avoid breathing fumes when curing.
Keep containers closed after use.
Wash hands after handling product and especially before eating or smoking.

= = = = = = = = = = = = SECTION VII - HANDLING AND STORAGE= = = = = = = = = = = = = = = = = = =

PROPER HANDLING AND STORING

Do not store above 80 degrees Fahrenheit. Keep away from heat, sparks, and flame.

= = = = = = = = = = = = SECTION VIII - EXPOSURE CONTROLS / PERSONAL PROTECTION = = = == = = =

RESPIRATORY PROTECTION

Use N I O S H Approved respirator prevent breathing dust or fumes. In confined spaces, use N I O S H/M S H A approved air respirator. Refer to OSHA 29 DFR 1910.134 "Respiratory Protection." Follow manufacturer directions for proper respirator use.

VENTILATION

Use general dilution and local exhaust ventilation in volume and pattern to keep the air contaminant concentration below OSHA requirements.

EYE PROTECTION

Use dust protective goggles.

HAND PROTECTION

For prolonged contact, wear impermeable gloves.
Wash hands after handling product.

PROTECTIVE CLOTHING

Wear long-sleeved shirt.
Wash contaminated clothing before reuse.

= = = = = = = = = = = = SECTION IX - PHYSICAL/CHEMICAL PROPERTIES = = = = = = = = = = = = = = = =

SPECIFIC GRAVITY	1.42± 0.05	PH	N/A
EVAPORATION RATE	N/A	Relative density	N/A
SOLUBILITY IN WATER	Negligible	Melting point/freezing point	N/A
APPEARANCE AND ODOR	Dry fine powder	PARTITION COEFFICENT	N/A
BOILING RANGE	N/A	AUTO-IGNITION TEMP	N/A
VAPOR DENSITY	N/A	DECOMPOSITION TEMP	N/A
UPPER/LOWER FLAMMABILITY or EXPLOSIVE LIMITS	N/A	VISCOSITY	N/A
ORDOR	N/A	FLASH POINTS	N/A
VAPOR PRESSURE	N/A		

= = = = = = = = = = = = SECTION X - STABILITY AND REACTIVITY = = = = = = = = = = = = = = = = = = =

STABILITY: Stable
CONDITIONS TO AVOID: Extreme high temperatures
INCOMPATIBILITY (MATERIALS TO AVOID): Oxidizing materials
HAZARDOUS DECOMPOSITION PRODUCTS: Heat will produce fumes possibly containing carbon monoxide, aldehydes, and carboxylic acids.
HAZARDOUS POLYMERIZATION: Will not occur

= = = = = = = = = = = = SECTION XI - TOXICOLOGICAL INFORMATION = = = = = = = = = = = = = = = = = = =

CHRONIC HEALTH HAZARDS

Carbon Black is classified by IARC as possibly carcinogenic to humans (group 2B) based on experimental animal data, however, there is insufficient evidence in humans for its carcinogenicity.

TOXICOLOGY DATA

CAS No	Ingredient Name			

2451-62-9	TRIGLYCIDYL ISOCYANURATE	LC50 RAT LD50 RAT	4 HR	Not Available 188mg/kg
1333-86-4	CARBON BLACK	LC50 RAT LD50 RAT	4 HR	Not Available Not Available

= = = = = = = = = = = = **SECTION XII - ECOLOGICAL INFORMATION** =

ECOTOXICOLOGICAL INFORMATION
Not Applicable

= = = = = = = = = = = = **SECTION XIII - DISPOSAL CONSIDERATIONS**= =

WASTE DISPOSAL METHOD
Waste from this product is not hazardous as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Incinerate in approved facility. Dispose in accordance with federal, state, local laws.

= = = = = = = = = = = = **SECTION XIV - TRANSPORT INFORMATION** =

US Ground (DOT)
Not Regulated

ICAO / IATA
Not Regulated

= = = = = = = = = = = = **SECTION XV - REGULATORY INFORMATION** =

SARA 313 (40 CFR 372.65C) SUPPLIER NOTIFICATION

CAS No.	CHEMICAL/COMPOUND	% by WT	% Element

No ingredients in this product are subject to SARA 313 (40 CFR 372.65C) Supplier Notification.

TSCA CERTIFICATION
All chemicals in this product are listed, or are exempt from listing, on the TSCA Inventory

= = = = = = = = = = = = **SECTION XVI - OTHER INFORMATION** =

Abbreviation: ACGIH-American Conference of Governmental industrial Hygienists, TSCA-Toxic Substance Control Act DOT-Department of Transportation, PEL-Permissible exposure level, PPE- Personal Protective Equipment, IATA-International Air Transport Association, ICAO-International Civil Aviation Organization
Issue date: 03-10-2015

= =

DISCLAIMER

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End of SDS

SAFETY DATA SHEET

AmeriCoats

= = = = = = = = = = **SECTION I - PRODUCT AND MANUFACTURER IDENTIFICATION** = = = = = = = = = = =

PRODUCT NAME: **BLACK**
PRODUCT CODE: **TBK-9011**
MANUFACTURER: AMERICOATS
ADDRESS: 3249 N. Runge St., Franklin Park, IL 60131
Product Use: Powder paint
INFORMATION PHONE: 847-455-1400
MEDICAL EMERGENCY PHONE: 1-866-455-2628
DATE PREPARED: 03/18/2015
NAME OF PREPARER: Rafal

= = = = = = = = = = = = **SECTION II - HAZARD(S) IDENTIFICATION** = = = = = = = = = = =

Health	2
Flammability	1
Reactivity	1
PPE	E

SIGNAL WORD: **DANGER**

ROUTES OF ENTRY: INHALATION, EYE, SKIN, INGESTION

EFFECTS OF OVEREXPOSURE

INHALATION: It can cause irritation of respiratory passages.
EYES: Dust and fumes can cause irritation
SKIN: May lead to minor-irritation
INGESTION: Moderately toxic

CARCINOGENICITY INFORMATION - Category 1B
See Section XI for more detail of cancer information.
Serious eye damage/eye irritation - Category 1
Skin sensitization - Category 1
Specific target organ toxicity (repeated exposure) -Category 2
Acute toxicity- oral - Category 4

If converted to small particles during further processing, handling, or by other means, may form combustible dust concentrations in air

= = = = = = = = = = SECTION III - COMPOSITION/INFORMATION ON INGREDIENTS= = = = = = = = = =

COMPONENT	CAS No.	% BY WT	ACGIH TLV.	OSHA PEL
TRIGLYCIDYL ISOCYANURATE	2451-62-9	< 8%	0.025 mg/m3	N/A
CARBON BLACK	1333-86-4	< 3%	3.5 mg/m3	3.5 mg/m3

All components of this product are in compliance with U.S. TSCA chemical substance inventory requirements.
This product should be treated and handled as a nuisance particulate. This product contains no chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act.
*Please see section XI

= = = = = = = = = = = = SECTION IV - FIRST AID MEASURES =

INHALATION HEALTH RISKS AND SYMPTOMS

Overexposure to dust can cause irritation of respiratory passages.
Remove to fresh air immediately.
Symptoms – Difficulties in breathing

SKIN AND EYE CONTACT RISKS AND SYMPTOMS

Eye Contact: Dust and fumes can cause irritation, wash eyes thoroughly with water.
Symptoms -- Redness and tearing
Skin Contact: May lead to minor-irritation
Symptoms -- Skin absorption is unlikely in normal use.

INGESTION: Moderately toxic. Symptoms are not fully known

HEALTH HAZARDS (ACUTE AND CHRONIC)

Inhalation is main source of exposure. Irritation to upper respiratory tract. May lead to nosebleeds.
Potential loss of appetite and bleeding from the nose.
No known chronic effects.

TGIC: This product contains less than EIGHT percent (8%) TGIC which has been incorporated with other resins and pigments into a homogeneous powder. Pure TGIC is a skin sensitizer and eye and respiratory tract irritant. TGIC at levels usually used in powder coatings (approximately 8%) exhibits much lower toxicity levels. Still, good safety practices dictate that exposure levels be minimized through use of recommended personal protective equipment, through proper handling techniques, and through adequate ventilation. Also, pure TGIC is a suspected mutagen based on animal studies in male mouse spermatogonial cells. The impact of these results on humans has not been fully established but prolonged inhalation of high concentrations of dust containing TGIC should be avoided. The manufacturer of TGIC recommends that the permissible internal exposure limit of 0.025 mg/cubic meter (on a pure TGIC basis) should be used for protection of workers using or exposed to TGIC.

Carbon Black: This product contains less than THREE percent (3%) carbon black which has been incorporated with resins into a homogeneous powder. Evidence of carcinogenicity of pure carbon black powder is inconclusive. Based on an International Agency for Research on Cancer (IARC) conclusion that there is "sufficient evidence in experimental animals for the carcinogenicity of carbon black" and insufficient evidence of carcinogenicity in humans, IARC's overall evaluation is that "carbon black is <u>possibly carcinogenic</u> to humans." Carbon black has <u>not</u> been listed as a carcinogen by the National Toxicology Program (NTP) or the Occupational Health and Safety Administration (OSHA).

EMERGENCY AND FIRST AID PROCEDURES

In case of eye contact, flush eyes thoroughly with water for at least 15 minutes and seek medical attention if symptoms persist.
For skin contact, wash with plenty of water.
If inhaled, obtain fresh air. If breathing difficulty continues, obtain medical help.

= = = = = = = = = = = = SECTION V - FIRE FIGHTING MEASURE =

EXTINGUISHING MEDIA: FOAM, CO2, DRY CHEMICAL, WATER FOG

UNUSUAL FIRE AND EXPLOSION HAZARDS

Dust suspended in air creates potential fire hazard. Containers must be kept closed when not in use.

SPECIAL FIREFIGHTING PROCEDURES

Firefighters should use full protective equipment including breathing apparatus.
Prevent dispersing dust to avoid further fire or explosion.

HAZAROUDOUS COMBUSTION PRODUCT: Heat will produce fumes possibly containing carbon monoxide, aldehydes, and carboxylic acids.

FLASH POINT: N/A **FLAMMABLE LIMITS IN AIR BY VOLUME**: LOWER: N/A HIGHER: N/A

= = = = = = = = = = = = SECTION VI - ACCIDENTAL RELEASE MEASURES = = = = = = = = = = = = = = = =

NECESSARY STEPS IN CASE OF MATERIAL SPILLED OR RELEASED

Remove all sources of ignition. Use vacuum equipment. Avoid breathing dust.

WASTE DISPOSAL METHOD

Dispose in accordance with federal, state, local laws.

OTHER PRECAUTIONS

Prevent prolonged exposure to skin and contact with eyes.
Do not take internally.
Avoid breathing fumes when curing.
Keep containers closed after use.
Wash hands after handling product and especially before eating or smoking.

= = = = = = = = = = = = SECTION VII - HANDLING AND STORAGE= = = = = = = = = = = = = = = = = = =

PROPER HANDLING AND STORING

Do not store above 80 degrees Fahrenheit. Keep away from heat, sparks, and flame.

= = = = = = = = = = = = SECTION VIII - EXPOSURE CONTROLS / PERSONAL PROTECTION = = = == = = =

RESPIRATORY PROTECTION

Use N I O S H Approved respirator prevent breathing dust or fumes. In confined spaces, use N I O S H/M S H A approved air respirator. Refer to OSHA 29 DFR 1910.134 "Respiratory Protection." Follow manufacturer directions for proper respirator use.

VENTILATION

Use general dilution and local exhaust ventilation in volume and pattern to keep the air contaminant concentration below OSHA requirements.

EYE PROTECTION

Use dust protective goggles.

HAND PROTECTION

For prolonged contact, wear impermeable gloves.
Wash hands after handling product.

PROTECTIVE CLOTHING

Wear long-sleeved shirt.
Wash contaminated clothing before reuse.

= = = = = = = = = = = = SECTION IX - PHYSICAL/CHEMICAL PROPERTIES = = = = = = = = = = = = = = = =

SPECIFIC GRAVITY	1.42± 0.05	PH	N/A
EVAPORATION RATE	N/A	Relative density	N/A
SOLUBILITY IN WATER	Negligible	Melting point/freezing point	N/A
APPEARANCE AND ODOR	Dry fine powder	PARTITION COEFFICENT	N/A
BOILING RANGE	N/A	AUTO-IGNITION TEMP	N/A
VAPOR DENSITY	N/A	DECOMPOSITION TEMP	N/A
UPPER/LOWER FLAMMABILITY or EXPLOSIVE LIMITS	N/A	VISCOSITY	N/A
ORDOR	N/A	FLASH POINTS	N/A
VAPOR PRESSURE	N/A		

= = = = = = = = = = = = SECTION X - STABILITY AND REACTIVITY = = = = = = = = = = = = = = = = = = =

STABILITY: Stable
CONDITIONS TO AVOID: Extreme high temperatures
INCOMPATIBILITY (MATERIALS TO AVOID): Oxidizing materials
HAZARDOUS DECOMPOSITION PRODUCTS: Heat will produce fumes possibly containing carbon monoxide, aldehydes, and carboxylic acids.
HAZARDOUS POLYMERIZATION: Will not occur

= = = = = = = = = = = = SECTION XI - TOXICOLOGICAL INFORMATION = = = = = = = = = = = = = = = = = = =

CHRONIC HEALTH HAZARDS

Carbon Black is classified by IARC as possibly carcinogenic to humans (group 2B) based on experimental animal data, however, there is insufficient evidence in humans for its carcinogenicity.

TOXICOLOGY DATA

CAS No	Ingredient Name			

2451-62-9	TRIGLYCIDYL ISOCYANURATE	LC50 RAT LD50 RAT	4 HR	Not Available 188mg/kg
1333-86-4	CARBON BLACK	LC50 RAT LD50 RAT	4 HR	Not Available Not Available

= = = = = = = = = = = = SECTION XII - ECOLOGICAL INFORMATION =

ECOTOXICOLOGICAL INFORMATION

Not Applicable

= = = = = = = = = = = = SECTION XIII - DISPOSAL CONSIDERATIONS= = = = = = = = = = = = = = = = = = = =

WASTE DISPOSAL METHOD

Waste from this product is not hazardous as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Incinerate in approved facility. Dispose in accordance with federal, state, local laws.

= = = = = = = = = = = = SECTION XIV - TRANSPORT INFORMATION =

US Ground (DOT)

Not Regulated

ICAO / IATA

Not Regulated

= = = = = = = = = = = = SECTION XV - REGULATORY INFORMATION =

SARA 313 (40 CFR 372.65C) SUPPLIER NOTIFICATION

CAS No.	CHEMICAL/COMPOUND	% by WT	% Element

No ingredients in this product are subject to SARA 313 (40 CFR 372.65C) Supplier Notification.

TSCA CERTIFICATION

All chemicals in this product are listed, or are exempt from listing, on the TSCA Inventory

= = = = = = = = = = = = SECTION XVI - OTHER INFORMATION =

Abbreviation: ACGIH-American Conference of Governmental industrial Hygienists, TSCA-Toxic Substance Control Act DOT-Department of Transportation, PEL-Permissible exposure level, PPE- Personal Protective Equipment, IATA-International Air Transport Association, ICAO-International Civil Aviation Organization

Issue date: 03-10-2015

= =

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End of SDS

TECHNICAL DATA SHEET

AmeriCoats

Polyester TGIC yields highly decorative powder coatings suitable for application to product exposed to direct sunlight . This type of coating is applied to patio furniture, automotive trim, truck bodies, architectural extrusions, fire extingushers, wire cloths, lawn and garden equipment, fencing and related items.

PRODUCT CODE: TBK-9011

PRODUCT TYPE: Polyester TGIC

PRODUCT NAME: Lo Cure Jet Black

DATE: 6/14/2019

TYPICAL PROPERTIES	**TEST METHODS**	**RESULTS**
Specific Gravity	PCI # 4	1.42 $\pm$ 0 .05
Coverage	Theoretical	136 $\pm$ 4.0 Sqft/lb @ 1 mil
Gloss @ 60 Degree	ASTM D523	90 $\pm$ 5
Over Bake Resistance	ASTM D2454	Good
Pencil Hardness	ASTM D3363	H - 2H
Direct Impact @ 2 mils	ASTM D2794	160 in lbs
Reverse Impact @ 2 mils	ASTM D2794	160 in lbs
Cross Hatch, Adhesion	ASTM D3359B	Pass
Mandrel Bend, Flexibility @ 2 mils	ASTM D522	1/4" no crack
Solvent Resistance	PCI # 8	Pass
Abrasion Resistance	ASTM D968	Good
Salt Spray	ASTM B117	1000 Hrs
Humidity	ASTM D2247	1000 Hrs
UL DTOV2 Organic Coatings	Steel Enclosures, Elec Equip	Recognized

APPLICATION		**Cure Schedule**	**Rec. Film Thickness**
Electostatic Spray:	Cold	10' @ 350 Degree F	2.5 to 3.5 mil
Substrate:	C.R.S.		
Pretreatment:	Bonderite 1000		

Note: All tests performed on Bonderite 1000 (Iron Phosphate) treated panels.

Shelf Life: 1 Year from the date of purchase, when stored under 75 degree F

Warranty Policy: All sales are subject to the AmeriCoats Standard Terms and Conditions then in effect, a copy of which can be found at [www.americoats.com/terms]. AmeriCoats will also provide a copy of the AmeriCoats Standard Terms and Conditions upon request. No additional or different terms or conditions will be binding upon AmeriCoats unless specifically agreed to in writing by an authorized representative. Please review all of the AmeriCoats Standard Terms and Conditions prior to entering any agreement with AmeriCoats. THE EXPRESS WARRANTY CONTAINED IN THE AMERICOATS STANDARD TERMS AND CONDITIONS IS EXCLUSIVE AND IN LIEU OF ALL OTHER REPRESENTATIONS AND WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING, WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE. The surface preparation and application procedures and other factors that affect performance are beyond our control. Do not use this product until the current material safety data sheet and technical data sheet have been read and fully understand. You must determine the suitability of this product for your own use and assume all risks and liabilities in connection therewith winoa

SAFETY DATA SHEET

SECTION 1. Identification

a) Product Identifier: Cast Steel Abrasive

b) Shot (spherical) and grit (angular) or shot/grit blends. W Abrasives, HPG, Hybrid Shots, Profilium, Prowheelium, Stainium & Surfium.

c) Recommended use and restrictions: No further applicable information available.

d) **Manufacturer:**

WINOA USA Inc.
1 Abrasive Avenue
Bedford, Virginia 24523 USA
www.wabrasives.com

e) Emergency phone number
(540) 586-0856

WINOA Canada Inc.
650 Rusholme Road
Welland, Ontario, L3B 5R4 Canada
www.wabrasives.com

e) Emergency phone number
(905) 735-4691

SECTION 2. Hazard(s) Identification

a) Classification of substance/mixture with OSHA paragraph D CFR 1910.1200 and WHMIS 2015: this product is not classified according to the regulations.

b) Hazard Symbol, Signal word, Hazard statement: Not applicable.

c) Other Hazards not resulting in classification: Winoa currently knows of no risk connected to the product. Cast steel abrasive itself is chemically inert and does not present any risk to people or to the environment. Risks are dependent upon the user's process and application.
Health Hazard: Health risks are linked to the exposure to dust. Dust is produced by the fragmentation of the abrasives and particles removed from the blasted parts. Dust may cause mechanical irritation of the eyes and respiratory tract.
Fire/Explosion: Dust can form an explosive mixture with air.
Other risks: Noise. Risk of falling due to the presence of abrasives on the floor.

SECTION 3. Composition/information on ingredients

a) Cast Steel Abrasive Shot (SAE J827) and Grit (SAE J1993) **Chemical composition:** All chemical elements in our abrasives are in alloyed form and not in a free form,

Substance	Chemical Symbol	CAS Number	% Weight
Iron	Fe	7439-89-6	> 95
Carbon	C	7440-44-0	<1.2
Manganese	Mn	7439-96-5	<1.2
Silicon	Si	7440-21-3	<1.2

b) Additional information:
The product is manufactured from recovered scrap metal. Due to the scrap metal recovery process, other unintentionally added elements such as Chromium (Cr), Nickel (Ni) or copper (Cu), may be present as impurities. The concentrations of these elements could in some case individually exceed 0.1% but do not lead to a global classification of the alloy.

SECTION 4. First-aid Measures

a) Description of first aid measures General information: No special measures required

Lungs: If inhaled, move to fresh air, and if symptoms persist, consult a qualified medical person.

Eye Contact: Do not rub, flush eyes with running water for at least 15 minutes and have any remaining particles removed from eyes by a qualified medical person.

Skin: Wash with soap and water after contact with dust. If irritation occurs, consult a qualified medical person.

Mouth**:** Rinse out mouth, if symptoms persist consult a qualified medical person.

b) Most important symptoms/effects, acute and delayed: No further applicable information available.

c) Indication of immediate medical attention and special treatment needed, if necessary: No further applicable information available.

SECTION 5. Fire-fighting Measures

These products are non-flammable.

a) Extinguishing Media: Select media appropriate for the surrounding materials/area.

b) Special Hazards: Fine metal dust that is created as a waste stream and/or contaminants that are removed during the blasting process may pose a small risk of fire or explosion.

c) Special Protective measure or equipment for Firefighters: None required.

SECTION 6. Accidental Release Measures

a) Personal precautions, protective equipment, and emergency procedures: Steel abrasives on horizontal surfaces can create slip and fall hazards. It is recommended to keep floors, stairs and work areas clean at all times.

b) Methods and materials for containment and cleaning up: Mechanical clean up, the material may be reused, recycled or disposed of in compliance with local, federal and state regulations.

SECTION 7. Handling and Storage

a) Precautions for safe handling: Handle with care to avoid damage to packaging to avoid spillage.

b) Conditions for safe storage, including any incompatibilities: Store in a dry place. No safety risk but oxidation and aggregation may occur in the presence of moisture. No further applicable information available

SECTION 8. Exposure Control/Personal Protection

a) There are no specific threshold limit values (TLV) or permissible exposure limits (PEL) for cast steel abrasives.

b) As the type of equipment used, surfaces/parts being processed and the operating conditions are the responsibility of the user, it is the user who must determine the appropriate thresholds, types of controls and the nature of the personal protection required.

Substance	Agency	Value Type	Value
Carbon black (1333-86-4)	OSHA ACGIH	PEL TLV-TWA	3.5 mg/m^3 3 mg/m^3 (IHL)
Silicon (7440-21-3)	OSHA	PEL (TWA)	15 mg/m3 (total dust) 5 mg/m3 (respirable fraction)

Manganese (7439-96-5) Elemental and Inorganic compounds, as Mn	ACGIH OSHA	TLV-TWA PEL (Ceiling)	0.02 mg/m3 (respirable particulate matter) 0.1 mg/m3 (inhalable particulate matter 5 mg/m3 (fume)

Ventilation: Adequate ventilation and exhaust of the dust and fumes generated during operations should be provided to reduce the exposure levels.
Respiratory protection: NIOSH approved respirator is recommended.
Eye protection: Approved safety eye protection (ANSI-Z87) with side shields should be worn.
Other protective measures: Protective gloves, work suits and work boots.

SECTION 9. Physical and Chemical Properties

Appearance: Spherical or angular steel particles of varied shades/hues of grey.
Physical state: Solid, Non-flammable and inert (non-explosive)

Specific gravity:	> 7 g/cc	Flash Point:	Not applicable
Melting Point:	1371-1482°C	Flammable limits:	Not applicable
Boiling Point:	approx. 3000°C	Auto-ignition temp:	Not applicable
Solubility in water:	Negligible	Evaporation rate:	Not applicable
Odor/threshold:	Odorless	Vapor Pressure:	Not applicable
PH:	Not applicable	Vapor density:	Not applicable
Viscosity:	Not applicable	% Volatile:	Not applicable
Partition coefficient:	Not applicable	Decomposition temp:	Not applicable

SECTION 10. Stability and Reactivity

a) Reactivity: The product is stable under normal conditions of storage and handling.
b) Chemical stability: Stable under normal conditions.
c) Possibility of hazardous reactions: No hazardous reactions known, under normal storage or working conditions, steel abrasives are stable and do not present any danger of hazardous reactions occurring.
d) Conditions to avoid: No applicable information available.
e) Incompatible materials: Acids.
f) Hazardous decomposition products: No hazardous decomposition products under normal storage and uses conditions. Toxic metal oxide smoke can be released in case of fire.

SECTION 11. Toxicological Information

No known specific indications or counter indications.
a) Information on the likely routes of exposure: No applicable information available.
b) Symptoms related to the physical, chemical and toxicological characteristics: No applicable information available.
c) Delayed and immediate effects and also chronic effects from short- and long-term exposure: No applicable information available.
d) Numerical measures of toxicity:

- Iron oxide (1309-37-1) Oral LD50 Rat: >10000 mg/kg
- Manganese (7439-96-5) Oral LD50 Rat: 9 g/kg
- Silicon (7440-21-3) Oral LD50 Rat: 3160 mg/kg

e) Not listed under the IARC, NTP, OSHA-Ca.

SECTION 12. Ecological Information

The product, as delivered, does not present any threat to the environment.
This product should be used under the best possible working conditions to avoid releasing it into the environment.

a) Eco-toxicity (aquatic and terrestrial): No applicable information available.
b) Persistence and degradability: No applicable information available.
c) Bio-accumulative potential: No applicable information available.
d) Mobility in soil: No applicable information available.
e) Other adverse effects: No applicable information available.

SECTION 13. Disposal Considerations

Do not discharge product into the environment. Disposal or recycling of this product or uncleaned packaging must be done in compliance with local, federal and/or state regulations.
Operating Wastes: Each user must study the problem of waste in relation to their specific activity.

SECTION 14. Transport Information

a) UN number: Not applicable
b) UN proper shipping name: Not applicable
c) Transport hazard class(es): Not applicable
d) Packing group: Not applicable
e) Environmental hazards Marine pollutant: No
f) Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code): Not applicable
g) Special precautions for user: There are no special conditions.

SECTION 15. Regulatory Information

Safety, health and environmental regulations specific for the product: No regulations specific to Steel Abrasives.

SECTION 16. Miscellaneous Information

Date of Revision: June 8, 2018
Prepared in accordance with, OSHA CFR 1910.1200 (USA), NOM-018-STPS-2000 (Mexico), WHIMIS 2015 (Canada).
This Safety Data Sheet is available in English, French and Spanish.
The information contained in this Safety Data Sheet applies only to cast steel abrasive as delivered and its unused state. The information contained in this Safety Data Sheet is our most up to date. The information and was obtained from sources Winoa believes to be reliable however Winoa makes no guarantee, representation or warranty as to the correctness or accuracy of the information. Winoa Inc. does not assume responsibility and disclaims liability for any losses, damages or expense associated with the use of these products.

SAFETY DATA SHEET

V93V00030

Section 1. Identification

Product name : MIL-PRF-32550 Zinc Rich Epoxy Primer Catalyst

Product code : V93V00030

Other means of identification : Not available.

Product type : Liquid.

Relevant identified uses of the substance or mixture and uses advised against

Not applicable.

Manufacturer : THE SHERWIN-WILLIAMS COMPANY
101 W. Prospect Avenue
Cleveland, OH 44115

Emergency telephone number of the company : US / Canada: (216) 566-2917
Mexico: SETIQ 01-800-00-214-00 / (52) 55-5559-1588 24 hours / 365 days a year

Product Information Telephone Number : US / Canada: Not Available
Mexico: Not Available

Regulatory Information Telephone Number : US / Canada: (216) 566-2902
Mexico: Not Available

Transportation Emergency Telephone Number : US / Canada: (800) 424-9300
Mexico: SETIQ 01-800-00-214-00 / (52) 55-5559-1588 24 hours / 365 days a year

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 3
ACUTE TOXICITY (dermal) - Category 4
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
SKIN SENSITIZATION - Category 1
CARCINOGENICITY - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2
ASPIRATION HAZARD - Category 1

Percentage of the mixture consisting of ingredient(s) of unknown oral toxicity: 28.4%
Percentage of the mixture consisting of ingredient(s) of unknown dermal toxicity: 64.8%
Percentage of the mixture consisting of ingredient(s) of unknown inhalation toxicity: 45.9%

GHS label elements

Hazard pictograms :

Signal word : Danger

Section 2. Hazards identification

Hazard statements : Flammable liquid and vapor.
Harmful in contact with skin.
Causes serious eye damage.
Causes skin irritation.
May cause an allergic skin reaction.
Suspected of causing cancer.
May be fatal if swallowed and enters airways.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May cause damage to organs through prolonged or repeated exposure.

Precautionary statements

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Use only outdoors or in a well-ventilated area. Do not breathe vapor. Wash hands thoroughly after handling. Contaminated work clothing must not be allowed out of the workplace.

Response : Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or physician if you feel unwell. Wash contaminated clothing before reuse. If skin irritation or rash occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.

Storage : Store locked up. Store in a well-ventilated place. Keep cool.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements

DELAYED EFFECTS FROM LONG TERM OVEREXPOSURE. Contains solvents which can cause permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal. WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. FOR INDUSTRIAL USE ONLY. This product must be mixed with other components before use. Before opening the packages, READ AND FOLLOW WARNING LABELS ON ALL COMPONENTS.

Please refer to the SDS for additional information. Keep out of reach of children. Do not transfer contents to other containers for storage.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Not available.

CAS number/other identifiers

Ingredient name	% by weight	CAS number
Polyamidoamine	≥25 - ≤50	68082-29-1
1,2,4-Trimethylbenzene	≥10 - ≤18	95-63-6
1-Butanol	≥10 - ≤17	71-36-3
Light Aromatic Hydrocarbons	≥10 - ≤25	64742-95-6
Xylene	≤11	1330-20-7
1,3,5-Trimethylbenzene	≤4.9	108-67-8
Tri(dimethylaminomethyl)phenol	≤4.8	90-72-2
Cumene	≤2.4	98-82-8

Section 3. Composition/information on ingredients

Ethylbenzene	≤1.8	100-41-4
1,2,3-Trimethylbenzene	≤3	526-73-8
Triethylene Tetramine	≤1.2	112-24-3

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.

Inhalation : Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Get medical attention immediately. Call a poison center or physician. Wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. May cause respiratory irritation.

Skin contact : Harmful in contact with skin. Causes skin irritation. May cause an allergic skin reaction.

Ingestion : Can cause central nervous system (CNS) depression. May be fatal if swallowed and enters airways.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain
watering
redness

Section 4. First aid measures

Inhalation	:	Adverse symptoms may include the following: respiratory tract irritation coughing nausea or vomiting headache drowsiness/fatigue dizziness/vertigo unconsciousness
Skin contact	:	Adverse symptoms may include the following: pain or irritation redness blistering may occur
Ingestion	:	Adverse symptoms may include the following: stomach pains nausea or vomiting

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	:	In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
Specific treatments	:	No specific treatment.
Protection of first-aiders	:	No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media	:	Use dry chemical, CO_2, water spray (fog) or foam.
Unsuitable extinguishing media	:	Do not use water jet.
Specific hazards arising from the chemical	:	Flammable liquid and vapor. Runoff to sewer may create fire or explosion hazard. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back.
Hazardous thermal decomposition products	:	Decomposition products may include the following materials: carbon dioxide carbon monoxide nitrogen oxides
Special protective actions for fire-fighters	:	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
Special protective equipment for fire-fighters	:	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	: No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
For emergency responders	: If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill	: Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.
Large spill	: Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures	: Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not swallow. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container.
Advice on general occupational hygiene	: Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits (OSHA United States)

Ingredient name	Exposure limits
Polyamidoamine	None.
1,2,4-Trimethylbenzene	**ACGIH TLV (United States, 3/2016).** TWA: 25 ppm 8 hours. TWA: 123 mg/m³ 8 hours. **NIOSH REL (United States, 10/2016).** TWA: 25 ppm 10 hours. TWA: 125 mg/m³ 10 hours.
1-Butanol	**ACGIH TLV (United States, 3/2016).** TWA: 20 ppm 8 hours. **NIOSH REL (United States, 10/2016).** **Absorbed through skin.** CEIL: 50 ppm CEIL: 150 mg/m³ **OSHA PEL (United States, 6/2016).** TWA: 100 ppm 8 hours. TWA: 300 mg/m³ 8 hours.
Light Aromatic Hydrocarbons	None.
Xylene	**ACGIH TLV (United States, 3/2016).** TWA: 100 ppm 8 hours. TWA: 434 mg/m³ 8 hours. STEL: 150 ppm 15 minutes. STEL: 651 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 100 ppm 8 hours. TWA: 435 mg/m³ 8 hours.
1,3,5-Trimethylbenzene	**ACGIH TLV (United States, 3/2016).** TWA: 25 ppm 8 hours. TWA: 123 mg/m³ 8 hours. **NIOSH REL (United States, 10/2016).** TWA: 25 ppm 10 hours. TWA: 125 mg/m³ 10 hours.
2,4,6-tris(dimethylaminomethyl)phenol	None.
Cumene	**ACGIH TLV (United States, 3/2016).** TWA: 50 ppm 8 hours. **NIOSH REL (United States, 10/2016).** **Absorbed through skin.** TWA: 50 ppm 10 hours. TWA: 245 mg/m³ 10 hours. **OSHA PEL (United States, 6/2016).** **Absorbed through skin.** TWA: 50 ppm 8 hours. TWA: 245 mg/m³ 8 hours.
Ethylbenzene	**ACGIH TLV (United States, 3/2016).** TWA: 20 ppm 8 hours. **NIOSH REL (United States, 10/2016).** TWA: 100 ppm 10 hours. TWA: 435 mg/m³ 10 hours. STEL: 125 ppm 15 minutes. STEL: 545 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 100 ppm 8 hours. TWA: 435 mg/m³ 8 hours.
1,2,3-Trimethylbenzene	**ACGIH TLV (United States, 3/2016).** TWA: 25 ppm 8 hours. TWA: 123 mg/m³ 8 hours. **NIOSH REL (United States, 10/2016).** TWA: 25 ppm 10 hours

Section 8. Exposure controls/personal protection

	TWA: 125 mg/m³ 10 hours.
Triethylene Tetramine	**AIHA WEEL (United States, 10/2011). Absorbed through skin.** TWA: 1 ppm 8 hours.

Occupational exposure limits (Canada)

Ingredient name	Exposure limits
1,2,4-Trimethylbenzene	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 123 mg/m³ 8 hours. 8 hrs OEL: 25 ppm 8 hours. **CA British Columbia Provincial (Canada, 7/2016).** TWA: 25 ppm 8 hours. **CA Québec Provincial (Canada, 1/2014).** TWAEV: 25 ppm 8 hours. TWAEV: 123 mg/m³ 8 hours. **CA Ontario Provincial (Canada, 7/2015).** TWA: 25 ppm 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 30 ppm 15 minutes. TWA: 25 ppm 8 hours.
1-Butanol	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 60 mg/m³ 8 hours. 8 hrs OEL: 20 ppm 8 hours. **CA British Columbia Provincial (Canada, 7/2016).** TWA: 15 ppm 8 hours. C: 30 ppm **CA Ontario Provincial (Canada, 7/2015).** TWA: 20 ppm 8 hours. **CA Québec Provincial (Canada, 1/2014). Absorbed through skin.** STEV: 50 ppm 15 minutes. STEV: 152 mg/m³ 15 minutes. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 30 ppm 15 minutes. TWA: 20 ppm 8 hours.
Xylene	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 100 ppm 8 hours. 15 min OEL: 651 mg/m³ 15 minutes. 15 min OEL: 150 ppm 15 minutes. 8 hrs OEL: 434 mg/m³ 8 hours. **CA British Columbia Provincial (Canada, 7/2016).** TWA: 100 ppm 8 hours. STEL: 150 ppm 15 minutes. **CA Québec Provincial (Canada, 1/2014).** TWAEV: 100 ppm 8 hours. TWAEV: 434 mg/m³ 8 hours. STEV: 150 ppm 15 minutes. STEV: 651 mg/m³ 15 minutes. **CA Ontario Provincial (Canada, 7/2015).** STEL: 150 ppm 15 minutes. TWA: 100 ppm 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 150 ppm 15 minutes.

Section 8. Exposure controls/personal protection

	TWA: 100 ppm 8 hours.
1,3,5-Trimethylbenzene	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 123 mg/m³ 8 hours. 8 hrs OEL: 25 ppm 8 hours. **CA British Columbia Provincial (Canada, 7/2016).** TWA: 25 ppm 8 hours. **CA Québec Provincial (Canada, 1/2014).** TWAEV: 25 ppm 8 hours. TWAEV: 123 mg/m³ 8 hours. **CA Ontario Provincial (Canada, 7/2015).** TWA: 25 ppm 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 30 ppm 15 minutes. TWA: 25 ppm 8 hours.
cumene	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 50 ppm 8 hours. 8 hrs OEL: 246 mg/m³ 8 hours. **CA British Columbia Provincial (Canada, 7/2016).** TWA: 25 ppm 8 hours. STEL: 75 ppm 15 minutes. **CA Ontario Provincial (Canada, 7/2015).** TWA: 50 ppm 8 hours. **CA Québec Provincial (Canada, 1/2014).** TWAEV: 50 ppm 8 hours. TWAEV: 246 mg/m³ 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 74 ppm 15 minutes. TWA: 50 ppm 8 hours.
Ethylbenzene	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 100 ppm 8 hours. 8 hrs OEL: 434 mg/m³ 8 hours. 15 min OEL: 543 mg/m³ 15 minutes. 15 min OEL: 125 ppm 15 minutes. **CA British Columbia Provincial (Canada, 7/2016).** TWA: 20 ppm 8 hours. **CA Ontario Provincial (Canada, 7/2015).** TWA: 20 ppm 8 hours. **CA Québec Provincial (Canada, 1/2014).** TWAEV: 100 ppm 8 hours. TWAEV: 434 mg/m³ 8 hours. STEV: 125 ppm 15 minutes. STEV: 543 mg/m³ 15 minutes. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 125 ppm 15 minutes. TWA: 100 ppm 8 hours.
1,2,3-Trimethylbenzene	**CA Alberta Provincial (Canada, 4/2009).** 8 hrs OEL: 123 mg/m³ 8 hours. 8 hrs OEL: 25 ppm 8 hours. **CA British Columbia Provincial (Canada, 7/2016).** TWA: 25 ppm 8 hours. **CA Québec Provincial (Canada, 1/2014).** TWAEV: 25 ppm 8 hours. TWAEV: 123 mg/m³ 8 hours. **CA Ontario Provincial (Canada, 7/2015).**

Section 8. Exposure controls/personal protection

	TWA: 25 ppm 8 hours. **CA Saskatchewan Provincial (Canada, 7/2013).** STEL: 30 ppm 15 minutes. TWA: 25 ppm 8 hours.
Triethylene Tetramine	**CA Ontario Provincial (Canada, 7/2015). Absorbed through skin.** TWA: 3 mg/m³ 8 hours. TWA: 0.5 ppm 8 hours.

Occupational exposure limits (Mexico)

Ingredient name	Exposure limits
1,2,4-Trimethylbenzene	**NOM-010-STPS-2014 (Mexico, 4/2016).** TWA: 25 ppm 8 hours.
1-Butanol	**NOM-010-STPS-2014 (Mexico, 4/2016). Absorbed through skin.** TWA: 20 ppm 8 hours
Xylene	**NOM-010-STPS-2014 (Mexico, 4/2016).** STEL: 150 ppm 15 minutes. TWA: 100 ppm 8 hours.
1,3,5-Trimethylbenzene	**NOM-010-STPS-2014 (Mexico, 4/2016).** TWA: 25 ppm 8 hours
cumene	**NOM-010-STPS-2014 (Mexico, 4/2016).** TWA: 50 ppm 8 hours.
Ethylbenzene	**NOM-010-STPS-2014 (Mexico, 4/2016).** TWA: 20 ppm 8 hours.
1,2,3-Trimethylbenzene	**NOM-010-STPS-2014 (Mexico, 4/2016).** TWA: 25 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Section 8. Exposure controls/personal protection

Body protection	: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
Other skin protection	: Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory protection	: Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

<u>Appearance</u>

Physical state	: Liquid.
Color	: Not available.
Odor	: Not available.
Odor threshold	: Not available.
pH	: Not available.
Melting point	: Not available.
Boiling point	: 117°C (242.6°F)
Flash point	: Closed cup: 27°C (80.6°F) [Pensky-Martens Closed Cup]
Evaporation rate	: 0.8 (butyl acetate = 1)
Flammability (solid, gas)	: Not available.
Lower and upper explosive (flammable) limits	: Lower: 0.7% Upper: 11.2%
Vapor pressure	: 1.3 kPa (10 mm Hg) [at 20°C]
Vapor density	: 2.55 [Air = 1]
Relative density	: 0.89
Solubility	: Not available.
Partition coefficient: n-octanol/water	: Not available.
Auto-ignition temperature	: Not available.
Decomposition temperature	: Not available.
Viscosity	: Kinematic (40°C (104°F)): <0.205 cm^2/s (<20.5 cSt)
Molecular weight	: Not applicable.

<u>Aerosol product</u>

Heat of combustion	: 31.821 kJ/g

Section 10. Stability and reactivity

Reactivity	: No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	: The product is stable.
Possibility of hazardous reactions	: Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	: Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

Section 10. Stability and reactivity

Incompatible materials : Reactive or incompatible with the following materials: oxidizing materials

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
1,2,4-Trimethylbenzene	LC50 Inhalation Vapor	Rat	18000 mg/m³	4 hours
	LD50 Oral	Rat	5 g/kg	-
1-Butanol	LC50 Inhalation Vapor	Rat	24000 mg/m³	4 hours
	LD50 Dermal	Rabbit	3400 mg/kg	-
	LD50 Oral	Rat	790 mg/kg	-
Light Aromatic Hydrocarbons	LD50 Oral	Rat	8400 mg/kg	-
Xylene	LC50 Inhalation Gas.	Rat	5000 ppm	4 hours
	LD50 Oral	Rat	4300 mg/kg	-
1,3,5-Trimethylbenzene	LC50 Inhalation Vapor	Rat	24000 mg/m³	4 hours
	LD50 Oral	Rat	5000 mg/kg	-
2,4,6-tris (dimethylaminomethyl)phenol	LD50 Dermal	Rat	1280 mg/kg	-
	LD50 Oral	Rat	1200 mg/kg	-
Cumene	LC50 Inhalation Vapor	Rat	39000 mg/m³	4 hours
	LD50 Oral	Rat	1400 mg/kg	-
Ethylbenzene	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	3500 mg/kg	-
Triethylene Tetramine	LD50 Dermal	Rabbit	805 mg/kg	-
	LD50 Oral	Rat	2500 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
1-Butanol	Eyes - Severe irritant	Rabbit	-	24 hours 2 milligrams	-
	Eyes - Severe irritant	Rabbit	-	0.005 Mililiters	-
	Skin - Moderate irritant	Rabbit	-	24 hours 20 milligrams	-
Light Aromatic Hydrocarbons	Eyes - Mild irritant	Rabbit	-	24 hours 100 microliters	-
Xylene	Eyes - Mild irritant	Rabbit	-	87 milligrams	-
	Eyes - Severe irritant	Rabbit	-	24 hours 5 milligrams	-
	Skin - Mild irritant	Rat	-	8 hours 60 microliters	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Moderate irritant	Rabbit	-	100 Percent	-
1,3,5-Trimethylbenzene	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Moderate irritant	Rabbit	-	24 hours 20 milligrams	-
2,4,6-tris (dimethylaminomethyl)phenol	Eyes - Severe irritant	Rabbit	-	24 hours 50 Micrograms	-
	Skin - Mild irritant	Rat	-	0.025 Mililiters	-
	Skin - Severe irritant	Rat	-	0.25 Mililiters	-
	Skin - Severe irritant	Rabbit	-	24 hours 2 milligrams	-
Cumene	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Eyes - Mild irritant	Rabbit	-	86 milligrams	-

Section 11. Toxicological information

	Skin - Mild irritant	Rabbit	-	24 hours 10 milligrams	-
	Skin - Moderate irritant	Rabbit	-	24 hours 100 milligrams	-
Ethylbenzene	Eyes - Severe irritant	Rabbit	-	500 milligrams	-
	Skin - Mild irritant	Rabbit	-	24 hours 15 milligrams	-
Triethylene Tetramine	Eyes - Moderate irritant	Rabbit	-	24 hours 20 milligrams	-
	Eyes - Severe irritant	Rabbit	-	49 milligrams	-
	Skin - Severe irritant	Rabbit	-	24 hours 5 milligrams	-
	Skin - Severe irritant	Rabbit	-	490 milligrams	-

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
Xylene	-	3	-
Cumene	-	2B	Reasonably anticipated to be a human carcinogen.
Ethylbenzene	-	2B	-

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
1,2,4-Trimethylbenzene	Category 3	Not applicable.	Respiratory tract irritation
1-Butanol	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
Light Aromatic Hydrocarbons	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
Xylene	Category 3	Not applicable.	Respiratory tract irritation
1,3,5-Trimethylbenzene	Category 3	Not applicable.	Respiratory tract irritation
Cumene	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
Ethylbenzene	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
1,2,3-Trimethylbenzene	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Section 11. Toxicological information

Name	Category	Route of exposure	Target organs
1-Butanol	Category 2	Not determined	Not determined
Light Aromatic Hydrocarbons	Category 2	Not determined	Not determined
Xylene	Category 2	Not determined	Not determined
Cumene	Category 2	Not determined	Not determined
Ethylbenzene	Category 2	Not determined	Not determined

Aspiration hazard

Name	Result
1,2,4-Trimethylbenzene	ASPIRATION HAZARD - Category 1
Light Aromatic Hydrocarbons	ASPIRATION HAZARD - Category 1
Xylene	ASPIRATION HAZARD - Category 1
1,3,5-Trimethylbenzene	ASPIRATION HAZARD - Category 1
Cumene	ASPIRATION HAZARD - Category 1
Ethylbenzene	ASPIRATION HAZARD - Category 1
1,2,3-Trimethylbenzene	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. May cause respiratory irritation.

Skin contact : Harmful in contact with skin. Causes skin irritation. May cause an allergic skin reaction.

Ingestion : Can cause central nervous system (CNS) depression. May be fatal if swallowed and enters airways.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
nausea or vomiting
headache
drowsiness/fatigue
dizziness/vertigo
unconsciousness

Skin contact : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur

Ingestion : Adverse symptoms may include the following:
stomach pains
nausea or vomiting

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : May cause damage to organs through prolonged or repeated exposure. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels

Carcinogenicity : Suspected of causing cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Oral Dermal Inhalation (gases) Inhalation (vapors)	2096 mg/kg 1745 mg/kg 23804 ppm 47.36 mg/l

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
1,2,4-Trimethylbenzene	Acute LC50 4910 µg/l Marine water	Crustaceans - Elasmopus pectenicrus - Adult	48 hours
	Acute LC50 7720 µg/l Fresh water	Fish - Pimephales promelas	96 hours
1-Butanol	Acute EC50 1983000 µg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 1730000 µg/l Fresh water	Fish - Pimephales promelas	96 hours
Xylene	Acute LC50 8500 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
	Acute LC50 13400 µg/l Fresh water	Fish - Pimephales promelas	96 hours
1,3,5-Trimethylbenzene	Acute LC50 13000 µg/l Marine water	Crustaceans - Cancer magister - Zoea	48 hours
	Acute LC50 12520 µg/l Fresh water	Fish - Carassius auratus	96 hours
	Chronic NOEC 400 µg/l Fresh water	Daphnia - Daphnia magna	21 days
Cumene	Acute EC50 2600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 7400 µg/l Fresh water	Crustaceans - Artemia sp. - Nauplii	48 hours
	Acute EC50 10600 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 2700 µg/l Fresh water	Fish - Oncorhynchus mykiss	96 hours
Ethylbenzene	Acute EC50 4600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 3600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	96 hours
	Acute EC50 6530 µg/l Fresh water	Crustaceans - Artemia sp. - Nauplii	48 hours
	Acute EC50 2930 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 4200 µg/l Fresh water	Fish - Oncorhynchus mykiss	96 hours
Triethylene Tetramine	Acute EC50 3700 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	96 hours

Section 12. Ecological information

	Acute LC50 33900 µg/l Fresh water	Daphnia - Daphnia magna	48 hours

Persistence and degradability

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
1-Butanol	-	-	Readily
Light Aromatic Hydrocarbons	-	-	Readily
Xylene	-	-	Readily
Ethylbenzene	-	-	Readily

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
1,2,4-Trimethylbenzene	-	243	low
Light Aromatic Hydrocarbons	-	10 to 2500	high
Xylene	-	8.1 to 25.9	low
1,3,5-Trimethylbenzene	-	161	low
Cumene	-	35.48	low
1,2,3-Trimethylbenzene	-	194.98	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	TDG Classification	Mexico Classification	IATA	IMDG
UN number	UN3469	UN3469	UN3469	UN3469	UN3469
UN proper shipping name	PAINT RELATED MATERIAL, FLAMMABLE, CORROSIVE	PAINT RELATED MATERIAL, FLAMMABLE, CORROSIVE	PAINT RELATED MATERIAL, FLAMMABLE, CORROSIVE	PAINT RELATED MATERIAL, FLAMMABLE, CORROSIVE	PAINT RELATED MATERIAL, FLAMMABLE, CORROSIVE

Section 14. Transport information

Transport hazard class(es)	3 (8) 	3 (8) 	3 (8) 	3 (8) 	3 (8) 
Packing group	III	III	III	III	III
Environmental hazards	No.	No.	No.	No.	No.
Additional information	- **ERG No.** 132	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.18-2.19 (Class 3), 2.40-2.42 (Class 8). **ERG No.** 132	- **ERG No.** 132	-	**Emergency schedules** F-E, S-C

Special precautions for user : Multi-modal shipping descriptions are provided for informational purposes and do not consider container sizes. The presence of a shipping description for a particular mode of transport (sea, air, etc.), does not indicate that the product is packaged suitably for that mode of transport. All packaging must be reviewed for suitability prior to shipment, and compliance with the applicable regulations is the sole responsibility of the person offering the product for transport. People loading and unloading dangerous goods must be trained on all of the risks deriving from the substances and on all actions in case of emergency situations.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Proper shipping name : Not available.
Ship type : Not available.
Pollution category : Not available.

Section 15. Regulatory information

SARA 313

SARA 313 (40 CFR 372.45) supplier notification can be found on the Environmental Data Sheet.

California Prop. 65

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

*	3
Flammability	3
Physical hazards	0

Section 16. Other information

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

Procedure used to derive the classification

Classification	Justification
FLAMMABLE LIQUIDS - Category 3	On basis of test data
ACUTE TOXICITY (dermal) - Category 4	Calculation method
SKIN CORROSION/IRRITATION - Category 2	Calculation method
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1	Calculation method
SKIN SENSITIZATION - Category 1	Calculation method
CARCINOGENICITY - Category 2	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2	Calculation method
ASPIRATION HAZARD - Category 1	Calculation method

History

Date of printing : 3/2/2018

Date of issue/Date of revision : 3/2/2018

Date of previous issue : 2/18/2018

Version : 8.01

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Notice to reader

It is recommended that each customer or recipient of this Safety Data Sheet (SDS) study it carefully and consult resources, as necessary or appropriate, to become aware of and understand the data contained in this SDS and any hazards associated with the product. This information is provided in good faith and believed to be accurate as of the effective date herein. However, no warranty, express or implied, is given. The information presented here applies only to the product as shipped. The addition of any material can change the composition, hazards and risks of the product. Products shall not be repackaged, modified, or tinted except as specifically instructed by Sherwin-Williams, including but not limited to the incorporation of non Sherwin-Williams products or the use or addition of products in proportions not specified by Sherwin-Williams. Regulatory requirements are subject to change and may differ between various locations and jurisdictions. The customer/buyer/user is responsible to ensure that his activities comply with all country, federal, state, provincial or local laws. The conditions for use of the product are not under the control of the manufacturer; the customer/buyer/user is responsible to determine the conditions necessary for the safe use of this product. The customer/buyer/user should not use the product for any purpose other than the purpose shown in the applicable section of this SDS without first referring to the supplier and obtaining written handling instructions. Due to the proliferation of sources for information such as manufacturer-specific SDS, the manufacturer cannot be responsible for SDSs obtained from any other source.

1. Identification

Product identifier used on the label

Cryscoat FG

Recommended use of the chemical and restriction on use

Recommended use*: Surface treatment agent

* The "Recommended use" identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:
Chemetall U.S., Inc.
675 Central Avenue
New Providence, NJ 07974 – USA

Telephone: +1 800 526-4473
E-mail address: michael.l.chang@basf.com

Emergency telephone number

Telephone: 800-424-9300, 1-703-527-3887

Other means of identification

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid
Colour	green
Odour	none
Hazard Summary	Harmful by inhalation and if swallowed. Causes severe burns. Liquid or vapor causes burns which may be delayed.

GHS Classification

Skin corrosion	:	Category 1A
Serious eye damage	:	Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Causes severe skin burns and eye damage.

Precautionary statements :

Prevention:
Wash skin thoroughly after handling.
Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response:
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
Wash contaminated clothing before reuse.
Storage:
Store locked up.
Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Potential Health Effects

Inhalation	:	yes
Skin	:	yes
Ingestion	:	yes
Aggravated Medical Condition	:	None known.

Carcinogenicity:

IARC No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

OSHA No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

NTP No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture :

Hazardous components

Component	CAS-No.	**Weight percent**
Zinc dihydrogen phosphate	13598-37-3	10 - 20
Phosphoric acid	7664-38-2	10 - 20
Zinc fluoride	7783-49-5	1 - 5

Unidentified ingredients are considered not hazardous, or not required to be listed under Federal Hazard Communication Standard (29CFR 1910.1200).

Specific chemical identity of composition has been withheld as a trade secret.

Exact percentage of composition has been withheld as a trade secret.

SECTION 4. FIRST AID MEASURES

If inhaled : Move to fresh air.
If symptoms persist, call a physician.
If breathing is irregular or stopped, administer artificial respiration.

In case of skin contact : Wash off immediately with plenty of water for at least 15 minutes.
Take off contaminated clothing and shoes immediately.
First treatment with calcium gluconate paste.
Call a physician if irritation develops or persists.

In case of eye contact : Rinse immediately with plenty of water for at least 15 minutes.
Keep eye wide open while rinsing.
Get medical attention immediately

If swallowed : Rinse mouth.
Drink 1 or 2 glasses of water.
Never give anything by mouth to an unconscious person.
Get medical attention immediately

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media : Carbon dioxide ($CO2$)
Dry chemical
Foam
Water spray

Further information : In the event of fire, cool tanks with water spray.

Special protective equipment for firefighters : In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures : Ensure adequate ventilation.

Methods and materials for containment and cleaning up : Ventilate area.
Neutralize with lime milk or soda and flush with plenty of water.
Clean up with inert absorbant material.
Keep in suitable, closed containers for disposal.
Flush with plenty of water.

Additional advice : Never return spills in original containers for re-use.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling : Use only with adequate ventilation.
Add this product to surface of solution slowly to avoid spattering
Do not add large amounts of product to solution at any one time.

Conditions for safe storage : Keep containers dry and tightly closed to avoid moisture absorption and contamination.
Store indoors in a cool, well-ventilated place

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Phosphoric acid	7664-38-2	TWA	1.000000 mg/m3	ACGIH
		STEL	3.000000 mg/m3	ACGIH
		TWA	1.000000 mg/m3	NIOSH REL
		ST	3.000000 mg/m3	NIOSH REL
		TWA	1.000000 mg/m3	OSHA Z-1
		TWA	1.000000 mg/m3	OSHA P0
		STEL	3.000000 mg/m3	OSHA P0
		PEL	1.000000 mg/m3	CAL PEL
		STEL	3.000000 mg/m3	CAL PEL
Zinc fluoride	7783-49-5	TWA	2.500000 mg/m3 (Fluorine)	OSHA Z-1
		TWA	2.500000 mg/m3 (Fluorine)	ACGIH
		TWA	2.500000 mg/m3	OSHA P0

			(Fluorine)	
		TWA	2.500000 mg/m3 (Fluorine)	OSHA Z-1
		TWA	2.500000 mg/m3 (Fluorine)	ACGIH
		TWA	2.500000 mg/m3 (Fluorine)	OSHA P0
		TWA	2.500000 mg/m3 (Fluorine)	NIOSH REL
		PEL	2.500000 mg/m3 (Fluorine)	CAL PEL

Biological occupational exposure limits

Components	CAS-No.	Control parameters	Biological specimen	Sampling time	Permissible concentration	Basis
Zinc fluoride	7783-49-5 , 7783-49-5	Fluoride	Urine	Prior to shift (16 hours after exposure ceases)	2.0000 mg/l	ACGIH BEI
		Fluoride	Urine	End of shift (As soon as possible after exposure ceases)	3.0000 mg/l	ACGIH BEI

Personal protective equipment

Respiratory protection : If the occupational exposure limits cannot be met, suitable respirator equipment shall be worn.

Hand protection
Remarks : Impervious gloves

Eye protection : Chemical resistant goggles must be worn.
Face-shield

Skin and body protection : Rubber or plastic apron

Hygiene measures : Avoid contact with skin, eyes and clothing.
Wear suitable gloves and eye/face protection.
Wear suitable protective clothing.
Wash hands before breaks and immediately after handling the product.
Provide adequate ventilation.
Do not inhale fumes.
Keep away from food and drink.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : liquid

Colour : green

Odour	: none
pH	: < 2.5
Freezing point	: -23 °C
Boiling point/boiling range	: No data available
Flash point	: does not flash
Evaporation rate	: 1 Water = 1
Upper explosion limit	: Not applicable.
Lower explosion limit	: Not applicable.
Vapour pressure	: No data available
Relative vapour density	: No data available
Relative density	: 1.344
Bulk density	: 11.2 lb/gal
Solubility(ies)	
Water solubility	: completely soluble
Partition coefficient: n-octanol/water	: No data available
Auto-ignition temperature	: No data available
Thermal decomposition	: No data available
Viscosity, dynamic	: No data available

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	: Heat, flames and sparks. Avoid letting the product become dry.
Incompatible materials	: Bases Reducing agents Combustible material Organic materials Avoid prolonged contact of concentrate with glass, ceramic, or concrete. Warning! Do not use together with other products. May release dangerous gases (chlorine).
Hazardous decomposition products	: Oxides of phosphorus Nitrogen oxides (NOx) Hydrogen, by reaction with metals Traces of Fluorides

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity	:	Acute toxicity estimate : > 5,000.000000 mg/kg Method: Calculation method
Acute inhalation toxicity	:	Acute toxicity estimate : > 40.000000 mg/l Exposure time: 4 h Test atmosphere: vapour Method: Calculation method
Acute dermal toxicity	:	Acute toxicity estimate : > 5,000.000000 mg/kg Method: Calculation method

Components:

Zinc dihydrogen phosphate:

Acute oral toxicity	:	LD50 Rat: 1,990.000000 mg/kg LD50 Mouse: 1,610.000000 mg/kg
Acute dermal toxicity	:	LD50 : 3,890.000000 mg/kg

Phosphoric acid:

Acute oral toxicity	:	LD50 Rat: 3,500.000000 mg/kg
Acute dermal toxicity	:	LD50 Rabbit: 2,740.000000 mg/kg

Skin corrosion/irritation

Components:

Phosphoric acid:
Result: Corrosive

Serious eye damage/eye irritation

Components:

Phosphoric acid:
Result: Risk of serious damage to eyes.

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

No data available

Bioaccumulative potential

Product:

Partition coefficient: n-octanol/water	:	Remarks: No data available

Other adverse effects

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	Refer to all federal, provincial, state and local regulation prior to disposition of container and unused contents by reuse, recycle or disposal.

SECTION 14. TRANSPORT INFORMATION

International Regulations

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

National Regulations

SECTION 15. REGULATORY INFORMATION

TSCA Status	:	All components of this material comply with US TSCA requirements.
OSHA Hazards	:	Harmful by ingestion., Corrosive to skin
WHMIS Classification	:	E: Corrosive Material D2B: Toxic Material Causing Other Toxic Effects

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Zinc nitrate	7779-88-6	1,000	12,376

SARA 311/312 Hazards : Acute Health Hazard

SARA 302 : No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

Zinc dihydrogen phosphate	13598-37-3
Zinc nitrate	7779-88-6
Zinc fluoride	7783-49-5
Zinc fluoborate	13826-88-5

US State Regulations

Massachusetts Right To Know

Phosphoric acid	7664-38-2
Zinc nitrate	7779-88-6
Zinc fluoride	7783-49-5

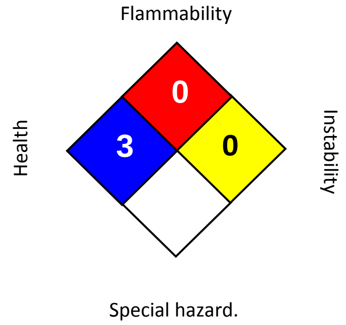
Pennsylvania Right To Know

water	7732-18-5
Zinc dihydrogen phosphate	13598-37-3
Phosphoric acid	7664-38-2
Zinc nitrate	7779-88-6
Zinc fluoride	7783-49-5
Ferric nitrate	10421-48-4

New Jersey Right To Know

water	7732-18-5
Zinc dihydrogen phosphate	13598-37-3
Phosphoric acid	7664-38-2
Zinc nitrate	7779-88-6
Gluconic acid	526-95-4
Zinc fluoride	7783-49-5

NFPA:



HMIS III:

HEALTH	3
FLAMMABILITY	0
PHYSICAL HAZARD	0

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

Corrosive Acid

Splash Goggles, Gloves, Apron, Dust and Vapour Respirator

SECTION 16. OTHER INFORMATION

Further information

Version *1.1*
Revision Date 12/20/2017

SDS Prepared by:
Chemetall (now part of BASF Group) NA Product Regulations
SDS Prepared on: 2018/01/04

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The content of this Safety Data Sheet (SDS) is based on an existing document from an acquired company with adaptations to Section I. The data is currently under validation.

END OF DATA SHEET

Safety Data Sheet
Gardobond Additiive H 7212

1. Identification

Product identifier used on the label

Gardobond Additiive H 7212

Recommended use of the chemical and restriction on use
Recommended use*: Surface treatment agent

* The “Recommended use” identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:
Chemetall U.S., Inc.
675 Central Avenue
New Providence, NJ 07974 – USA

Telephone: +1 800 526-4473
E-mail address: michael.l.chang@basf.com

Emergency telephone number

Telephone: 800-424-9300, 1-703-527-3887

Other means of identification

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid
Colour	colourless
Odour	none
Hazard Summary	Harmful by inhalation and if swallowed. Causes severe burns.

GHS Classification

Skin corrosion : Category 1A

Serious eye damage : Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Causes severe skin burns and eye damage.

Precautionary statements : **Prevention:**
Wash skin thoroughly after handling.
Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response:
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
Wash contaminated clothing before reuse.
Storage:
Store locked up.
Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Potential Health Effects

Inhalation : yes

Skin : yes

Ingestion : yes

Aggravated Medical Condition : None known.

Carcinogenicity:

IARC No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

OSHA No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

NTP No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture :

Hazardous components

Component	CAS-No.	**Weight percent**
Sodium hydroxide	1310-73-2	30 - 50

Unidentified ingredients are considered not hazardous, or not required to be listed under Federal Hazard Communication Standard (29CFR 1910.1200).

Specific chemical identity of composition has been withheld as a trade secret.

Exact percentage of composition has been withheld as a trade secret.

SECTION 4. FIRST AID MEASURES

If inhaled : Move to fresh air.
If symptoms persist, call a physician.
If breathing is irregular or stopped, administer artificial respiration.

In case of skin contact : Wash off immediately with plenty of water for at least 15 minutes.
Take off contaminated clothing and shoes immediately.
Get medical attention if irritation develops and persists

In case of eye contact : Rinse immediately with plenty of water for at least 15 minutes.
Keep eye wide open while rinsing.
Get medical attention immediately

If swallowed : Rinse mouth.
Drink 1 or 2 glasses of water.
Never give anything by mouth to an unconscious person.
Get medical attention immediately

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media : Carbon dioxide (CO2)
Dry chemical
Foam
Water spray

Further information : Use water spray to cool unopened containers.

Special protective equipment for firefighters : In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures : Ensure adequate ventilation.
Material can create slippery conditions.

Methods and materials for containment and cleaning up : Ventilate area.
Neutralize with lime milk or soda and flush with plenty of water.
Clean up with inert absorbant material.
Keep in suitable, closed containers for disposal.
Flush with plenty of water.

Additional advice : Never return spills in original containers for re-use.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling : Add this product to surface of solution slowly to avoid spattering
Do not add large amounts of product to solution at any one time.
Do not add to hot water warmer than 43 degrees to 49 degrees C (110 degrees to 120 degrees F).
Never add liquids to product

Conditions for safe storage : Keep containers dry and tightly closed to avoid moisture absorption and contamination.
Store indoors in a cool, well-ventilated place

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Sodium hydroxide	1310-73-2	C	2.000000 mg/m3	ACGIH
		C	2.000000 mg/m3	NIOSH REL
		TWA	2.000000 mg/m3	OSHA Z-1
		C	2.000000 mg/m3	OSHA P0
		C	2.000000 mg/m3	CAL PEL

Personal protective equipment

Respiratory protection : If the occupational exposure limits cannot be met, suitable respirator equipment shall be worn.

Hand protection
Remarks : Nitrile rubber Neoprene gloves

Eye protection : Chemical resistant goggles must be worn.
Face-shield

Skin and body protection	:	Rubber or plastic apron
Hygiene measures	:	Avoid contact with skin, eyes and clothing. Wear suitable gloves and eye/face protection. Wear suitable protective clothing. Wash hands before breaks and immediately after handling the product. Provide adequate ventilation. Do not inhale fumes. Keep away from food and drink.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	colourless
Odour	:	none
pH	:	> 12.5
Freezing point	:	4.5 °C
Boiling point/boiling range	:	No data available
Flash point	:	 does not flash
Evaporation rate	:	1 Water = 1
Upper explosion limit	:	Not applicable.
Lower explosion limit	:	Not applicable.
Vapour pressure	:	No data available
Relative density	:	1.485
Bulk density	:	12.37 lb/gal
Solubility(ies)		
Water solubility	:	completely soluble
Partition coefficient: n-octanol/water	:	No data available
Auto-ignition temperature	:	No data available
Thermal decomposition	:	No data available
Viscosity, dynamic	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	freezing
Incompatible materials	:	Acids

Hazardous decomposition products	:	Hydrogen, by reaction with metals

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity	:	Acute toxicity estimate : > 5,000.000000 mg/kg Method: Calculation method
Acute dermal toxicity	:	Acute toxicity estimate : 3,000.000000 mg/kg Method: Calculation method

Components:

Sodium hydroxide:

Acute oral toxicity	:	LD50 Mouse: 6,600.000000 mg/kg LD50 Rat: 4,090.000000 mg/kg
Acute inhalation toxicity	:	LC50 Mouse: 1,200.000000 mg/l Exposure time: 2 h Test atmosphere: dust/mist LC50 Rat: 2,300.000000 mg/l Exposure time: 2 h Test atmosphere: dust/mist
Acute dermal toxicity	:	LD50 Rabbit: 1,350.000000 mg/kg

Skin corrosion/irritation

Components:

Sodium hydroxide:
Result: Corrosive

Serious eye damage/eye irritation

Components:

Sodium hydroxide:
Result: Corrosive
Classification: Corrosive

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

No data available

Bioaccumulative potential

Product:

Partition coefficient: n-octanol/water	:	Remarks: No data available

Other adverse effects

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	Refer to all federal, provincial, state and local regulation prior to disposition of container and unused contents by reuse, recycle or disposal.

SECTION 14. TRANSPORT INFORMATION

International Regulations

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

National Regulations

SECTION 15. REGULATORY INFORMATION

TSCA Status	:	All components of this material comply with US TSCA requirements.
OSHA Hazards	:	Harmful by skin absorption, Corrosive to skin

WHMIS Classification : E: Corrosive Material

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Sodium hydroxide	1310-73-2	1,000	2,222

SARA 311/312 Hazards : Acute Health Hazard

SARA 302 : No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

US State Regulations

Massachusetts Right To Know

Sodium hydroxide	1310-73-2

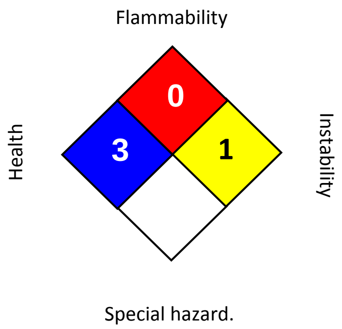
Pennsylvania Right To Know

water	7732-18-5
Sodium hydroxide	1310-73-2

New Jersey Right To Know

water	7732-18-5
Sodium hydroxide	1310-73-2

NFPA:



HMIS III:

HEALTH	3
FLAMMABILITY	0
PHYSICAL HAZARD	1

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

Corrosive Alkaline

Splash Goggles, Gloves, Apron, Dust and Vapour Respirator

SECTION 16. OTHER INFORMATION

Further information

Version *1.1*
Revision Date 12/19/2017

SDS Prepared by:
Chemetall (now part of BASF Group) NA Product Regulations
SDS Prepared on: 2018/01/04

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The content of this Safety Data Sheet (SDS) is based on an existing document from an acquired company with adaptations to Section I. The data is currently under validation.

END OF DATA SHEET

Safety Data Sheet
Gardobond Additiive H 7014

Revision date : 2019/04/23 Page: 1/8
Version: 2.1 (30690172/SDS_GEN_US/EN)

1. Identification

Product identifier used on the label

Gardobond Additiive H 7014

Recommended use of the chemical and restriction on use

Recommended use*: Surface treatment agent
Unsuitable for use: None known

* The “Recommended use” identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:
Chemetall U.S., Inc.
675 Central Avenue
New Providence, NJ 07974 – USA
+1 800 526-4473
michael.l.chang@basf.com

Emergency telephone number

Telephone: 800-424-9300, 1-703-527-3887

Other means of identification

2. Hazards Identification

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Classification of the product

Acute Tox.	4 (oral)	Acute toxicity
Eye Dam./Irrit.	2A	Serious eye damage/eye irritation
Aquatic Acute	2	Hazardous to the aquatic environment - acute

Label elements

Pictogram:

Signal Word:
Warning

Hazard Statement:

H302	Harmful if swallowed.
H319	Causes serious eye irritation.
H401	Toxic to aquatic life.

Precautionary Statements (Prevention):

P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P264	Wash with plenty of water and soap thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.

Precautionary Statements (Response):

P301 + P312	IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P330	Rinse mouth.
P337 + P313	If eye irritation persists: Get medical advice/attention.

Precautionary Statements (Disposal):

P501	Dispose of contents/container to hazardous or special waste collection point.

Hazards not otherwise classified

If applicable information is provided in this section on other hazards which do not result in classification but which may contribute to the overall hazards of the substance or mixture.

3. Composition / Information on Ingredients

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

CAS Number	**Weight %**	**Chemical name**
7632-00-0	>= 20.0 - < 25.0%	sodium nitrite

4. First-Aid Measures

Description of first aid measures

General advice:
Immediately remove contaminated clothing. Remove affected person from danger area. Symptoms of poisoning may occur even after several hours, continue medical observation for at least 48 hours after the accident. First aid personnel should pay attention to their own safety.

If inhaled:
Remove the affected individual into fresh air and keep the person calm. If symptoms persist, seek medical advice.

If on skin:
Flush with copious amounts of water for at least 15 minutes. If symptoms persist, seek medical advice.

If in eyes:
Immediately wash affected eyes for at least 15 minutes under running water with eyelids held open, consult an eye specialist. Immediate medical attention required.

If swallowed:
Rinse mouth and then drink 200-300 ml of water. Summon medical aid without delay.

Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11.
Hazards: Danger of methaemoglobin formation.

Indication of any immediate medical attention and special treatment needed

Note to physician
Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
carbon dioxide, dry powder, water spray, alcohol-resistant foam

Unsuitable extinguishing media for safety reasons:
water jet

Special hazards arising from the substance or mixture

Hazards during fire-fighting:
nitrogen oxides
When dry, the substance/product is oxidising.

Advice for fire-fighters

Protective equipment for fire-fighting:
Appropriate breathing apparatus may be required.

Further information:
Cool endangered containers with water-spray. Collect contaminated extinguishing water separately, do not allow to reach sewage or effluent systems. Dispose of fire debris and contaminated extinguishing water in accordance with official regulations.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures
Use personal protective clothing. Advice on product handling can be found in sections 7 and 8 of this safety data sheet.

Environmental precautions
Do not discharge into drains/surface waters/groundwater. Do not discharge into the subsoil/soil.

Methods and material for containment and cleaning up
Ensure adequate ventilation. Take up mechanically and collect in suitable container (adequately labelled) for disposal. Pick up with inert absorbent material (e.g. sand, earth etc.).

7. Handling and Storage

Precautions for safe handling
To avoid the risk of fire, do not allow this product to dry out. Do not return residues to the storage containers. Provide good ventilation of working area (local exhaust ventilation if necessary). Avoid inhalation of vapour and spray mist. The workplace should be equipped with an emergency shower and eye-rinsing facility. Avoid contact with skin and eyes. Keep away from food, drink and animal feeding stuffs. Warn users about safety measures and precautions to prevent accidents.

Protection against fire and explosion:
The relevant fire protection measures should be noted. Prevent drying-out. Substance/product in the dry state promotes fires.

Conditions for safe storage, including any incompatibilities
Segregate from acids. Segregate from oxidizable substances. Segregate from ammonium salts. Segregate from combustible materials.

Suitable materials for containers: High density polyethylene (HDPE), Low density polyethylene (LDPE), Polyethylenetherephtalate (PET), Polypropylene (PP), Carbon steel (Iron), tinned carbon steel (Tinplate)

Further information on storage conditions: The entrance to storage rooms is to be granted only to appropriately trained personnel. Keep only in the original container. Keep container tightly closed in a cool, well-ventilated place. Avoid direct sunlight.

8. Exposure Controls/Personal Protection

No occupational exposure limits known.

Advice on system design:
Use only in well-ventilated areas.

Personal protective equipment

Respiratory protection:
Wear respiratory protection if ventilation is inadequate.

Hand protection:
Chemical resistant protective gloves (EN 374), Further information on penetration time is available from the manufacturer of the glove., The gloves should be replaced immediately in case of damage or signs of wear. It is recommended to use preventative skin protection (skin cream)., Use suitable protective gloves made of nitrile rubber or butyl rubber. Please observe the glove manufacturer's instructions on permeability and ruptur times as well as the specific workplace conditions.

Eye protection:
Tightly fitting safety goggles (splash goggles) (e.g. EN 166)

Body protection:
Chemical resistant protective clothing according to DIN EN 13034 (Type 6)

General safety and hygiene measures:
Handle in accordance with good industrial hygiene and safety practice. Eye wash fountains and safety showers must be easily accessible. Contact with eyes and skin must be avoided. Take off immediately all contaminated clothing. Keep away from food, drink and animal feeding stuffs. Hands and/or face should be washed before breaks and at the end of the shift.

9. Physical and Chemical Properties

Form:	liquid
Odour:	odourless
Colour:	light yellow
pH value:	8.5 - 9.5 (20 °C) (undiluted)
Freezing point:	-2 °C
onset of boiling:	not determined
Flash point:	not applicable
Flammability:	not applicable
Lower explosion limit:	not determined
Upper explosion limit:	not applicable
Autoignition:	not determined
Vapour pressure:	(20 °C) not determined
Density:	1.142 g/cm3 (20 °C)
Partitioning coefficient n-octanol/water (log Pow):	No data available.
Solubility in water:	fully soluble
Miscibility with water:	miscible

10. Stability and Reactivity

Reactivity
No hazardous reactions if stored and handled as prescribed/indicated.

Oxidizing properties:
not fire-propagating

Chemical stability
The product is stable if stored and handled as prescribed/indicated.

Possibility of hazardous reactions
Contact with acids may liberate toxic gas. Dried product promotes spreading of fire.

Conditions to avoid
Avoid drying-out. Avoid prolonged exposure to extreme heat.

Incompatible materials
ammonium salts, organic substances, acids, amines

Hazardous decomposition products

Decomposition products:
Possible decomposition products: No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological information

Primary routes of exposure

Routes of entry for solids and liquids are ingestion and inhalation, but may include eye or skin contact. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquefied gases.

<u>Primary routes of entry</u>
Ingestion

Acute Toxicity/Effects

Chronic Toxicity/Effects

<u>Other Information</u>
The product has not been tested. The statement has been derived from the properties of the individual components.

Symptoms of Exposure

The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11.

12. Ecological Information

Bioaccumulative potential

<u>Bioaccumulation potential</u>
No data available.

Mobility in soil

<u>Assessment transport between environmental compartments</u>
No data available.

13. Disposal considerations

Waste disposal of substance:
Observe national and local legal requirements.

Container disposal:
Contaminated packaging should be emptied as far as possible and disposed of in the same manner as the substance/product.

14. Transport Information

Land transport
USDOT

Not classified as a dangerous good under transport regulations

Sea transport
IMDG

Not classified as a dangerous good under transport regulations

Air transport
IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information

Federal Regulations

Registration status:

Chemical	TSCA, US	released / listed

EPCRA 311/312 (Hazard categories): Refer to SDS section 2 for GHS hazard classes applicable for this product.

EPCRA 313:

CAS Number	Chemical name
7632-00-0	sodium nitrite

CERCLA RQ	CAS Number	Chemical name
100 LBS	7632-00-0	sodium nitrite

State regulations

State RTK	CAS Number	Chemical name
NJ	7632-00-0	sodium nitrite
PA	7632-00-0	sodium nitrite

NFPA Hazard codes:
Health: 1 Fire: 0 Reactivity: 1 Special:

HMIS III rating
Health: 1 Flammability: 0 Physical hazard: 1

16. Other Information

SDS Prepared by:
Chemetall (now part of BASF Group) NA Product Regulations
SDS Prepared on: 2019/04/23

We support worldwide Responsible Care® initiatives. We value the health and safety of our employees, customers, suppliers and neighbors, and the protection of the environment. Our commitment to Responsible Care is integral to conducting our business and operating our facilities in a safe and environmentally responsible fashion, supporting our customers and suppliers in ensuring the safe and environmentally sound handling of our products, and minimizing the impact of our operations on society and the environment during production, storage, transport, use and disposal of our products.

END OF DATA SHEET

Safety Data Sheet
GardoClean 390 LB

1. Identification

Product identifier used on the label

GardoClean 390 LB

Recommended use of the chemical and restriction on use
Recommended use*: Detergents

* The “Recommended use” identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:
Chemetall U.S., Inc.
675 Central Avenue
New Providence, NJ 07974 – USA

Telephone: +1 800 526-4473
E-mail address: michael.l.chang@basf.com

Emergency telephone number

Telephone: 800-424-9300, 1-703-527-3887

Other means of identification

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid
Colour	light yellow
Odour	surfactant
Hazard Summary	May be harmful if swallowed Irritating to eyes.

GHS Classification

Eye irritation : Category 2B

GHS label elements

Signal word : Warning

Hazard statements : Causes eye irritation.

Precautionary statements : **Prevention:**
Wash skin thoroughly after handling.
Response:
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If eye irritation persists: Get medical advice/ attention.

Potential Health Effects

Inhalation : no

Skin : no

Ingestion : yes

Aggravated Medical Condition : None known.

Carcinogenicity:

IARC No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

OSHA No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

NTP No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture :

Hazardous components

Component	CAS-No.	**Weight percent**
Trade Secret Registry	735517-5014P	10 - 20

Unidentified ingredients are considered not hazardous, or not required to be listed under Federal Hazard Communication Standard (29CFR 1910.1200).

Specific chemical identity of composition has been withheld as a trade secret.

Exact percentage of composition has been withheld as a trade secret.

SECTION 4. FIRST AID MEASURES

If inhaled	:	Remove person to fresh air. If signs/symptoms continue, get medical attention.
In case of skin contact	:	Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.
In case of eye contact	:	Rinse immediately with plenty of water for at least 15 minutes. Keep eye wide open while rinsing. Seek medical advice.
If swallowed	:	Rinse mouth. Drink 1 or 2 glasses of water. Never give anything by mouth to an unconscious person. Obtain medical attention.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Dry chemical Carbon dioxide (CO2) Foam Water spray
Further information	:	Use water spray to cool unopened containers.
Special protective equipment for firefighters	:	In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Ensure adequate ventilation. Material can create slippery conditions.
Methods and materials for containment and cleaning up	:	Ventilate area. Neutralise with acid. Clean up with inert absorbant material. Keep in suitable, closed containers for disposal. Flush with plenty of water.
Additional advice	:	Never return spills in original containers for re-use.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	Use only with adequate ventilation.

		Do not add large amounts of product to solution at any one time.
Conditions for safe storage	:	Store indoors in a cool, well-ventilated place KEEP FROM FREEZING Keep containers dry and tightly closed to avoid moisture absorption and contamination.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection	:	In case of insufficient ventilation wear suitable respiratory equipment.
Hand protection		
Remarks	:	Impervious gloves
Eye protection	:	Chemical resistant goggles must be worn.
Skin and body protection	:	Rubber or plastic apron
Hygiene measures	:	Avoid contact with skin, eyes and clothing. Wear suitable gloves and eye/face protection. Wear suitable protective clothing. Wash hands before breaks and immediately after handling the product. Provide adequate ventilation. Do not inhale fumes. Keep away from food and drink.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	light yellow
Odour	:	surfactant
pH	:	10.0 - 11.0
Freezing point	:	18.8 °C
Boiling point/boiling range	:	No data available
Flash point	:	does not flash
Evaporation rate	:	1 Water = 1
Upper explosion limit	:	Not applicable.
Lower explosion limit	:	Not applicable.
Vapour pressure	:	No data available

Relative density	:	1.034
Bulk density	:	8.6 lb/gal
Solubility(ies)		
Water solubility	:	completely soluble
Partition coefficient: n-octanol/water	:	No data available
Auto-ignition temperature	:	No data available
Thermal decomposition	:	No data available
Viscosity, dynamic	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	freezing Direct sources of heat.
Incompatible materials	:	Acids
Hazardous decomposition products	:	Carbon dioxide (CO2) Carbon monoxide Sulphur oxides

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity : Acute toxicity estimate : 2,371.000000 mg/kg
Method: Calculation method

Components:

Trade Secret Registry:

Acute oral toxicity : LD50 Rat: 438.000000 mg/kg

LD50 Mouse: 1,330.000000 mg/kg

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

Product:

Result: Mild eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

No data available

Bioaccumulative potential

Product:

Partition coefficient: n-octanol/water	:	Remarks: No data available

Other adverse effects

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	Refer to all federal, provincial, state and local regulation prior to disposition of container and unused contents by reuse, recycle or disposal.

SECTION 14. TRANSPORT INFORMATION

International Regulations

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

National Regulations

SECTION 15. REGULATORY INFORMATION

TSCA Status : All components of this material comply with US TSCA requirements.

OSHA Hazards : Mild eye irritant, Toxic by ingestion
WHMIS Classification : D2B: Toxic Material Causing Other Toxic Effects

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Trade Secret Registry	735517-5014P	1,000	5,420

SARA 311/312 Hazards : Acute Health Hazard

SARA 302 : No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

US State Regulations

Massachusetts Right To Know

Trade Secret Registry	735517-5014P

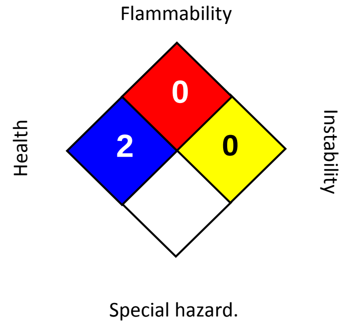
Pennsylvania Right To Know

water	7732-18-5
Trade Secret Registry	735517-5014P
Trade secret registry	735517-5097P
Sodium sulfate	7757-82-6
Sodium hydroxide	1310-73-2

New Jersey Right To Know

water	7732-18-5
Trade Secret Registry	735517-5014P
Trade secret registry	735517-5097P

NFPA:



HMIS III:

HEALTH	**2**
FLAMMABILITY	**0**
PHYSICAL HAZARD	**0**

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

Safety Glasses, Gloves, Apron

SECTION 16. OTHER INFORMATION

Further information

Version *1.1*
Revision Date 12/20/2017

SDS Prepared by:
Chemetall (now part of BASF Group) NA Product Regulations
SDS Prepared on: 2018/01/18

IMPORTANT: WHILE THE DESCRIPTIONS, DESIGNS, DATA AND INFORMATION CONTAINED HEREIN ARE PRESENTED IN GOOD FAITH AND BELIEVED TO BE ACCURATE , IT IS PROVIDED FOR YOUR GUIDANCE ONLY. BECAUSE MANY FACTORS MAY AFFECT PROCESSING OR APPLICATION/USE, WE RECOMMEND THAT YOU MAKE TESTS TO DETERMINE THE SUITABILITY OF A PRODUCT FOR YOUR PARTICULAR PURPOSE PRIOR TO USE. NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE REGARDING PRODUCTS DESCRIBED OR DESIGNS, DATA OR INFORMATION SET FORTH, OR THAT THE PRODUCTS, DESIGNS, DATA OR INFORMATION MAY BE USED WITHOUT INFRINGING THE INTELLECTUAL PROPERTY RIGHTS OF OTHERS. IN NO CASE SHALL THE DESCRIPTIONS, INFORMATION, DATA OR DESIGNS PROVIDED BE CONSIDERED A PART OF OUR TERMS AND CONDITIONS OF SALE. FURTHER, YOU EXPRESSLY UNDERSTAND AND AGREE THAT THE DESCRIPTIONS, DESIGNS, DATA, AND INFORMATION FURNISHED BY OUR COMPANY HEREUNDER ARE GIVEN GRATIS AND WE ASSUME NO OBLIGATION OR LIABILITY FOR THE DESCRIPTION, DESIGNS, DATA AND INFORMATION GIVEN OR RESULTS OBTAINED, ALL SUCH BEING GIVEN AND ACCEPTED AT YOUR RISK.

The content of this Safety Data Sheet (SDS) is based on an existing document from an acquired company with adaptations to Section I. The data is currently under validation.

END OF DATA SHEET

Safety Data Sheet
GardoClean R 1700 F

1. Identification

Product identifier used on the label

GardoClean R 1700 F

Recommended use of the chemical and restriction on use
Recommended use*: Detergents

* The “Recommended use” identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:
Chemetall U.S., Inc.
675 Central Avenue
New Providence, NJ 07974 – USA

Telephone: +1 800 526-4473
E-mail address: michael.l.chang@basf.com

Emergency telephone number

Telephone: 800-424-9300, 1-703-527-3887

Other means of identification

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid
Colour	light brown
Odour	none
Hazard Summary	Causes severe burns. Harmful if swallowed.

GHS Classification

Skin corrosion : Category 1A

Serious eye damage : Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Causes severe skin burns and eye damage.

Precautionary statements :

Prevention:
Wash skin thoroughly after handling.
Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response:
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
Wash contaminated clothing before reuse.
Storage:
Store locked up.
Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Potential Health Effects

Inhalation : no

Skin : yes

Ingestion : yes

Aggravated Medical Condition : None known.

Carcinogenicity:

IARC No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

OSHA	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
NTP	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture :

Hazardous components

Component	CAS-No.	**Weight percent**
Sodium hydroxide	1310-73-2	30 - 50

Unidentified ingredients are considered not hazardous, or not required to be listed under Federal Hazard Communication Standard (29CFR 1910.1200).

Specific chemical identity of composition has been withheld as a trade secret.

Exact percentage of composition has been withheld as a trade secret.

SECTION 4. FIRST AID MEASURES

If inhaled	:	Move to fresh air. If symptoms persist, call a physician. If breathing is irregular or stopped, administer artificial respiration.
In case of skin contact	:	Wash off immediately with plenty of water for at least 15 minutes. Take off contaminated clothing and shoes immediately. Get medical attention if irritation develops and persists
In case of eye contact	:	Rinse immediately with plenty of water for at least 15 minutes. Keep eye wide open while rinsing. Get medical attention immediately
If swallowed	:	Rinse mouth. Drink 1 or 2 glasses of water. Never give anything by mouth to an unconscious person. Get medical attention immediately

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Dry chemical Carbon dioxide (CO2) Foam Water spray
Further information	:	Use water spray to cool unopened containers.

Special protective equipment for firefighters : In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures : Ensure adequate ventilation.
Material can create slippery conditions.

Methods and materials for containment and cleaning up : Ventilate area.
Neutralise with acid.
Clean up with inert absorbant material.
Keep in suitable, closed containers for disposal.
Flush with plenty of water.

Additional advice : Never return spills in original containers for re-use.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling : Add this product to surface of solution slowly to avoid spattering
Do not add large amounts of product to solution at any one time.
Do not add to hot water warmer than 43 degrees to 49 degrees C (110 degrees to 120 degrees F).
Never add liquids to product

Conditions for safe storage : Keep containers dry and tightly closed to avoid moisture absorption and contamination.
Store indoors in a cool, well-ventilated place

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Sodium hydroxide	1310-73-2	C	2.000000 mg/m3	ACGIH
		C	2.000000 mg/m3	NIOSH REL
		TWA	2.000000 mg/m3	OSHA Z-1
		C	2.000000 mg/m3	OSHA P0
		C	2.000000 mg/m3	CAL PEL

Personal protective equipment

Respiratory protection : If the occupational exposure limits cannot be met, suitable respirator equipment shall be worn.

Hand protection
Remarks : Impervious gloves Neoprene gloves Nitrile rubber

Eye protection : Chemical resistant goggles must be worn.
Face-shield

Skin and body protection	:	Rubber or plastic apron
Hygiene measures	:	Avoid contact with skin, eyes and clothing. Wear suitable gloves and eye/face protection. Wear suitable protective clothing. Wash hands before breaks and immediately after handling the product. Provide adequate ventilation. Do not inhale fumes. Keep away from food and drink.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	light brown
Odour	:	none
pH	:	> 12.5
Freezing point	:	4 °C
Boiling point/boiling range	:	No data available
Flash point	:	does not flash
Evaporation rate	:	1 Water = 1
Upper explosion limit	:	Not applicable.
Lower explosion limit	:	Not applicable.
Vapour pressure	:	No data available
Relative density	:	1.522
Bulk density	:	12.7 lb/gal
Solubility(ies)		
Water solubility	:	completely soluble
Partition coefficient: n-octanol/water	:	No data available
Auto-ignition temperature	:	No data available
Thermal decomposition	:	No data available
Viscosity, dynamic	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Direct sources of heat.
Incompatible materials	:	Acids

Hazardous decomposition products	:	Hydrogen, by reaction with metals

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity	:	Acute toxicity estimate : > 5,000.000000 mg/kg Method: Calculation method
Acute dermal toxicity	:	Acute toxicity estimate : 2,935.000000 mg/kg Method: Calculation method

Components:

Sodium hydroxide:

Acute oral toxicity	:	LD50 Mouse: 6,600.000000 mg/kg
		LD50 Rat: 4,090.000000 mg/kg
Acute inhalation toxicity	:	LC50 Mouse: 1,200.000000 mg/l Exposure time: 2 h Test atmosphere: dust/mist
		LC50 Rat: 2,300.000000 mg/l Exposure time: 2 h Test atmosphere: dust/mist
Acute dermal toxicity	:	LD50 Rabbit: 1,350.000000 mg/kg

Skin corrosion/irritation

Components:

Sodium hydroxide:
Result: Corrosive

Serious eye damage/eye irritation

Components:

Sodium hydroxide:
Result: Corrosive
Classification: Corrosive

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

No data available

Bioaccumulative potential

Product:

Partition coefficient: n-octanol/water	:	Remarks: No data available

Other adverse effects

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	Refer to all federal, provincial, state and local regulation prior to disposition of container and unused contents by reuse, recycle or disposal.

SECTION 14. TRANSPORT INFORMATION

International Regulations

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

National Regulations

SECTION 15. REGULATORY INFORMATION

TSCA Status	:	All components of this material comply with US TSCA requirements.
OSHA Hazards	:	Harmful by skin absorption, Corrosive to skin

WHMIS Classification : E: Corrosive Material
D2B: Toxic Material Causing Other Toxic Effects

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Sodium hydroxide	1310-73-2	1,000	2,174

SARA 311/312 Hazards : Acute Health Hazard

SARA 302 : No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

US State Regulations

Massachusetts Right To Know

Sodium hydroxide 1310-73-2

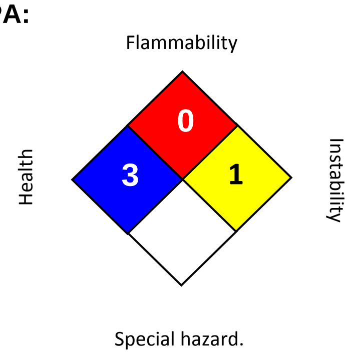
Pennsylvania Right To Know

Sodium hydroxide 1310-73-2
water 7732-18-5
Trade Secret Registry 735517-5145P

New Jersey Right To Know

Sodium hydroxide 1310-73-2
water 7732-18-5
Trade Secret Registry 735517-5145P

NFPA:



HMIS III:

HEALTH	3
FLAMMABILITY	0
PHYSICAL HAZARD	1

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

Corrosive Alkaline

Splash Goggles, Gloves, Apron, Dust and Vapour Respirator

SECTION 16. OTHER INFORMATION

Further information

Version *1.1*
Revision Date 12/20/2017

SDS Prepared by:
Chemetall (now part of BASF Group) NA Product Regulations
SDS Prepared on: 2018/01/18

The content of this Safety Data Sheet (SDS) is based on an existing document from an acquired company with adaptations to Section I. The data is currently under validation.

END OF DATA SHEET

Safety Data Sheet
Gardolene D 6871

1. Identification

Product identifier used on the label

Gardolene D 6871

Recommended use of the chemical and restriction on use

Recommended use*: Surface treatment agent

* The “Recommended use” identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:
Chemetall U.S., Inc.
675 Central Avenue
New Providence, NJ 07974 – USA

Telephone: +1 800 526-4473
E-mail address: michael.chang@chemetall.com

Emergency telephone number

Telephone: 800-424-9300, 1-703-527-3887

Other means of identification

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid
Colour	straw
Odour	mild
Hazard Summary	Combustible material May cause eye irritation May be harmful if swallowed Repeated or prolonged ingestion of Ethanol may cause cancer

GHS Classification

Flammable liquids	: Category 4
Carcinogenicity	: Category 1A

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Combustible liquid.
May cause cancer.

Precautionary statements : **Prevention:**
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat/sparks/open flames/hot surfaces. No smoking.
Wear protective gloves/ eye protection/ face protection.
Use personal protective equipment as required.
Response:
IF exposed or concerned: Get medical advice/ attention.
In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
Storage:
Store in a well-ventilated place. Keep cool.
Store locked up.
Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Potential Health Effects

Inhalation	: no
Skin	: no
Ingestion	: yes
Aggravated Medical Condition	: None known.

Carcinogenicity:

IARC	Group 1: Carcinogenic to humans	
	Ethanol	64-17-5
ACGIH	Confirmed animal carcinogen with unknown relevance to humans	
	Ethanol	64-17-5

OSHA No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

NTP No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture :

Hazardous components

Component	CAS-No.	**Weight percent**
Ethanol	64-17-5	1 - 5

Unidentified ingredients are considered not hazardous, or not required to be listed under Federal Hazard Communication Standard (29CFR 1910.1200).

Specific chemical identity of composition has been withheld as a trade secret.

Exact percentage of composition has been withheld as a trade secret.

SECTION 4. FIRST AID MEASURES

If inhaled : Remove to fresh air.
If symptoms persist, call a physician.

In case of skin contact : Wash off with plenty of water.
If skin irritation persists, call a physician.

In case of eye contact : Keep eye wide open while rinsing.
Rinse immediately with plenty of water for at least 15 minutes.
If eye irritation persists, consult a specialist.

If swallowed : Rinse mouth.
Never give anything by mouth to an unconscious person.
Obtain medical attention.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media : Carbon dioxide (CO_2)
Dry chemical
Foam
Water spray

Further information : Use water spray to cool unopened containers.

Special protective equipment for firefighters : In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures : Ensure adequate ventilation.
Remove all sources of ignition.

Methods and materials for containment and cleaning up : Ventilate area.
Use nonsparking equipment when cleaning up flammable spill.
Clean up with inert absorbant material.
Flush with plenty of water.
Keep in suitable, closed containers for disposal.

Additional advice : Never return spills in original containers for re-use.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling : Unscrew closure slowly. Allow all pressure to escape through threads before removing closure
Use with adequate ventilation.

Conditions for safe storage : Keep containers tightly closed in a cool, well-ventilated place.
KEEP FROM FREEZING

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Ethanol	64-17-5	TWA	1,000 ppm 1,900.000000 mg/m3	NIOSH REL
		TWA	1,000 ppm 1,900.000000 mg/m3	OSHA Z-1
		TWA	1,000 ppm 1,900.000000 mg/m3	OSHA P0
		STEL	1,000 ppm	ACGIH
		PEL	1,000 ppm 1,900.000000 mg/m3	CAL PEL

Personal protective equipment

Respiratory protection : If the occupational exposure limits cannot be met, suitable respirator equipment shall be worn.

Hand protection
Remarks : Impervious gloves

Eye protection : Safety glasses with side-shields

Skin and body protection	: Rubber or plastic apron
Hygiene measures	: Avoid contact with eyes. Wear suitable gloves and eye/face protection. Wear suitable protective clothing. Wash hands before breaks and immediately after handling the product. Provide adequate ventilation. Do not inhale fumes. Keep away from heat and flame. Keep away from food and drink.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	: liquid
Colour	: straw
Odour	: mild
pH	: 10.5 - 11.5
Freezing point	: -4.44 °C
Boiling point/boiling range	: No data available
Flash point	: 61 °C Method: Tag closed cup
Evaporation rate	: 1 Water = 1
Upper explosion limit	: No data available
Lower explosion limit	: No data available
Vapour pressure	: No data available
Relative vapour density	: No data available
Relative density	: 1.007
Bulk density	: 8.40 lb/gal
Solubility(ies)	
Water solubility	: completely soluble
Partition coefficient: n-octanol/water	: No data available
Auto-ignition temperature	: No data available
Thermal decomposition	: No data available
Viscosity, dynamic	: No data available

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	: Heat, flames and sparks.

freezing

Incompatible materials	:	Strong oxidizing agents Acids
Hazardous decomposition products	:	Carbon dioxide (CO_2) Carbon monoxide

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity	:	Acute toxicity estimate : > 5,000.000000 mg/kg Method: Calculation method

Components:

Ethanol:

Acute oral toxicity	:	LD50 Rat: 6,200.000000 mg/kg LD50 Rat: 7,060.000000 mg/kg LDlo Humans: 1,400.000000 mg/kg
Acute inhalation toxicity	:	LC50 Rat: 8,001.000000 mg/l Exposure time: 4 h
Acute dermal toxicity	:	LD50 Rabbit: 19,999.000000 mg/kg

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

Components:

Ethanol:
Result: Eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

No data available

Bioaccumulative potential

Product:

Partition coefficient: n-octanol/water	:	Remarks: No data available

Other adverse effects

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	Refer to all federal, provincial, state and local regulation prior to disposition of container and unused contents by reuse, recycle or disposal.

SECTION 14. TRANSPORT INFORMATION

International Regulations

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

National Regulations

SECTION 15. REGULATORY INFORMATION

TSCA Status	:	All components of this material comply with US TSCA requirements.
OSHA Hazards	:	Combustible Liquid, Carcinogen, Moderate eye irritant
WHMIS Classification	:	B3: Combustible Liquid D2B: Toxic Material Causing Other Toxic Effects

EPCRA - Emergency Planning and Community Right-to-Know Act

SARA 311/312 Hazards	:	Fire Hazard

Chronic Health Hazard
Acute Health Hazard

SARA 302 : No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

US State Regulations

Massachusetts Right To Know

Ethanol	64-17-5

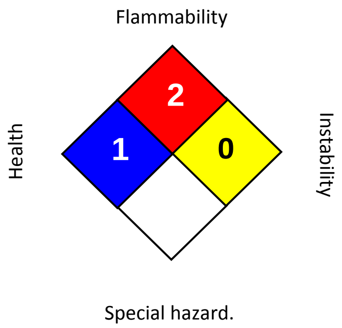
Pennsylvania Right To Know

water	7732-18-5
Ethanol	64-17-5
Trade Secret Registry	735517-5062P
2-Propanol	67-63-0

New Jersey Right To Know

water	7732-18-5
Ethanol	64-17-5
Trade Secret Registry	735517-5062P

NFPA:



HMIS III:

HEALTH	1
FLAMMABILITY	2
PHYSICAL HAZARD	0

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

Safety Glasses, Gloves

SECTION 16. OTHER INFORMATION

Further information

Version *1.1*

Revision Date 12/20/2017

SDS Prepared by:
Chemetall (now part of BASF Group) NA Product Regulations
SDS Prepared on: 2018/01/04

The content of this Safety Data Sheet (SDS) is based on an existing document from an acquired company with adaptations to Section I. The data is currently under validation.

END OF DATA SHEET

BASF We create chemistry | Chemetall expect more

Safety Data Sheet
6978000 Gardolene V 6522 (BULK)

1. Identification

Product identifier used on the label

6978000 Gardolene V 6522 (BULK)

Recommended use of the chemical and restriction on use
Recommended use*: Surface treatment agent

* The “Recommended use” identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:
Chemetall U.S., Inc.
675 Central Avenue
New Providence, NJ 07974 – USA

Telephone: +1 800 526-4473
E-mail address: michael.l.chang@basf.com

Emergency telephone number

Telephone: 800-424-9300, 1-703-527-3887

Other means of identification

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	powder
Colour	white
Odour	none
Hazard Summary	Harmful by inhalation and if swallowed. Causes irritation of eyes and skin. WARNING! MAY FORM COMBUSTIBLE DUST CONCENTRATIONS IN AIR.

GHS Classification

Not a hazardous substance or mixture.

GHS label elements

Not a hazardous substance or mixture.

Potential Health Effects

Inhalation : yes

Skin : yes

Ingestion : yes

Aggravated Medical Condition : None known.

Carcinogenicity:

IARC	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
OSHA	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
NTP	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture :

Hazardous components

Component	CAS-No.	**Weight percent**
Tetrasodium pyrophosphate	7722-88-5	90 - 100
Trade Secret Registry	735517-5122P	1 - 5

Unidentified ingredients are considered not hazardous, or not required to be listed under Federal Hazard Communication Standard (29CFR 1910.1200).

Specific chemical identity of composition has been withheld as a trade secret.

Exact percentage of composition has been withheld as a trade secret.

SECTION 4. FIRST AID MEASURES

If inhaled : Remove to fresh air.
If symptoms persist, call a physician.

In case of skin contact	:	Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.
In case of eye contact	:	Rinse immediately with plenty of water for at least 15 minutes. Keep eye wide open while rinsing. Seek medical advice.
If swallowed	:	Rinse mouth. Drink plenty of water. Obtain medical attention.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Water spray Dry powder Foam Carbon dioxide (CO2)
Further information	:	Use water spray to cool unopened containers.
Special protective equipment for firefighters	:	In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Ensure adequate ventilation. Avoid dust formation. Material can create slippery conditions.
Methods and materials for containment and cleaning up	:	Ventilate area. Avoid dust generation Sweep up and remove immediately. Keep in suitable, closed containers for disposal. Flush with plenty of water.
Additional advice	:	Never return spills in original containers for re-use.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	Use only with adequate ventilation. Avoid breathing dust. Never add liquids to product
Conditions for safe storage	:	Keep containers dry and tightly closed to avoid moisture absorption and contamination. Store indoors in a cool, well-ventilated place Protect from direct contact with water or excessive moisture.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Tetrasodium pyrophosphate	7722-88-5	TWA	5.000000 mg/m3	NIOSH REL
		TWA	5.000000 mg/m3	OSHA P0
		PEL	5.000000 mg/m3	CAL PEL

Personal protective equipment

Respiratory protection : If the occupational exposure limits cannot be met, suitable respirator equipment shall be worn.

Hand protection
Remarks : Impervious gloves

Eye protection : Safety glasses with side-shields

Skin and body protection : Rubber or plastic apron

Hygiene measures : Avoid contact with skin, eyes and clothing.
Wear suitable gloves and eye/face protection.
Wear suitable protective clothing.
Wash hands before breaks and immediately after handling the product.
Provide adequate ventilation.
Avoid breathing dust or vapor.
Keep away from food and drink.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : powder

Colour : white

Odour : none

pH : 10.0 - 11.0

Freezing point : Not applicable

Boiling point/boiling range : Not applicable

Flash point :
does not flash

Evaporation rate : Not applicable

Upper explosion limit : Not applicable.

Lower explosion limit : Not applicable.

Vapour pressure : No data available

Relative density : Not applicable

Bulk density : 62.4 lb/ft3

Solubility(ies)

Water solubility	: partly soluble
Partition coefficient: n-octanol/water	: No data available
Auto-ignition temperature	: No data available
Thermal decomposition	: No data available
Viscosity, dynamic	: No data available

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	: Exposure to moisture
Incompatible materials	: Acids
Hazardous decomposition products	: Oxides of phosphorus Carbon oxides

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity	: Acute toxicity estimate : 4,359.000000 mg/kg Method: Calculation method
Acute inhalation toxicity	: Acute toxicity estimate : > 10.000000 mg/l Exposure time: 4 h Test atmosphere: dust/mist Method: Calculation method

Components:

Tetrasodium pyrophosphate:

Acute oral toxicity	: LD50 Mouse: 2,980.000000 mg/kg LD50 Rat: 4,000.000000 mg/kg
Acute dermal toxicity	: LD50 Rabbit: > 7,940.000000 mg/kg

Trade Secret Registry:

Acute oral toxicity	: LD50 Rat: 4,090.000000 mg/kg LD50 Mouse: 6,600.000000 mg/kg
Acute inhalation toxicity	: LC50 Rat: 2.300000 mg/l Exposure time: 4 h

Test atmosphere: dust/mist

LC50 Mouse: 1.200000 mg/l
Exposure time: 2 h
Test atmosphere: dust/mist

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

Components:

Tetrasodium pyrophosphate:
Result: Corrosive

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

No data available

Bioaccumulative potential

Product:

Partition coefficient: n-octanol/water : Remarks: No data available

Other adverse effects

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Refer to all federal, provincial, state and local regulation prior to disposition of container and unused contents by reuse, recycle or disposal.

SECTION 14. TRANSPORT INFORMATION

International Regulations

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

National Regulations

SECTION 15. REGULATORY INFORMATION

TSCA Status : All components of this material comply with US TSCA requirements.

OSHA Hazards : Combustible dust, Toxic by inhalation.
WHMIS Classification : D2B: Toxic Material Causing Other Toxic Effects

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Disodium phosphate	7558-79-4	5,000	71,429

SARA 311/312 Hazards : Acute Health Hazard

SARA 302 : No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

US State Regulations

Massachusetts Right To Know

Tetrasodium pyrophosphate	7722-88-5
Disodium phosphate	7558-79-4

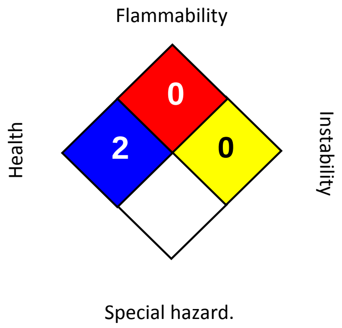
Pennsylvania Right To Know

Tetrasodium pyrophosphate	7722-88-5
Disodium phosphate	7558-79-4
Sodium sulfate	7757-82-6

New Jersey Right To Know

Tetrasodium pyrophosphate	7722-88-5
Disodium phosphate	7558-79-4
Trade Secret Registry	735517-5122P

NFPA:



HMIS III:

HEALTH	2
FLAMMABILITY	0
PHYSICAL HAZARD	0

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

Safety Glasses, Gloves, Dust Respirator

SECTION 16. OTHER INFORMATION

Further information

Version *1.1*
Revision Date 01/06/2018

SDS Prepared by:
Chemetall (now part of BASF Group) NA Product Regulations
SDS Prepared on: 2018/01/12

IMPORTANT: WHILE THE DESCRIPTIONS, DESIGNS, DATA AND INFORMATION CONTAINED HEREIN ARE PRESENTED IN GOOD FAITH AND BELIEVED TO BE ACCURATE , IT IS PROVIDED FOR YOUR GUIDANCE ONLY. BECAUSE MANY FACTORS MAY AFFECT PROCESSING OR APPLICATION/USE, WE RECOMMEND THAT YOU MAKE TESTS TO DETERMINE THE SUITABILITY OF A PRODUCT FOR YOUR PARTICULAR PURPOSE PRIOR TO USE. NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE REGARDING PRODUCTS DESCRIBED OR DESIGNS, DATA OR INFORMATION SET FORTH, OR THAT THE PRODUCTS, DESIGNS, DATA OR INFORMATION MAY BE USED WITHOUT INFRINGING THE INTELLECTUAL PROPERTY RIGHTS OF OTHERS. IN NO CASE SHALL THE DESCRIPTIONS, INFORMATION, DATA OR DESIGNS PROVIDED BE CONSIDERED A PART OF OUR TERMS AND CONDITIONS OF SALE. FURTHER, YOU EXPRESSLY UNDERSTAND AND AGREE THAT THE DESCRIPTIONS, DESIGNS, DATA, AND INFORMATION FURNISHED BY OUR COMPANY HEREUNDER ARE GIVEN GRATIS AND WE ASSUME NO OBLIGATION OR LIABILITY FOR THE DESCRIPTION, DESIGNS, DATA AND INFORMATION GIVEN OR RESULTS OBTAINED, ALL SUCH BEING GIVEN AND ACCEPTED AT YOUR RISK.

The content of this Safety Data Sheet (SDS) is based on an existing document from an acquired company with adaptations to Section I. The data is currently under validation.

END OF DATA SHEET

Safety Data Sheet
Liquid Dynadet

1. Identification

Product identifier used on the label

Liquid Dynadet

Recommended use of the chemical and restriction on use

Recommended use*: Detergents

* The “Recommended use” identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:
Chemetall U.S., Inc.
675 Central Avenue
New Providence, NJ 07974 – USA
+1 800 526-4473
michael.l.chang@basf.com

Emergency telephone number

Telephone: 800-424-9300, 1-703-527-3887

Other means of identification

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid
Colour	dark brown
Odour	slight
Hazard Summary	Causes severe burns. Harmful if swallowed.

GHS Classification

Acute toxicity (Oral)	:	Category 4
Skin corrosion	:	Category 1A
Serious eye damage	:	Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements :
Harmful if swallowed.
Causes severe skin burns and eye damage.

Precautionary statements :
Prevention:
Wash skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response:
IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
Wash contaminated clothing before reuse.
Storage:
Store locked up.
Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Potential Health Effects

Inhalation	:	no
Skin	:	yes
Ingestion	:	yes
Aggravated Medical Condition	:	None known.

Carcinogenicity:

IARC No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

OSHA No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

NTP No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture :

Hazardous components

Component	CAS-No.	**Weight percent**
Potassium hydroxide	1310-58-3	30 - 50
Trade Secret Registry	735517-5127P	5 - 10

Unidentified ingredients are considered not hazardous, or not required to be listed under Federal Hazard Communication Standard (29CFR 1910.1200).

Specific chemical identity of composition has been withheld as a trade secret.

Exact percentage of composition has been withheld as a trade secret.

SECTION 4. FIRST AID MEASURES

If inhaled : Remove to fresh air.
If symptoms persist, call a physician.
If breathing is irregular or stopped, administer artificial respiration.

In case of skin contact : Wash off immediately with plenty of water for at least 15 minutes.
Take off contaminated clothing and shoes immediately.
Get medical attention immediately if irritation develops and persists

In case of eye contact : Rinse immediately with plenty of water for at least 15 minutes.
Keep eye wide open while rinsing.
Get medical attention immediately

If swallowed : Rinse mouth.
Drink plenty of water.
Never give anything by mouth to an unconscious person.
Get medical attention immediately

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Special protective equipment for firefighters : In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Methods and materials for containment and cleaning up : Soak up with inert absorbent material.
Neutralise with acid.
Flush with plenty of water.

Additional advice : Never return spills in original containers for re-use.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling : Add this product to surface of solution slowly to avoid spattering
Wear personal protective equipment.(see section 8)

Conditions for safe storage : Keep containers dry and tightly closed to avoid moisture absorption and contamination.
Store indoors in a cool, well-ventilated place

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Potassium hydroxide	1310-58-3	C	2.000000 mg/m3	ACGIH
		C	2.000000 mg/m3	NIOSH REL
		C	2.000000 mg/m3	OSHA P0
		C	2.000000 mg/m3	CAL PEL

Personal protective equipment

Respiratory protection : If the occupational exposure limits cannot be met, suitable respirator equipment shall be worn.

Hand protection
Remarks : Impervious gloves

Eye protection : Chemical resistant goggles must be worn.

Skin and body protection : Rubber or plastic apron

Hygiene measures : Avoid contact with skin, eyes and clothing.
Wear suitable gloves and eye/face protection.
Wear suitable protective clothing.

Wash hands and face before breaks and immediately after handling the product.
Provide adequate ventilation.
Do not inhale fumes.
Keep away from food and drink.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	dark brown
Odour	:	slight
pH	:	> 12.5
Freezing point	:	< -5 °C
Boiling point/boiling range	:	No data available
Flash point	:	does not flash
Evaporation rate	:	1 Water = 1
Upper explosion limit	:	Not applicable.
Lower explosion limit	:	Not applicable.
Vapour pressure	:	No data available
Relative density	:	1.462
Bulk density	:	12.2 lb/gal
Solubility(ies)		
Water solubility	:	completely soluble
Partition coefficient: n-octanol/water	:	No data available
Auto-ignition temperature	:	No data available
Thermal decomposition	:	No data available
Viscosity, dynamic	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	freezing Direct sources of heat.
Incompatible materials	:	Acids
Hazardous decomposition products	:	Carbon dioxide (CO2) Carbon monoxide Oxides of phosphorus Hydrogen, by reaction with metals

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity	:	Acute toxicity estimate : 697.540000 mg/kg Method: Calculation method
Acute dermal toxicity	:	Acute toxicity estimate : 3,286.000000 mg/kg Method: Calculation method

Components:

Potassium hydroxide:

Acute oral toxicity	:	LD50 Rat: 273.000000 mg/kg LD50 Rat: 365.000000 mg/kg
Acute dermal toxicity	:	LD50 Rabbit: 1,260.000000 mg/kg

Trade Secret Registry:

Acute oral toxicity	:	LD50 Rat: 2,080.000000 mg/kg
Acute dermal toxicity	:	LD50 Rabbit: > 4,640.000000 mg/kg

Skin corrosion/irritation

Components:

Potassium hydroxide:
Result: Corrosive

Trade Secret Registry:
Result: Skin irritation

Serious eye damage/eye irritation

Components:

Potassium hydroxide:
Result: Corrosive

Trade Secret Registry:
Species: Rabbit
Result: Eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

No data available

Bioaccumulative potential

Product:

Partition coefficient: n-octanol/water	:	Remarks: No data available

Other adverse effects

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	Refer to all federal, provincial, state and local regulation prior to disposition of container and unused contents by reuse, recycle or disposal.

SECTION 14. TRANSPORT INFORMATION

International Regulations

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

National Regulations

SECTION 15. REGULATORY INFORMATION

TSCA Status	:	All components of this material comply with US TSCA requirements.

OSHA Hazards : Toxic by ingestion, Harmful by skin absorption, Corrosive to skin, Moderate eye irritant

WHMIS Classification : E: Corrosive Material

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Potassium hydroxide	1310-58-3	1,000	2,608

SARA 311/312 Hazards : Acute Health Hazard

SARA 302 : No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

US State Regulations

Massachusetts Right To Know

Potassium hydroxide	1310-58-3

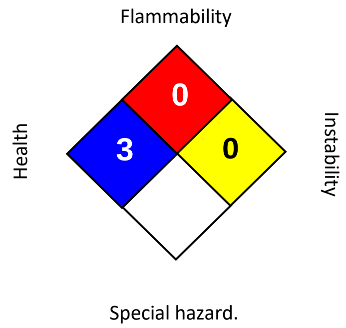
Pennsylvania Right To Know

water	7732-18-5
Potassium hydroxide	1310-58-3
Trade Secret Registry	735517-5127P

New Jersey Right To Know

water	7732-18-5
Potassium hydroxide	1310-58-3
Trade Secret Registry	735517-5127P
Sodium Glucoheptonate	31138-65-5

NFPA:



HMIS III:

HEALTH	3
FLAMMABILITY	0
PHYSICAL HAZARD	0

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

Corrosive Alkaline

Splash Goggles, Gloves, Apron, Dust and Vapour Respirator

SECTION 16. OTHER INFORMATION

Further information

Version *1.1*
Revision Date 12/20/2017

SDS Prepared by:
Chemetall (now part of BASF Group) NA Product Regulations
SDS Prepared on: 2018/01/18

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The content of this Safety Data Sheet (SDS) is based on an existing document from an acquired company with adaptations to Section I. The data is currently under validation.

END OF DATA SHEET

Attachment L

Centerfire Room Air Emissions Testing Report

AIR HYGIENE, INC.

Testing Solutions for a Better World

EMISSION COMPLIANCE TEST
FOR THE
CENTERFIRE ROOM, VENTS #1, 2, AND 3
PREPARED FOR
CHOCTAW DEFENSE FACILITY
AT THE
MCALESTER FACILITY
MCALESTER, OKLAHOMA
DECEMBER 18-19, 2019

Report Date: January 11, 2020

Corporate Headquarters
1600 W Tacoma Street
Broken Arrow, Oklahoma 74012

AIR HYGIENE, INC.

(918) 307-8865 or (888) 461-8778
www.airhygiene.com

Remote Testing Offices
Las Vegas, NV 89156
Ft. Worth, TX 76028
Humble, TX 77338
Shreveport, LA 71115
Miami, FL 33101
Pittsburgh, PA 15205

EMISSION COMPLIANCE TEST
FOR THE
CENTERFIRE ROOM, VENTS #1, 2, AND 3
PREPARED FOR
CHOCTAW DEFENSE FACILITY
AT THE
MCALESTER FACILITY
MCALESTER, OKLAHOMA
DECEMBER 18-19, 2019

Prepared and Reviewed by:

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AHU Support Staff

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Director of AHU

I,
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Director of Customer Service

certify that this testing was conducted and this report was created in conformance with the requirements of ASTM D7036

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CERTIFICATION OF INFORMATION

I certify under penalty of law that I believe the information provided in this document is true, accurate and complete. I am aware that there are significant civil and criminal penalties, including the possibility of fine or imprisonment or both, for submitting false, inaccurate or incomplete information.

Paul Little, QSTI
Director of Customer Service
Air Hygiene International, Inc.

December 29, 2019
Date

FACILITY CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attached documents and, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil and criminal penalties, including the possibility of fine or imprisonment or both, for submitting false, inaccurate or incomplete information.

I am the responsible official with direct knowledge and overall responsibility for the information contained in this report.

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Name

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Title

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Emissions Compliance Test
Centerfire Room, Vents #1, 2, and 3
Choctaw Defense Facility
McAlester Facility
McAlester, Oklahoma
December 18-19, 2019

1.0 INTRODUCTION

Air Hygiene International, Inc. (Air Hygiene) has completed the Emissions Compliance Test for lead (Pb) from the exhaust of the Centerfire Room, Vents #1, 2, and 3 for Choctaw Defense Facility at the McAlester Facility in McAlester, Oklahoma. This report details the background, results, process description, and the sampling/analysis methodology of the stack sampling survey conducted on December 18-19, 2019.

1.1 TEST PURPOSE AND OBJECTIVES

The purpose of the test was to conduct an emission test to document levels of selected pollutants. The information will be used to demonstrate emissions as part of an air permit application and to determine what emission factors are for the operation. The specific objective was to determine the emission concentration of Pb from the exhaust of Choctaw Defense Facility's Centerfire Room, Vents #1, 2, and 3 with all production equipment in the Centerfire Room operating at maximum production.

1.2 SUMMARY OF TEST PROGRAM

The following list details pertinent information related to this specific project:

1.2.1 Participating Organizations
- Choctaw Defense Facility
- A & M Engineering and Environmental Services, Inc.
- Air Hygiene

1.2.2 Industry
- Small Arms Ammunition Manufacturing

1.2.3 Plant Location
- McAlester Facility in McAlester, Oklahoma
  - GPS Coordinates [Latitude 34.891594, Longitude -95.778621]
  - Physical Address: 3 Skyway Drive, McAlester, Oklahoma 74501
  - Federal Registry System / Facility Registry Service (FRS) No. – 110070242795
  - Source Classification Code (SCC) – 39999994

1.2.4 Equipment Tested
- Centerfire Room, Vents #1, 2, and 3

1.2.5 Emission Points
- Exhaust from the Centerfire Room, Vents #1, 2, and 3
- For all Pb testing, 25 sampling points in the exhaust duct from the Centerfire Room, Vents #1, 2, and 3

1.2.6 Emission Parameters Measured
- Pb
- Flow
- H_2O

1.2.7 Dates of Emission Test

- December 18-19, 2019

1.2.8 Federal Certifications

- Stack Testing Accreditation Council AETB Certificate No. 3796.02
- International Standard ISO/IEC 17025:2005 Certificate No. 3796.01

1.3 KEY PERSONNEL

Choctaw Defense Facility:	Jacob Williams (jawilliams@choctawdefense.com)	918-426-2871
A&M Eng and Env Services:	Jeff Jenkins (JJenkins@aandmengineering.com)	918-665-6575
Air Hygiene:	Paul Little (plittle@airhygiene.com)	918-307-8865
Air Hygiene:	Jeff Wollrab	918-307-8865
Air Hygiene:	Isaac Hernandez	918-307-8865

2.0 SUMMARY OF TEST RESULTS

Results from the sampling conducted on Choctaw Defense Facility's Centerfire Room, Vents #1, 2, and 3 located at the McAlester Facility on December 18-19, 2019 are summarized in the following tables and relate only to the items tested.

TABLE 2.1
CHOCTAW DEFENSE FACILITY CENTERFIRE ROOM VENT #1
EMISSION DATA SUMMARY

Parameters	V1Pb-1	V1Pb-2	V1Pb-3	Average	Units
Run Start Time	07:55	12:47	14:26		hh:mm
Run Stop Time	11:00	13:59	15:35		hh:mm
Test Date	12/18/19	12/18/19	12/18/19		mm/dd/yy
Production Rate	Max	Max	Max		ton/hr
Total Sampling Time	60.00	60.00	60.00	60.00	min
Dry Standard Stack Flow Rate	793,601	782,625	792,993	789,740	dscfh
Emission Rate Data	**V1Pb-1**	**V1Pb-2**	**V1Pb-3**	**Average**	**Units**
Lead Mass	0.0026	0.0022	0.0015	0.0021	mg
Lead Concentration	8.15E-08	6.94E-08	4.74E-08	6.61E-08	g/dscf
	1.26E-06	1.07E-06	7.32E-07	1.02E-06	gr/dscf
Lead Emission Rate	6.47E-05	5.43E-05	3.76E-05	5.22E-05	kg/hr
	1.43E-04	1.20E-04	8.29E-05	1.15E-04	lb/hr
	6.24E-04	5.25E-04	3.63E-04	5.04E-04	tpy

TABLE 2.2
CHOCTAW DEFENSE FACILITY CENTERFIRE ROOM VENT #2
EMISSION DATA SUMMARY

Parameters	V2Pb-1	V2Pb-2	V2Pb-3	Average	Units
Run Start Time	16:42	07:08	08:45		hh:mm
Run Stop Time	17:52	08:14	09:50		hh:mm
Test Date	12/18/19	12/19/19	12/19/19		mm/dd/yy
Production Rate	Max	Max	Max		ton/hr
Total Sampling Time	60.00	60.00	60.00	60.00	min
Dry Standard Stack Flow Rate	843,962	860,200	833,474	845,879	dscfh
Emission Rate Data	**V2Pb-1**	**V2Pb-2**	**V2Pb-3**	**Average**	**Units**
Lead Mass	0.0008	0.0017	0.0014	0.0013	mg
Lead Concentration	2.33E-08	4.85E-08	4.17E-08	3.78E-08	g/dscf
	3.59E-07	7.48E-07	6.43E-07	5.83E-07	gr/dscf
Lead Emission Rate	1.96E-05	4.17E-05	3.47E-05	3.20E-05	kg/hr
	4.33E-05	9.19E-05	7.66E-05	7.06E-05	lb/hr
	1.90E-04	4.03E-04	3.35E-04	3.09E-04	tpy

TABLE 2.3
CHOCTAW DEFENSE FACILITY CENTERFIRE ROOM VENT #3
EMISSION DATA SUMMARY

Parameters	V3Pb-1	V3Pb-2	V3Pb-3	Average	Units
Run Start Time	12:01	13:47	15:11		hh:mm
Run Stop Time	13:08	14:54	16:18		hh:mm
Test Date	12/19/19	12/19/19	12/19/19		mm/dd/yy
Production Rate	Max	Max	Max		ton/hr
Total Sampling Time	60.00	60.00	60.00	60.00	min
Dry Standard Stack Flow Rate	161,180	180,386	172,013	171,193	dscfh
Emission Rate Data	**V3Pb-1**	**V3Pb-2**	**V3Pb-3**	**Average**	**Units**
Lead Mass	0.0008	0.0005	0.0006	0.0006	mg
Lead Concentration	5.58E-08	2.44E-08	3.09E-08	3.70E-08	g/dscf
	8.60E-07	3.77E-07	4.77E-07	5.71E-07	gr/dscf
Lead Emission Rate	8.99E-06	4.40E-06	5.32E-06	6.24E-06	kg/hr
	1.98E-05	9.71E-06	1.17E-05	1.37E-05	lb/hr
	8.68E-05	4.25E-05	5.14E-05	6.02E-05	tpy

All testing was performed without any real or apparent errors with the exception that Run 1 on Vent #1 began, but shortly thereafter the process experienced production slowdowns. During this time the test train was halted in place with no sampling occurring until the situation was remedied. Testing resumed when production levels were re-established. All testing was conducted according to the approved testing protocol with the exception that Method 3A was not performed. All sources were ambient vents and diluent concentrations were assumed as ambient. Also, the Vent #3 shroud did not meet the EPA Method 1 minimum design distances between the sample ports and the upstream and downstream disturbances. However, the average null angle of zero degrees is a good indicator of a lack of cyclonic flow.

3.0 SOURCE OPERATION

3.1 PROCESS DESCRIPTION

The Choctaw Defense Facility located at 3 Skyway Drive in McAlester, Oklahoma. Located on this facility are three process vents discharging emissions from an isolated process room utilized to produce ammunitions. The process vents are designated, for the purposes of this protocol, as Vent #1, Vent #2, and Vent #3.

The Centerfire Room is enclosed from other areas of the facility by hard walls and overhead doors which are kept closed at all times, except for brief moments while receiving material then immediately closed. Walk through doors are only opened as an employee is entering or existing the room. The Centerfire Room has three exhaust fans that were operational during the testing. Since the room is a fully enclosed environment, all exhaust is controlled by the three exhaust fans. This is the normal operating conditions for the Centerfire Room; thus, no increase in employee exposure was anticipated.

Each exhaust fan was tested with a minimum of three, one-hour runs with the other two exhaust fans operating. The exhaust fans were not equipped with variable speed controls, so fans were either on or off. Revolutions per minute (RPM) data was taken from manufacturers specifications. The other exhaust fans from the facility are in areas away from, and not associated with, the Centerfire Room. Each exhaust fan had a temporary shroud (duct) fabricated to snugly slip over the fan housing. Insulation was placed between the shroud and the fan housing and screwed in place with sheet metal screws. The seam where the fan housing and shroud met was taped with duct tape to make the connection leak proof.

3.2 SAMPLING LOCATION

The Vent #1 and Vent #2 stacks are horizontal, square and measure 3.58 feet (ft) (43 inches) wide and 3.67 ft (44 inches) deep at the five test ports. The test ports are located approximately 8.42 ft (101 inches) downstream and approximately 3.83 ft (46 inches) upstream from the nearest disturbances.

The Vent #3 stack is vertical, square and measures 3.0 feet (ft) (36 inches) deep and 3.0 feet (ft) (36 inches) wide at the test ports. The test ports are located approximately 3.67 ft (44 inches) downstream and approximately 1.0 ft (12 inches) upstream from the nearest disturbances. This stack did not meet the EPA Method 1 minimum design distances between the sample ports and the upstream and downstream disturbances. However, the average null angle of zero degrees is a good indicator of a lack of cyclonic flow.

Air Hygiene has field verified the measurable dimensions. Non-field verified dimensions are provided by Choctaw Defense Facility. For Pb testing, an initial velocity traverse was performed across the from 25 total points. All Pb sampling occurred from the same points by leaving the probe at each for an equal amount of time in order to draw an isokinetic sample through the sample train.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 TEST METHODS

The emission test on the Centerfire Room, Vents #1, 2, and 3 at the McAlester Facility was performed following United States Environmental Protection Agency (EPA) methods described by the Code of Federal Regulations (CFR). Table 4.1 outlines the specific methods performed on December 18-19, 2019.

TABLE 4.1
SUMMARY OF SAMPLING METHODS

Pollutant or Parameter	Sampling Method	Analysis Method
Sample Point Location	EPA Method 1	Equal Area Method
Stack Flow Rate	EPA Method 2	S-Type Pitot Tube
Stack Moisture Content	EPA Method 4	Gravimetric Analysis
Lead	EPA Method 12	Digestion

4.2 INSTRUMENT CONFIGURATION AND OPERATIONS FOR ANALYSIS

The sampling and analysis procedures used during these tests conform with the methods outlined in the Code of Federal Regulations (CFR), Title 40, Part 60, Appendix A, Methods 1, 2, 4, and 12.

Figure 4.1 represents the sample system used for the wet chemistry tests (Pb). A heated stainless-steel probe with a glass liner and nozzle was inserted into the sample ports of the stack to extract gas measurements from the emission stream through a filter and glass impinger train. Flow rates are monitored with oil filled manometers and total sample volumes are measured with a dry gas meter.

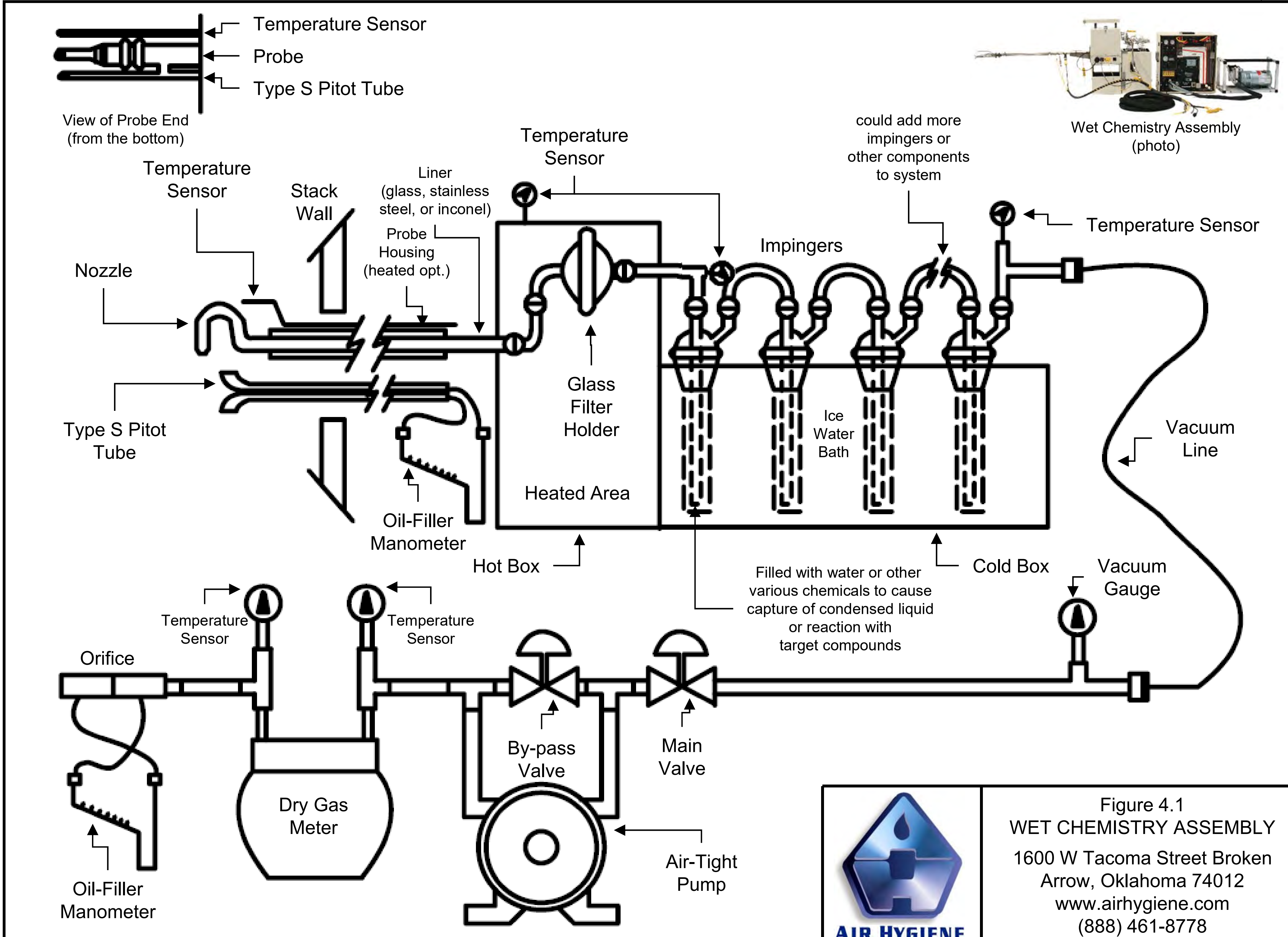

Figure 4.1
WET CHEMISTRY ASSEMBLY

1600 W Tacoma Street Broken
Arrow, Oklahoma 74012
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APPENDIX A

TEST RESULTS AND CALCULATIONS

TABLE A.1: EMISSIONS TESTING SCHEDULE

Unit	Load	Component	Run	Date	Start	Stop	Time Sync	Duration
Vent #1	Max	Preliminaries	V1Pb-V1	12/17/19	08:08	08:48	DAHS	00:40
Vent #1	Max	Lead	V1Pb-1	12/18/19	07:55	11:00	DAHS	03:05
Vent #1	Max	Lead	V1Pb-2	12/18/19	12:47	13:59	DAHS	01:12
Vent #1	Max	Lead	V1Pb-3	12/18/19	14:26	15:35	DAHS	01:09
Vent #2	Max	Preliminaries	V2Pb-V1	12/18/19	15:58	16:18	DAHS	00:20
Vent #2	Max	Lead	V2Pb-1	12/18/19	16:42	17:52	DAHS	01:10
Vent #2	Max	Lead	V2Pb-2	12/19/19	07:08	08:14	DAHS	01:06
Vent #2	Max	Lead	V2Pb-3	12/19/19	08:45	09:50	DAHS	01:05
Vent #3	Max	Preliminaries	V3Pb-V1	12/19/19	11:09	11:43	DAHS	00:34
Vent #3	Max	Lead	V3Pb-1	12/19/19	12:01	13:08	DAHS	01:07
Vent #3	Max	Lead	V3Pb-2	12/19/19	13:47	14:54	DAHS	01:07
Vent #3	Max	Lead	V3Pb-3	12/19/19	15:11	16:18	DAHS	01:07

Note: Vent #1, Run 1 started at 07:55, but process experienced three lengthy delays because of site equipment issues. Test train was paused in place until production was re-established.

TEST RESULTS AND CALCULATIONS

Vent #1 Emissions Data

METHOD 12 (LEAD) - RESULTS

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Historical Data	**V1Pb-1**	**V1Pb-2**	**V1Pb-3**	**Average**	**Units**
Run Start Time	07:55	12:47	14:26		hh:mm
Run Stop Time	11:00	13:59	15:35		hh:mm
Test Date	12/18/19	12/18/19	12/18/19		mm/dd/yy
Production Rate	Max	Max	Max		ton/hr
Meter Calibration Factor	0.995	0.995	0.995		
Pitot Tube Coefficient	0.8290	0.8190	0.8290		
Average Nozzle Diameter	0.312	0.314	0.312		in
Stack Test Data	**V1Pb-1**	**V1Pb-2**	**V1Pb-3**	**Average**	**Units**
Initial Meter Volume	663.978	697.000	729.733		ft^3
Final Meter Volume	696.754	729.421	762.455		ft^3
Total Meter Volume	32.776	32.421	32.722	32.640	ft^3
Total Sampling Time	60.00	60.00	60.00	60.00	min
Average Meter Temperature	74.08	72.32	78.08	74.83	°F
Average Stack Temperature	60.44	68.68	70.80	66.64	°F
Barometric Pressure	29.54	29.56	29.54	29.55	in Hg
Stack Static Pressure	0.01	0.01	0.01	0.01	in H_2O
Absolute Stack Pressure	29.54	29.56	29.54	29.55	in Hg
Average Orifice Pressure Drop	1.02	1.05	0.96	1.01	in H_2O
Absolute Meter Pressure	29.68	29.70	29.68	29.69	in Hg
Avg Square Root Pitot Pressure	0.30	0.31	0.31	0.31	$\sqrt{(\text{in } H_2O)}$
Moisture Content Data	**V1Pb-1**	**V1Pb-2**	**V1Pb-3**	**Average**	**Units**
Impinger Water Weight Gain	-2.80	5.50	-2.80	-0.03	g
Silica Gel Weight Gain	6.20	10.10	7.40	7.90	g
Total Water Volume Collected	3.41	15.63	4.61	7.88	ml
Standard Water Vapor Volume	0.16	0.74	0.22	0.37	scf
Standard Meter Volume	31.9	31.7	31.6	31.7	dscf
Standard Metric Meter Volume	0.9	0.9	0.9	0.9	dscm
Calculated Stack Moisture	0.50	2.27	0.68	1.15	%
Saturated Stack Moisture	1.79	2.39	2.57	2.25	%
Reported Stack Moisture Content	0.50	2.27	0.68	1.15	%
Gas Analysis Data	**V1Pb-1**	**V1Pb-2**	**V1Pb-3**	**Average**	**Units**
Carbon Dioxide Content	0.0	0.0	0.0	0.0	%
Oxygen Content	20.9	20.9	20.9	20.9	%
Carbon Monoxide Content	0.0	0.0	0.0	0.0	ppm
Nitrogen Content	79.1	79.1	79.1	79.1	%
Stack Dry Molecular Weight	28.84	28.84	28.84	28.84	lb/lb-mole
Stack Wet Molecular Weight	28.78	28.59	28.76	28.71	lb/lb-mole

METHOD 12 (LEAD) - RESULTS

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Volumetric Flow Rate Data	**V1Pb-1**	**V1Pb-2**	**V1Pb-3**	**Average**	**Units**
Average Stack Gas Velocity	16.83	17.16	17.19	17.06	ft/sec
Stack Cross-Sectional Area	13.14	13.14	13.14	13.14	ft²
Actual Stack Flow Rate	13,271	13,526	13,550	13,449	acfm
Wet Standard Stack Flow Rate	798	801	798	799	wkscfh
Dry Standard Stack Flow Rate	793,601	782,625	792,993	789,740	dscfh
Percent of Isokinetic Rate	101.8	105.1	99.2	102.0	%
Emission Rate Data	**V1Pb-1**	**V1Pb-2**	**V1Pb-3**	**Average**	**Units**
Lead Mass	0.0026	0.0022	0.0015	0.0021	mg
Lead Concentration	8.15E-08	6.94E-08	4.74E-08	6.61E-08	g/dscf
	1.26E-06	1.07E-06	7.32E-07	1.02E-06	gr/dscf
Lead Emission Rate	6.47E-05	5.43E-05	3.76E-05	5.22E-05	kg/hr
	1.43E-04	1.20E-04	8.29E-05	1.15E-04	lb/hr
	6.24E-04	5.25E-04	3.63E-04	5.04E-04	tpy

Note: HNO_3 blank concentration of 0.6 µg subtracted from each result

Nomenclature

- $\%CO$ = carbon monoxide concentration (%)
- $\%CO_2$ = carbon dioxide concentration (%)
- $\%N_2$ = nitrogen concentration (%)
- $\%O_2$ = oxygen concentration (%)
- $\%O_{2,wet}$ = Oxygen content of gas stream, % by volume of wet gas. (Note: The oxygen percentage used in Method 201A, Equation 3 is on a wet gas basis. That means that since oxygen is typically measured on a dry gas basis, the measured percent O2 must be multiplied by the quantity (1 - B_{ws}) to convert to the actual volume fraction. Therefore, $\%O_{2,wet} = (1 - B_{ws}) * \%O_{2, dry}$)
- $(\%EA)_{avg}$ = average excess air (%)
- $(F_o)_{avg}$ = average calculated fuel factor
- $[(\Delta p)^{0.5}]_{avg}$ = Average of square roots of the velocity pressures measured during the preliminary traverse, inches W.C.
- μ = Gas viscosity, micropoise
- 12.0 = Constant calculated as 60 percent of 20.5 square inch cross-sectional area of combined cyclone head, square inches
- 17.03 = mg/milliequivalents for ammonium ion
- 22.4 = liters of ideal gas per lb-mol of substance at 0°C and 1 atm (ref. Civil Engineering Reference Manual, 7th ed. - Michael R. Lindeburg)
- 24.04 = liters of ideal gas per lb-mol of substance at 20°C and 1 atm (ref. Civil Engineering Reference Manual, 7th ed. - Michael R. Lindeburg)
- 5.02×10^4 = constant derived from the molecular weight and correcting standard temperature and pressure (ref. Bay Area Air Quality Management District, Source Test Procedure ST-1B, Ammonia Integrated Sampling, Adopted January 20, 1982, Regulation 7-303)
- A = distance upstream (in.)
- A_D = stack diameters upstream (dia.)
- An = Area of nozzle, square feet
- A_s = area of stack (ft^2)
- B = distance downstream (in.)
- B_D = stack diameters downstream (dia.)
- b_f = Average blockage factor calculated in Equation 26, dimensionless
- B_{wm} = meter moisture content (%)
- B_{ws} = stack moisture content (%)
- C = Cunningham correction factor for particle diameter, Dp, and calculated using the actual stack gas temperature, dimensionless
- C_1 = -150.3162 (micropoise)
- C_2 = 18.0614 (micropoise/$K^{0.5}$) = 13.4622 (micropoise/$R^{0.5}$)
- $C_3 = 1.19183 \times 10^6$ (micropoise/K^2) = 3.86153×10^6 (micropoise/R^2)
- C_4 = 0.591123 (micropoise)
- C_5 = 91.9723 (micropoise)
- $C_6 = 4.91705 \times 10^{-5}$ (micropoise/K^2) = 1.51761×10^{-5} (micropoise/R^2)
- C_a = Acetone blank concentration, mg/mg
- C_b = Concentration of NH3 ion in the back half of train (breakthrough)
- C_f = Concentration of NH3 ion in the front half of train (main catch)
- C_{fPM10} = Conc. of filterable PM_{10}, gr/dscf
- $C_{fPM2.5}$ = Conc. of filterable $PM_{2.5}$, gr/dscf
- C_k = K Factor Constant, 849.8

Nomenclature

- C_n = nozzle diameter constant, 0.03575
- C_p' = Coefficient for the pitot used in the preliminary traverse, dimensionless
- C_p = Pitot coefficient for the combined cyclone pitot, dimensionless
- C_{cpm} = Concentration of the condensable PM in the stack gas, dry basis, corrected to standard conditions, milligrams/dry standard cubic foot.
- C_r = Re-estimated Cunningham correction factor for particle diameter equivalent to the actual cut size diameter and calculated using the actual stack gas temperature, dimensionless
- D_{50} = Particle cut diameter, micrometers
- $D_{50(N+1)}$ = D_{50} value for cyclone IV calculated during the N+1 iterative step, micrometers
- D_{50-1} = Re-calculated particle cut diameters based on re-estimated C_r, micrometers
- D_{50LL} = Cut diameter for cyclone I corresponding to the 2.25 micrometer cut diameter for cyclone IV, micrometer
- D_{50N} = D_{50} value for cyclone IV calculated during the Nth iterative step, micrometers
- D_{50T} = Cyclone I cut diameter corresponding to the middle of the overlap zone shown in Method 201A, Figure 10 of Section 17, micrometers
- D_e = equivalent stack diameter (in.)
- ΔH@ = ΔH @ 0.75 scfm (in. H2O)
- ΔH_{avg} = average orifice pressure (in. H_2O)
- D_n = Inner diameter of sampling nozzle mounted on Cyclone I, inches
- D_{na} = actual nozzle diameter (in.)
- D_p = Physical particle size, micrometers
- Δp = velocity head (in. H_2O)
- Δp_1 = velocity head at first current traverse point (in. H_2O)
- $\Delta p'_1$ = velocity head at first preliminary traverse point (in. H_2O)
- Δp_{avg} = average pitot tube differential pressure (in. H_2O)
- Δp_n = velocity head at subsequent current traverse point (in. H_2O)
- Δp_{RM2} = method 2 velocity head (in. H_2O)
- D_s = diameter of stack (in.)
- F_d = fuel f-factor (dscf/MMBtu)
- f_{O2} = stack gas fraction of O_2, by volume, dry basis
- I = Percent isokinetic sampling, dimensionless
- K_1 = standard volume correction, 17.65^{o}R/in. Hg
- K_4 = isokinetic conversion constant, 0.0945min•in.Hg/sec•^{o}R
- K_5 = water mass to std water vapor, 0.04715 ft^3/g
- K_p = 85.49, ((ft/sec)/(pounds/mole -^{o}R))
- L = length of stack (in.)
- L_{fw} = distance to far wall of stack (in.)
- L_{nw} = distance to near wall of stack (in.) [reference]
- $m_{\#x}$ = weight measurements (g)
- M_1 = Milligrams of PM collected on the filter, less than or equal to 2.5 micrometers
- M_2 = Milligrams of PM recovered from Container #2 (acetone blank corrected), greater than 10 micrometers
- M_3 = Milligrams of PM recovered from Container #3 (acetone blank corrected), less than or equal to 10 and greater than 2.5 micrometers
- M_4 = Milligrams of PM recovered from Container #4 (acetone blank corrected), less than or equal to 2.5 micrometers

Nomenclature

- m_a = Mass of residue of acetone after evaporation, mg
- m_c = Mass of the NH4+ added to sample to form ammonium sulfate, mg
- m_{cpm} = Mass of the total condensable PM, mg
- M_d = Molecular weight of dry gas, pounds/pound mole
- m_{fb} = Mass of total CPM in field train recovery blank, mg
- m_{fx} = final weight, avg of last two measurements (g)
- mg = Milligram
- mg/L = Milligram per liter
- m_i = Mass of inorganic CPM, mg
- m_{ib} = Mass of inorganic CPM in field train recovery blank, mg
- M_n = total particulates (mg)
- m_o = Mass of organic CPM, mg
- m_{ob} = Mass of organic CPM in field train blank, mg
- m_r = Mass of dried sample from inorganic fraction, mg
- m_{tx} = tare weight (g)
- MW = molecular weight (lb/lb-mole)
- M_w = Molecular weight of wet gas, pounds/pound mole
- N = Normality of ammonium hydroxide titrant
- N_a = null angle (deg.)
- N_{re} = Reynolds number, dimensionless
- N_{tp} = Number of iterative steps or total traverse points
- P_b = P_{bar} = barometric pressure (in. Hg)
- P_{bar} = barometric pressure (in. Hg)
- ppmCO = carbon monoxide concentration (ppm)
- ppmv = Parts per million by volume
- ppmw = Parts per million by weight
- P_s = absolute stack pressure (in. Hg)
- P_{static} = static pressure (in. H_2O)
- P_{std} = standard pressure, 29.92 in. Hg
- Θ = total sampling time (min)
- Q_{aw} = average stack wet flow rate (ascf/min)
- Q_I = Sampling rate for cyclone I to achieve specified D_{50}
- Q_m = estimated orifice flow rate, 0.750 acfm, else Vm/Q from previous run
- Q_s = Sampling rate for cyclone I to achieve specified D_{50}
- $Q_{s(std)}$ = total cyclone flow rate at standard conditions (dscf/min)
- Q_{sd} = dry standard stack flow rate (dscfm)
- Q_{sST} = Dry gas sampling rate through the sampling assembly, dscfm
- Q_{sw} = wet standard stack flow rate (ascfm)
- R_{max} = Nozzle/stack velocity ratio parameter, dimensionless
- R_{min} = Nozzle/stack velocity ratio parameter, dimensionless
- t_1 = Sampling time at point 1, min
- t_m = average gas meter temperature (^oF)
- t_m = average meter temperature (^oF)
- T_m = Meter box and orifice gas temperature, ^oR
- t_n = Sampling time at point n, min

Nomenclature

- t_r = Total projected run time, min
- T_s = Absolute stack gas temperature, ^oR
- T_{std} = standard temperature, 68^{o}F, 528^{o}R
- T_u = absolute temperature offset, 460^{o}R
- V_a = Volume of acetone blank, ml
- V_{aw} = Volume of acetone used in sample recovery wash, ml
- V_b = Volume of aliquot taken for IC analysis, ml
- V_c = Quantity of water captured in impingers and silica gel, ml
- V_f = final impinger volume (ml)
- V_i = initial impinger volume (ml)
- V_{ic} = Volume of impinger contents sample, ml
- V_m = Dry gas meter volume sampled, acf
- $V_{m(std)}$ = standard meter volume (dscf)
- v_{max} = Maximum gas velocity calculated from Equations 18 or 19, ft/sec
- v_{max} = maximum nozzle velocity (ft/sec)
- V_{mf} = final dry gas meter reading (dcf)
- V_{mi} = initial dry gas meter reading (dcf)
- v_{min} = Minimum gas velocity calculated from Method 201A, Equations 16 or 17, ft/sec
- V_{ms} = Dry gas meter volume sampled, corrected to standard conditions, dscf
- v_n = Sample gas velocity in the nozzle, ft/sec
- v_{org} = organics wash volume (ml)
- V_p = Volume of water added during train purge
- v_s = average stack gas velocity (ft/sec)
- v_{sl} = local velocity (ft/sec)
- V_t = total impinger volume (ml) = ;(V_f-V_i)
- V_t = Volume of NH4OH titrant, ml
- $V_{w(std)}$ = volume of water vapor in gas sample at standard conditions (scf)
- v_x = blank volume (ml)
- W = width of stack (in.)
- $W_{2,3,4}$ = Weight of PM recovered from Containers #2, #3, and #4, mg
- W_a = Weight of blank residue in acetone used to recover samples, mg
- W_f = final impinger weight (g)
- W_i = initial impinger weight (g)
- W_t = total impinger weight (g) = ;(W_f-W_i)
- w_x = blank weight of solids (g)
- Y = meter calibration factor (a.k.a gamma)
- Z = Ratio between estimated cyclone IV D_{50} values, dimensionless
- γ = Dry gas meter gamma value, dimensionless
- ΔH = Meter box orifice pressure drop, inches W.C.
- ΔH@ = Pressure drop across orifice at flow rate of 0.75 scfm at standard conditions, inches W.C. (Note: Specific to each orifice and meter box.)
- Δp_1 = Velocity pressure measured at point 1, inches W.C.
- Δp_{avg} = Average velocity pressure, inches W.C.
- Δp_m = Observed velocity pressure using S-type pitot tube in preliminary traverse, inches W.C.
- Δp_{max} = Maximum velocity pressure, inches W.C.

Nomenclature

- Δp_{min} = Minimum velocity pressure, inches W.C.
- Δp_n = Velocity pressure measured at point n during the test run, inches W.C.
- Δp_s = Velocity pressure calculated in Method 201a, Equation 25, inches W.C.
- Δp_{s1} = Velocity pressure adjusted for combined cyclone pitot tube, inches W.C.
- Δp_{s2} = Velocity pressure corrected for blockage, inches W.C.
- θ = Total run time, min
- ρ_a = Density of acetone, mg/ml (see label on bottle)
- Σ_n = total number of sampling points

EXAMPLE CALCULATIONS (Reference Method 1 - Rectangular Stack)

Length of Stack (in.)

$$L(in.) = L_{fw} - L_{nw}$$

L (in.) = 44.13 in. - 0.13 in. = 44.00 in.

Equivalent Diameter of Stack (in.)

$$D_e(in.) = \frac{2 \times L \times W}{L + W}$$

$$D_e\text{ (in.)} = \frac{2 \times 44.00\text{ in.} \times 43.00\text{ in.}}{44.00\text{ in.} + 43.00\text{ in.}} = 43.49\text{ in.}$$

Area of Stack (ft^2)

$$A_s(ft^2) = w \times l$$

$$A_s\ (ft^2) = \frac{43.00}{12}\text{ ft} \times \frac{44.00}{12}\text{ ft} = 13.14\ ft^2$$

Stack Diameters Downstream

$$B_D(dia.) = \frac{B}{D_e}$$

$$B_D\text{ (dia.)} = \frac{101.00\text{ in.}}{43.49\text{ in.}} = 2.32\text{ diameters}$$

Stack Diameters Upstream

$$A_D(dia.) = \frac{A}{D_e}$$

$$A_D\text{ (dia.)} = \frac{46.00\text{ in.}}{43.49\text{ in.}} = 1.06\text{ diameters}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 3a) [Values from Run 1 test]

Carbon Monoxide Concentration (%)

$$\%CO = \frac{ppmCO}{10{,}000}$$

%CO (%) = $\frac{0.00 \text{ ppm}}{10{,}000 \text{ ppm/\%}}$ = 0.0000 %

Nitrogen Concentration (%)

$$\%N_2 = 100 - \%CO_2 - \%O_2 - \%CO$$

$\%N_2$ (%) = 100 - 0.00 % - 20.90 % - 0.00 / 10,000 % = 79.1 %

Stack Dry Molecular Weight (lb/lb-mole)

$$M_d\,(lb/lb-mol) = \sum\left(\frac{MW_{comp}}{100} \times \%component\right)$$

M_d (lb/lb-mol) = ($\frac{44 \text{ lb/lb-mol}}{100}$ x 0.00 %) + ($\frac{32 \text{ lb/lb-mol}}{100}$ x 20.90 %) + ($\frac{28 \text{ lb/lb-mol}}{100}$ x [$\frac{0.00}{10{,}000}$ + 79.10]) = $\frac{28.84 \text{ lb}}{\text{lb-mol}}$

Stack Wet Molecular Weight (lb/lb-mole)

$$M_S\,(lb/lb-mol) = \left[M_d \times \left(1 - \frac{B_{WS}}{100}\right)\right] + \left[MW_{H_2O} \times \frac{B_{WS}}{100}\right]$$

M_S (lb/lb-mol) = { $\frac{28.84 \text{ lb}}{\text{lb-mol}}$ x (1 - $\frac{0.50 \text{ \%}}{100}$) } + { $\frac{18 \text{ lb}}{\text{lb-mol}}$ x $\frac{0.50 \text{ \%}}{100}$ } = $\frac{28.78 \text{ lb}}{\text{lb-mol}}$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 2) [Values from Run 1 test]

Absolute Stack Pressure (in. Hg)

$$P_S(in.Hg) = P_b + \frac{P_{static}}{13.6}$$

$$P_s \text{ (in. Hg)} = 29.54 \text{ in. Hg} + \frac{0.01 \text{ in. } H_2O}{13.6 \text{ in. } H_2O\text{/in. Hg}} = 29.54 \text{ in. Hg}$$

Average Stack Gas Velocity (ft/sec)

$$v_s\,(ft/\sec) = K_p \times C_p \times \left(\sqrt{\Delta p}\right)_{avg} \times \sqrt{\frac{(t_s)_{avg} + T_u}{P_s \times M_s}}$$

v_{sl} (ft/sec) =

$$\left(\frac{85.49 \text{ ft (lb/lb-mol)(in. Hg)}}{\text{sec } (^oR)(\text{in. } H_2O)}\right)^{1/2} \times 0.83 \times 0.30 \text{ in.}H_2O^{1/2} \times \sqrt{\frac{60.44 + 460\ ^oR}{29.54 \text{ in. Hg} \times 28.78 \text{ lb/lb-mol}}} = \frac{16.8 \text{ ft}}{\text{sec}}$$

Average Stack Dry Standard Flow Rate (dscfh)

$$Q_{sd}(dscfh) = \frac{60 \times 60 \times \left(1 - \frac{B_{ws}}{100}\right) \times v_s \times A_s \times T_{std} \times P_s}{(t_s + T_u) \times P_{std}}$$

$$Q_{sd} \text{ (dscf/hr)} = \frac{3600 \text{ sec}}{\text{hr}} \times \left(1 - \frac{0.50\ \%}{100}\right) \times \frac{16.83 \text{ ft}}{\text{sec}} \times 13.14 \text{ ft}^2 \times \frac{68.00 + 460\ ^oR}{60.44 + 460\ ^oR} \times \frac{29.54 \text{ in. Hg}}{29.92 \text{ in. Hg}} = \frac{793{,}600.92 \text{ dscf}}{\text{hr}}$$

Average Stack Wet Flow Rate (acfm)

$$Q_{aw}(acfm) = 60 \times v_s \times A_s$$

$$Q_{aw} \text{ (acf/min)} = \frac{60 \text{ sec}}{\text{min}} \times \frac{16.83 \text{ ft}}{\text{sec}} \times 13.14 \text{ ft}^2 = \frac{13{,}271.02 \text{ acf}}{\text{min}}$$

Average Stack Wet Standard Flow Rate (ascfh)

$$Q_{sw}(ascfh) = \frac{60 \times Q_{aw} \times T_{std} \times P_s}{(t_s + T_u) \times P_{std}}$$

$$Q_{sw} \text{ (ascf/hr)} = \frac{60 \text{ min}}{\text{hr}} \times \frac{13{,}271.02 \text{ acf}}{\text{min}} \times \frac{68.00 + 460\ ^oR}{60.44 + 460\ ^oR} \times \frac{29.54 \text{ in. Hg}}{29.92 \text{ in. Hg}} = \frac{797{,}587.57 \text{ ascf}}{\text{hr}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 4) [Values from Run 1 test]

Water Volume Weighed (scf)

$$V_{wsg\,(std)}(scf) = W_t \times K_5$$

$V_{wsg(std)}$ = 3.40 g x 0.04715 ft^3/g = 0.160 scf

Standard Meter Volume (dscf)

$$V_{m(std)}(dscf) = \frac{K_1 \times Y \times V_m \times \left(P_b + \frac{\Delta H_{avg}}{13.6}\right)}{(t_m)_{avg} + T_u}$$

$$V_{m(std)} = \frac{\frac{17.65\ ^oR}{in.\ Hg} \times 1.00 \times 32.78\ dcf \times \left(29.54\ in.\ Hg + \frac{1.02\ in.\ H_2O}{13.6\ in.\ H_2O\ /\ in.\ Hg}\right)}{74.08\ ^oF + 460\ ^oR} = 31.91\ dscf$$

Calculated Moisture Content (%)

$$B_{ws\,(calc)}(\%) = 100 \times \frac{V_{wsg\,(std)}}{V_{wsg\,(std)} + V_{m\,(std)}}$$

$$B_{ws(calc)} = 100 \times \frac{0.16\ dscf}{0.16\ dscf + 31.91\ dscf} = 0.50\ \%$$

Saturated Moisture Content (%)

$$B_{ws(svp)}(\%) = 100 \times \frac{10^{6.691 - \frac{3144}{t_{s(avg)} + 390.86}}}{P_b + \frac{P_{static}}{13.6}} \leq 100$$

$$B_{ws(svp)} = 100 \times \frac{10^{\left(6.691 - \frac{3144}{60.44\ ^oF + 390.86}\right)}}{29.54\ in.\ Hg + \frac{0.01\ in.\ H_2O}{13.6\ in.\ H_2O\ /\ in.\ Hg}} \leq 100 = 1.79\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Isokinetic Sampling) [Values from Run 1 test]

Desired Orifice (in. H_2O) (first point)

$$\Delta H_d (in.H_2O) = K \times \Delta p$$

ΔH_d (in. H_2O) = 10.55 x 0.14 in. H_2O = 1.48 in. H_2O

Absolute Meter Pressure (in. Hg)

$$P_m (in.Hg) = P_b + \frac{\Delta H@}{13.6}$$

$$P_m \text{ (in. Hg)} = 29.54 \text{ in. Hg} + \frac{1.88 \text{ in. } H_2O}{13.6 \text{ in. } H_2O/\text{in. Hg}} = 29.68 \text{ in. Hg}$$

Recommended Nozzle Diameter (in.)

$$D_{ni}(in.) = \sqrt{\frac{C_n \times Q_m \times P_m}{(t_m + T_u) \times C_p} \times \left(\frac{1-\frac{B_{wm}}{100}}{1-\frac{B_{ws}}{100}}\right) \times \sqrt{(t_s + T_u) \times \left[\frac{M_d \times \left(1-\frac{B_{ws}}{100}\right) + \left(18 \times \frac{B_{ws}}{100}\right)}{P_s \times \Delta p_{avg}}\right]}}$$

$$D_{ni} \text{ (in.)} = \sqrt{\frac{\frac{0.03575 \text{ (lb-mole}\cdot{}^{o}\text{R}\cdot\text{in. } H_2O)^{1/2}\cdot\text{min}\cdot\text{in.}^2}{\text{acf}\cdot\text{in. Hg}^{3/4}\cdot\text{lb}^{1/2}} \times 0.75 \text{ acf} \times 29.68 \text{ in. Hg}}{(74.08\ {}^{o}\text{F} + 460{}^{o}\text{R}) \times 0.83} \times \left(\frac{1 - \frac{0.00\ \%}{100}}{1 - \frac{0.50\ \%}{100}}\right) \times \sqrt{(60.44\ {}^{o}\text{F} + 460{}^{o}\text{R}) \times \frac{\frac{28.84 \text{ lb}}{\text{lb-mole}} \times \left(1 - \frac{0.50\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{0.50\ \%}{100}\right)}{29.54 \text{ in. Hg} \times 0.30 \text{ in. } H_2O}}} = 0.271 \text{ in.}$$

ΔP to ΔH Isokinetic Factor

$$K = C_k \times C_p^2 \times \Delta H@ \times D_{na}^4 \times \left[\frac{M_d \times \left(1-\frac{B_{wm}}{100}\right) + \left(18 \times \frac{B_{wm}}{100}\right)}{M_d \times \left(1-\frac{B_{ws}}{100}\right) + \left(18 \times \frac{B_{ws}}{100}\right)}\right] \times \left(\frac{1-\frac{B_{ws}}{100}}{1-\frac{B_{wm}}{100}}\right)^2 \times \left(\frac{t_m + T_u}{ts + T_u}\right) \times \frac{P_s}{P_m}$$

$$K = \frac{849.8}{\text{in. } H_2O\cdot\text{in.}^4} \times 0.83^2 \times 1.88 \text{ in. } H_2O \times 0.31^4 \times \left(\frac{1 - \frac{0.50\ \%}{100}}{1 - \frac{0.00\ \%}{100}}\right)^2 \times \left(\frac{74.08\ {}^{o}\text{F} + 460{}^{o}\text{R}}{60.44\ {}^{o}\text{F} + 460{}^{o}\text{R}}\right) \times$$

$$\left(\frac{\frac{28.84 \text{ lb}}{\text{lb/mole}} \times \left(1 - \frac{0.00\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{0.00\ \%}{100}\right)}{\frac{28.84 \text{ lb}}{\text{lb/mole}} \times \left(1 - \frac{0.50\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{0.50\ \%}{100}\right)}\right) \times \frac{29.54 \text{ in. Hg}}{29.68 \text{ in. Hg}} = 10.55$$

Percent Isokinetic (%) (first point)

$$I(\%) = \frac{K_4 \times \left((t_s)_{avg} + T_u\right) \times V_{m(std)}}{\left(\Theta \times \left(v_{s(I)}\right)_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right) \times \left(1 - \frac{B_{ws}}{100}\right)}$$

$$I\ (\%) = \frac{\frac{0.0945 \text{ min}\cdot\text{in. Hg}}{\text{sec}\cdot{}^{o}\text{R}} \times (56.00\ {}^{o}\text{F} + 460\ {}^{o}\text{R}) \times 1.63 \text{ dscf}}{2.40 \text{ min} \times \frac{20.66 \text{ ft}}{\text{sec}} \times 29.54 \text{ in. Hg} \times 3.14 \times \left(\frac{0.31 \text{ in.}}{2} \times \frac{\text{ft.}}{12 \text{ in.}}\right)^2 \times \left(1 - \frac{0.50\ \%}{100}\right)} = 102.98\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Isokinetic Sampling) [Values from Run 1 test]

Cumulative Percent Isokinetic (%) (weighted average of all points)

$$I(\%) = \sum_{1-n} \frac{\lfloor I(\%) \times V_{m(std)} \rfloor_{1-n}}{V_{m(std)_{1-n}}}$$

Using Method 5, Eq 5-8 to determine intermediate isokinetics at each point, weighted averaging of the cumulative isokinetics is necessary since all points are not equal, and determined by using the dry standard meter volume collected at each point to weight the cumulative average. Intermediate isokinetics and dry standard meter volumes are found at each point. At each point the cumulative sum is found of each value and the quotient of the two used to determine the cumulative isokinetics for each residual point (n).

Pt	In (%)	x	Vm(std)n	=	I (%)n	∑(I (%)n)	/	∑(Vm(std)n)	=	I (%)
A-1	102.98	x	1.634	=	168.26	168.26	/	1.63	=	103.0
A-2	106.71	x	1.632	=	174.10	342.36	/	3.27	=	104.8
A-3	91.95	x	1.560	=	143.40	485.76	/	4.83	=	100.7
A-4	100.05	x	1.588	=	158.83	644.59	/	6.41	=	100.5
A-5	94.52	x	1.552	=	146.74	791.33	/	7.97	=	99.3
B-1	97.05	x	1.426	=	138.36	929.68	/	9.39	=	99.0
B-2	100.25	x	1.410	=	141.35	1071.03	/	10.80	=	99.2
B-3	129.98	x	1.457	=	189.38	1260.42	/	12.26	=	102.8
B-4	72.79	x	0.816	=	59.39	1319.81	/	13.07	=	101.0
B-5	96.24	x	1.467	=	141.22	1461.02	/	14.54	=	100.5
C-1	101.44	x	1.484	=	150.58	1611.60	/	16.03	=	100.6
C-2	100.97	x	1.045	=	105.50	1717.10	/	17.07	=	100.6
C-3	99.20	x	1.025	=	101.73	1818.83	/	18.10	=	100.5
C-4	101.56	x	0.958	=	97.25	1916.07	/	19.05	=	100.6
C-5	95.79	x	1.141	=	109.31	2025.39	/	20.19	=	100.3
D-1	98.39	x	1.172	=	115.33	2140.71	/	21.37	=	100.2
D-2	98.99	x	1.103	=	109.20	2249.92	/	22.47	=	100.1
D-3	100.82	x	1.123	=	113.18	2363.09	/	23.59	=	100.2
D-4	99.21	x	1.181	=	117.16	2480.25	/	24.77	=	100.1
D-5	101.25	x	1.205	=	122.01	2602.26	/	25.98	=	100.2

Pt	In (%)	x	Vm(std)n	=	I (%)n	∑(I (%)n)	/	∑(Vm(std)n)	=	I (%)
E-1	60.66	x	0.807	=	48.97	2651.23	/	26.79	=	99.0
E-2	146.22	x	1.846	=	269.93	2921.16	/	28.63	=	102.0
E-3	99.03	x	1.179	=	116.72	3037.89	/	29.81	=	101.9
E-4	99.86	x	1.111	=	110.93	3148.81	/	30.92	=	101.8
E-5	100.71	x	1.037	=	104.44	3253.26	/	31.96	=>	101.8
Last Pt										

Percent Isokinetic (%) (intermediate equation, all points)
[equivalent to taking an average of point-by-point isokinetics without weighting the average (e.g. all points equal)]

$$I(\%) = \frac{K_4 \times \left((t_s)_{avg} + T_u\right) \times V_{m(std)}}{\left(\Theta \times \left(v_{s(l)}\right)_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right) \times \left(1 - \frac{B_{ws}}{100}\right)}$$

I (%) =

$$\frac{\frac{0.0945\ \text{min•in. Hg}}{\text{sec•}^{o}\text{R}} \times (60.44\ ^{o}\text{F} + 460\ ^{o}\text{R}) \times 31.91\ \text{dscf}}{60.00\ \text{min} \times \frac{16.83\ \text{ft}}{\text{sec}} \times 29.54\ \text{in. Hg} \times 3.14 \times \left(\frac{0.31\ \text{in.}}{2} \times \frac{\text{ft.}}{12\ \text{in.}}\right)^2 \times \left(1 - \frac{0.50\ \%}{100}\right)} = 99.57\ \%$$

Raw Data Percent Isokinetic (%)
[utilizes the raw data equation for isokinetics from Method 5]

$$I(\%) = \frac{100\left((t_s)_{avg} + T_u\right)\left[K_4 V_{1c} + \frac{V_m Y}{(t_m)_{avg} + T_u}\left(P_{bar} + \frac{\Delta H}{13.6}\right)\right]}{60\left(\Theta \times \left(v_{s(l)}\right)_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right)}$$

I (%) =

$$\frac{100 \times (60.44\ ^{o}\text{F} + 460\ ^{o}\text{R}) \times \left[\frac{0.002669\ \text{ft}^3\text{•in. Hg}}{\text{ml•}^{o}\text{R}} \times 3.406\ \text{ml} + \frac{32.78\ \text{dcf} \times 0.995}{74.08\ ^{o}\text{F} + 460\ ^{o}\text{R}}\left(29.54\ \text{in Hg} + \frac{0.304}{13.6}\right)\right]}{60 \times 60.00\ \text{min} \times \frac{16.83\ \text{ft}}{\text{sec}} \times 29.54\ \text{in. Hg} \times 3.14 \times \left(\frac{0.31\ \text{in.}}{2} \times \frac{\text{ft.}}{12\ \text{in.}}\right)^2} = 99.34\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Analysis) [Values from Run 1 test - Lead Mass]

Stack Lead Concentration (g/dscf)

$$c_s(g/dscf) = 0.001 \times \frac{M_n}{V_{m(std)}}$$

$$c_s\text{ (g/dscf)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{\text{0.00 mg}}{\text{31.91 dscf}} = \frac{\text{8.00E-08 g}}{\text{dscf}}$$

Stack Lead Concentration (gr/dscf)

$$c_s^{'}(gr/dscf) = 0.001 \times \frac{M_n}{V_{m(std)}} \times \frac{7000}{453.592}$$

$$c'_s\text{ (gr/dscf)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{\text{0.00 mg}}{\text{31.91 dscf}} \times \frac{\text{7000 gr}}{\text{lb}} \times \frac{\text{lb}}{\text{453.592 g}} = \frac{\text{1.26E-06 gr}}{\text{dscf}}$$

Lead Emissions Rate (kg/hr)

$$E(kg/hr) = c_s \times Q_{sd} \times \frac{kg}{1000\ g}$$

$$E\text{ (kg/hr)} = \frac{\text{kg}}{\text{1000 g}} \times \frac{\text{8.15E-08 g}}{\text{dscf}} \times \frac{\text{793,601 dscf}}{\text{hr}} = \frac{\text{6.47E-05 kg}}{\text{hr}}$$

Lead Emissions Rate (lb/hr)

$$E^{'}(lb/hr) = \frac{M_n \times Q_{sd}}{V_{m(std)}} \times \frac{lb \times g}{453.592g \times 1000mg}$$

$$E'\text{ (lb/hr)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{\text{lb}}{\text{453.592 g}} \times \frac{\text{0.00 mg}}{\text{31.91 dscf}} \times \frac{\text{793,601 dscf}}{\text{hr}} = \frac{\text{1.43E-04 lb}}{\text{hr}}$$

Lead Emissions Rate (tpy)

$$E^{''}(ton/yr) = E^{'} \times \frac{8760}{2000}$$

$$E''\text{ (tpy)} = \frac{\text{ton}}{\text{2000 lb}} \times \frac{\text{8,760 hr}}{\text{yr}} \times \frac{\text{0.00 lb}}{\text{hr}} = \frac{\text{6.24E-04 ton}}{\text{yr}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

TEST RESULTS AND CALCULATIONS

Vent #2 Emissions Data

METHOD 12 (LEAD) - RESULTS

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Historical Data	**V2Pb-1**	**V2Pb-2**	**V2Pb-3**	**Average**	**Units**
Run Start Time	16:42	07:08	08:45		hh:mm
Run Stop Time	17:52	08:14	09:50		hh:mm
Test Date	12/18/19	12/19/19	12/19/19		mm/dd/yy
Production Rate	Max	Max	Max		ton/hr
Meter Calibration Factor	0.995	0.995	0.995		
Pitot Tube Coefficient	0.8290	0.8190	0.8290		
Average Nozzle Diameter	0.312	0.314	0.312		in
Stack Test Data	**V2Pb-1**	**V2Pb-2**	**V2Pb-3**	**Average**	**Units**
Initial Meter Volume	763.058	798.888	834.988		ft^3
Final Meter Volume	798.585	834.659	869.781		ft^3
Total Meter Volume	35.527	35.771	34.793	35.364	ft^3
Total Sampling Time	60.00	60.00	60.00	60.00	min
Average Meter Temperature	77.32	70.20	78.56	75.36	°F
Average Stack Temperature	65.48	58.20	59.32	61.00	°F
Barometric Pressure	29.54	29.51	29.54	29.53	in Hg
Stack Static Pressure	0.01	0.01	0.01	0.01	in H_2O
Absolute Stack Pressure	29.54	29.51	29.54	29.53	in Hg
Average Orifice Pressure Drop	1.16	1.20	1.09	1.15	in H_2O
Absolute Meter Pressure	29.68	29.65	29.68	29.67	in Hg
Avg Square Root Pitot Pressure	0.33	0.33	0.32	0.33	$\sqrt{}$(in H_2O)
Moisture Content Data	**V2Pb-1**	**V2Pb-2**	**V2Pb-3**	**Average**	**Units**
Impinger Water Weight Gain	-1.10	-3.20	-0.10	-1.47	g
Silica Gel Weight Gain	7.90	6.10	11.70	8.57	g
Total Water Volume Collected	6.81	2.91	11.62	7.11	ml
Standard Water Vapor Volume	0.32	0.14	0.55	0.33	scf
Standard Meter Volume	34.4	35.1	33.6	34.4	dscf
Standard Metric Meter Volume	1.0	1.0	1.0	1.0	dscm
Calculated Stack Moisture	0.92	0.39	1.60	0.97	%
Saturated Stack Moisture	2.14	1.66	1.72	1.84	%
Reported Stack Moisture Content	0.92	0.39	1.60	0.97	%
Gas Analysis Data	**V2Pb-1**	**V2Pb-2**	**V2Pb-3**	**Average**	**Units**
Carbon Dioxide Content	0.0	0.0	0.0	0.0	%
Oxygen Content	20.9	20.9	20.9	20.9	%
Carbon Monoxide Content	0.0	0.0	0.0	0.0	ppm
Nitrogen Content	79.1	79.1	79.1	79.1	%
Stack Dry Molecular Weight	28.84	28.84	28.84	28.84	lb/lb-mole
Stack Wet Molecular Weight	28.74	28.79	28.66	28.73	lb/lb-mole

METHOD 12 (LEAD) - RESULTS

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Volumetric Flow Rate Data	**V2Pb-1**	**V2Pb-2**	**V2Pb-3**	**Average**	**Units**
Average Stack Gas Velocity	18.15	18.17	17.84	18.05	ft/sec
Stack Cross-Sectional Area	13.14	13.14	13.14	13.14	ft²
Actual Stack Flow Rate	14,311	14,321	14,064	14,232	acfm
Wet Standard Stack Flow Rate	852	864	847	854	wkscfh
Dry Standard Stack Flow Rate	843,962	860,200	833,474	845,879	dscfh
Percent of Isokinetic Rate	101.2	100.3	99.9	100.5	%
Emission Rate Data	**V2Pb-1**	**V2Pb-2**	**V2Pb-3**	**Average**	**Units**
Lead Mass	0.0008	0.0017	0.0014	0.0013	mg
Lead Concentration	2.33E-08	4.85E-08	4.17E-08	3.78E-08	g/dscf
	3.59E-07	7.48E-07	6.43E-07	5.83E-07	gr/dscf
Lead Emission Rate	1.96E-05	4.17E-05	3.47E-05	3.20E-05	kg/hr
	4.33E-05	9.19E-05	7.66E-05	7.06E-05	lb/hr
	1.90E-04	4.03E-04	3.35E-04	3.09E-04	tpy

Note: HNO_3 blank concentration of 0.6 µg subtracted from each result

EXAMPLE CALCULATIONS (Reference Method 1 - Rectangular Stack)

Length of Stack (in.)

$$L(in.) = L_{fw} - L_{nw}$$

L (in.) = 44.13 in. - 0.13 in. = 44.00 in.

Area of Stack (ft^2)

$$A_s(ft^2) = w \times l$$

$$A_s\ (ft^2) = \frac{43.00}{12}\ ft \times \frac{44.00}{12}\ ft = 13.14\ ft^2$$

Equivalent Diameter of Stack (in.)

$$D_e(in.) = \frac{2 \times L \times W}{L + W}$$

$$D_e\ (in.) = \frac{2 \times 44.00\ in. \times 43.00\ in.}{44.00\ in. + 43.00\ in.} = 43.49\ in.$$

Stack Diameters Downstream

$$B_D(dia.) = \frac{B}{D_e}$$

$$B_D\ (dia.) = \frac{101.00\ in.}{43.49\ in.} = 2.32\ \text{diameters}$$

Stack Diameters Upstream

$$A_D(dia.) = \frac{A}{D_e}$$

$$A_D\ (dia.) = \frac{46.00\ in.}{43.49\ in.} = 1.06\ \text{diameters}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 3a) [Values from Run 1 test]

Carbon Monoxide Concentration (%)

$$\%CO = \frac{ppmCO}{10,000}$$

$$\%CO\ (\%) = \frac{0.00\ \text{ppm}}{10,000\ \text{ppm}/\%} = 0.0000\ \%$$

Nitrogen Concentration (%)

$$\%N_2 = 100 - \%CO_2 - \%O_2 - \%CO$$

$\%N_2$ (%) = 100 - 0.00 % - 20.90 % - 0.00 / 10,000 % = 79.1 %

Stack Dry Molecular Weight (lb/lb-mole)

$$M_d\,(lb/lb-mol) = \sum\left(\frac{MW_{comp}}{100} \times \%component\right)$$

$$M_d\ (\text{lb/lb-mol}) = \left(\frac{44\ \text{lb/lb-mol}}{100} \times 0.00\ \%\right) + \left(\frac{32\ \text{lb/lb-mol}}{100} \times 20.90\ \%\right) + \left(\frac{28\ \text{lb/lb-mol}}{100} \times \left[\frac{0.00}{10,000} + 79.10\right]\right) = \frac{28.84\ \text{lb}}{\text{lb-mol}}$$

Stack Wet Molecular Weight (lb/lb-mole)

$$M_S\,(lb/lb-mol) = \left[M_d \times \left(1 - \frac{B_{WS}}{100}\right)\right] + \left[MW_{H_2O} \times \frac{B_{WS}}{100}\right]$$

$$M_S\ (\text{lb/lb-mol}) = \left\{\frac{28.84\ \text{lb}}{\text{lb-mol}} \times \left(1 - \frac{0.92\ \%}{100}\right)\right\} + \left\{\frac{18\ \text{lb}}{\text{lb-mol}} \times \frac{0.92\ \%}{100}\right\} = \frac{28.74\ \text{lb}}{\text{lb-mol}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 2) [Values from Run 1 test]

Absolute Stack Pressure (in. Hg)

$$P_S\,(in.Hg) = P_b + \frac{P_{static}}{13.6}$$

$$P_s\ (\text{in. Hg}) = 29.54\ \text{in. Hg} + \frac{0.01\ \text{in. } H_2O}{13.6\ \text{in. } H_2O/\text{in. Hg}} = 29.54\ \text{in. Hg}$$

Average Stack Gas Velocity (ft/sec)

$$v_s\,(ft/\sec) = K_p \times C_p \times \left(\sqrt{\Delta p}\right)_{avg} \times \sqrt{\frac{(t_s)_{avg} + T_u}{P_s \times M_s}}$$

v_{sl} (ft/sec) =

$$\left(\frac{85.49\ \text{ft}\ \ (\text{lb/lb-mol})(\text{in. Hg})}{\text{sec}\ \ (^{o}\text{R})(\text{in. } H_2O)}\right)^{1/2} \times 0.83 \times 0.33\ \text{in.} H_2O^{1/2} \times \sqrt{\frac{65.48\ \ + 460\ ^{o}\text{R}}{29.54\ \text{in. Hg} \times 28.74\ \text{lb/lb-mol}}} = \frac{18.1\ \text{ft}}{\text{sec}}$$

Average Stack Dry Standard Flow Rate (dscfh)

$$Q_{sd}(dscfh) = \frac{60 \times 60 \times \left(1 - \frac{B_{ws}}{100}\right) \times v_s \times A_s \times T_{std} \times P_s}{(t_s + T_u) \times P_{std}}$$

$$Q_{sd}\ (\text{dscf/hr}) = \frac{3600\ \text{sec}}{\text{hr}} \times \left(1 - \frac{0.92\ \%}{100}\right) \times \frac{18.15\ \text{ft}}{\text{sec}} \times 13.14\ \text{ft}^2 \times$$

$$\frac{68.00\ \ + 460\ ^{o}\text{R}}{65.48\ \ + 460\ ^{o}\text{R}} \times \frac{29.54\ \text{in. Hg}}{29.92\ \text{in. Hg}} = \frac{843{,}961.71\ \text{dscf}}{\text{hr}}$$

Average Stack Wet Flow Rate (acfm)

$$Q_{aw}(acfm) = 60 \times v_s \times A_s$$

$$Q_{aw}\ (\text{acf/min}) = \frac{60\ \text{sec}}{\text{min}} \times \frac{18.15\ \text{ft}}{\text{sec}} \times 13.14\ \text{ft}^2 = \frac{14{,}310.80\ \text{acf}}{\text{min}}$$

Average Stack Wet Standard Flow Rate (ascfh)

$$Q_{sw}(ascfh) = \frac{60 \times Q_{aw} \times T_{std} \times P_s}{(t_s + T_u) \times P_{std}}$$

$$Q_{sw}\ (\text{ascf/hr}) = \frac{60\ \text{min}}{\text{hr}} \times \frac{14{,}310.80\ \text{acf}}{\text{min}} \times$$

$$\frac{68.00\ \ + 460\ ^{o}\text{R}}{65.48\ \ + 460\ ^{o}\text{R}} \times \frac{29.54\ \text{in. Hg}}{29.92\ \text{in. Hg}} = \frac{851{,}829.08\ \text{ascf}}{\text{hr}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 4) [Values from Run 1 test]

Water Volume Weighed (scf)

$$V_{wsg\,(std)}(scf) = W_t \times K_5$$

$V_{wsg(std)}$ = 6.80 g x 0.04715 ft^3/g = 0.321 scf

Standard Meter Volume (dscf)

$$V_{m(std)}(dscf) = \frac{K_1 \times Y \times V_m \times \left(P_b + \frac{\Delta H_{avg}}{13.6}\right)}{(t_m)_{avg} + T_u}$$

$$V_{m(std)} = \frac{\frac{17.65\ ^{o}R}{in.\ Hg} \times 1.00 \times 35.53\ dcf \times \left(29.54\ in.\ Hg + \frac{1.16\ in.\ H_2O}{13.6\ in.\ H_2O\ /\ in.\ Hg}\right)}{77.32\ ^{o}F + 460\ ^{o}R} = 34.39\ dscf$$

Calculated Moisture Content (%)

$$B_{ws(calc)}(\%) = 100 \times \frac{V_{wsg(std)}}{V_{wsg(std)} + V_{m(std)}}$$

$$B_{ws(calc)} = 100 \times \frac{0.32\ dscf}{0.32\ dscf + 34.39\ dscf} = 0.92\ \%$$

Saturated Moisture Content (%)

$$B_{ws(svp)}(\%) = 100 \times \frac{10^{6.691 - \frac{3144}{t_{s(avg)} + 390.86}}}{P_b + \frac{P_{static}}{13.6}} \le 100$$

$$B_{ws(svp)} = 100 \times \frac{10^{\left(6.691 - \frac{3144}{65.48\ ^{o}F + 390.86}\right)}}{29.54\ in.\ Hg + \frac{0.01\ in.\ H_2O}{13.6\ in.\ H_2O\ /\ in.\ Hg}} \le 100 = 2.14\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Isokinetic Sampling) [Values from Run 1 test]

Desired Orifice (in. H_2O) (first point)

$$\Delta H_d (in. H_2O) = K \times \Delta p$$

ΔH_d (in. H_2O) = 10.44 x 0.11 in. H_2O = 1.15 in. H_2O

Absolute Meter Pressure (in. Hg)

$$P_m (in.Hg) = P_b + \frac{\Delta H @}{13.6}$$

$$P_m \text{ (in. Hg)} = 29.54 \text{ in. Hg} + \frac{1.88 \text{ in. } H_2O}{13.6 \text{ in. } H_2O\text{/in. Hg}} = 29.68 \text{ in. Hg}$$

Recommended Nozzle Diameter (in.)

$$D_{ni}(in.) = \sqrt{\frac{C_n \times Q_m \times P_m}{(t_m + T_u) \times C_p} \times \left(\frac{1 - \frac{B_{wm}}{100}}{1 - \frac{B_{ws}}{100}}\right) \times \sqrt{(t_s + T_u) \times \left[\frac{M_d \times \left(1 - \frac{B_{ws}}{100}\right) + \left(18 \times \frac{B_{ws}}{100}\right)}{P_s \times \Delta p_{avg}}\right]}}$$

$$D_{ni} \text{ (in.)} = \sqrt{\frac{\frac{0.03575 \text{ (lb-mole}\bullet{}^oR\bullet\text{in. } H_2O)^{1/2}\bullet\text{min}\bullet\text{in.}^2}{\text{acf}\bullet\text{in. Hg}^{3/4}\bullet\text{lb}^{1/2}} \times 0.75 \text{ acf} \times 29.68 \text{ in. Hg}}{(77.32\ {}^oF + 460^oR) \times 0.83} \times \left(\frac{1 - \frac{0.00\ \%}{100}}{1 - \frac{0.92\ \%}{100}}\right) \times \sqrt{(65.48\ {}^oF + 460^oR) \times \frac{\frac{28.84 \text{ lb}}{\text{lb-mole}} \times \left(1 - \frac{0.92\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{0.92\ \%}{100}\right)}{29.54 \text{ in. Hg} \times 0.33 \text{ in. } H_2O}}} = 0.266 \text{ in.}$$

ΔP to ΔH Isokinetic Factor

$$K = C_k \times C_p^2 \times \Delta H @ \times D_{na}^4 \times \left[\frac{M_d \times \left(1 - \frac{B_{wm}}{100}\right) + \left(18 \times \frac{B_{wm}}{100}\right)}{M_d \times \left(1 - \frac{B_{ws}}{100}\right) + \left(18 \times \frac{B_{ws}}{100}\right)}\right] \times \left(\frac{1 - \frac{B_{ws}}{100}}{1 - \frac{B_{wm}}{100}}\right)^2 \times \left(\frac{t_m + T_u}{ts + T_u}\right) \times \frac{P_s}{P_m}$$

$$K = \frac{849.8}{\text{in. } H_2O\bullet\text{in.}^4} \times 0.83^2 \times 1.88 \text{ in. } H_2O \times 0.31^4 \times \left(\frac{1 - \frac{0.92\ \%}{100}}{1 - \frac{0.00\ \%}{100}}\right)^2 \times \left(\frac{77.32\ {}^oF + 460^oR}{65.48\ {}^oF + 460^oR}\right) \times \left(\frac{\frac{28.84 \text{ lb}}{\text{lb/mole}} \times \left(1 - \frac{0.00\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{0.00\ \%}{100}\right)}{\frac{28.84 \text{ lb}}{\text{lb/mole}} \times \left(1 - \frac{0.92\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{0.92\ \%}{100}\right)}\right) \times \frac{29.54 \text{ in. Hg}}{29.68 \text{ in. Hg}} = 10.44$$

Percent Isokinetic (%) (first point)

$$I(\%) = \frac{K_4 \times \left((t_s)_{avg} + T_u\right) \times V_{m(std)}}{\left(\Theta \times (v_{s(l)})_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right) \times \left(1 - \frac{B_{ws}}{100}\right)}$$

$$I\ (\%) = \frac{\frac{0.0945 \text{ min}\bullet\text{in. Hg}}{\text{sec}\bullet{}^oR} \times (70.00\ {}^oF + 460\ {}^oR) \times 1.47 \text{ dscf}}{2.40 \text{ min} \times \frac{18.57 \text{ ft}}{\text{sec}} \times 29.54 \text{ in. Hg} \times 3.14 \times \left(\frac{0.31 \text{ in.}}{2} \times \frac{\text{ft.}}{12 \text{ in.}}\right)^2 \times \left(1 - \frac{0.92\ \%}{100}\right)} = 106.51\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Isokinetic Sampling) [Values from Run 1 test]

Cumulative Percent Isokinetic (%) (weighted average of all points)

$$I(\%) = \sum_{1-n} \frac{\left[I(\%) \times V_{m(std)}\right]_{1-n}}{V_{m(std)1-n}}$$

Using Method 5, Eq 5-8 to determine intermediate isokinetics at each point, weighted averaging of the cumulative isokinetics is necessary since all points are not equal, and determined by using the dry standard meter volume collected at each point to weight the cumulative average. Intermediate isokinetics and dry standard meter volumes are found at each point. At each point the cumulative sum is found of each value and the quotient of the two used to determine the cumulative isokinetics for each residual point (n).

Pt	In (%)	x	Vm(std)n	=	I (%)n	∑(I (%)n)	/	∑(Vm(std)n)	=	I (%)
A-1	106.51	x	1.473	=	156.90	156.90	/	1.47	=	106.5
A-2	102.66	x	1.420	=	145.74	302.64	/	2.89	=	104.6
A-3	108.17	x	1.429	=	154.59	457.23	/	4.32	=	105.8
A-4	103.02	x	1.361	=	140.22	597.44	/	5.68	=	105.1
A-5	95.28	x	1.128	=	107.47	704.92	/	6.81	=	103.5
B-1	102.57	x	1.289	=	132.22	837.14	/	8.10	=	103.4
B-2	99.67	x	1.447	=	144.18	981.32	/	9.55	=	102.8
B-3	101.46	x	1.125	=	114.10	1095.42	/	10.67	=	102.7
B-4	99.52	x	1.103	=	109.79	1205.21	/	11.77	=	102.4
B-5	110.54	x	1.389	=	153.58	1358.79	/	13.16	=	103.2
C-1	88.97	x	1.118	=	99.50	1458.29	/	14.28	=	102.1
C-2	118.52	x	1.647	=	195.20	1653.49	/	15.93	=	103.8
C-3	109.13	x	1.210	=	132.00	1785.49	/	17.14	=	104.2
C-4	97.83	x	1.230	=	120.30	1905.79	/	18.37	=	103.8
C-5	101.18	x	1.406	=	142.26	2048.05	/	19.77	=	103.6
D-1	98.54	x	1.369	=	134.93	2182.98	/	21.14	=	103.2
D-2	99.97	x	1.324	=	132.40	2315.38	/	22.47	=	103.1
D-3	95.16	x	1.322	=	125.83	2441.21	/	23.79	=	102.6
D-4	99.78	x	1.322	=	131.91	2573.12	/	25.11	=	102.5
D-5	96.75	x	1.216	=	117.65	2690.77	/	26.33	=	102.2

Pt	In (%)	x	Vm(std)n	=	I (%)n	∑(I (%)n)	/	∑(Vm(std)n)	=	I (%)
E-1	98.92	x	1.659	=	164.13	2854.91	/	27.99	=	102.0
E-2	101.97	x	1.711	=	174.42	3029.33	/	29.70	=	102.0
E-3	97.36	x	1.633	=	159.01	3188.34	/	31.33	=	101.8
E-4	97.08	x	1.523	=	147.88	3336.22	/	32.85	=	101.5
E-5	94.70	x	1.538	=	145.67	3481.89	/	34.39	=>	101.2
Last Pt										

Percent Isokinetic (%) (intermediate equation, all points)
[equivalent to taking an average of point-by-point isokinetics without weighting the average (e.g. all points equal)]

$$I(\%) = \frac{K_4 \times \left((t_s)_{avg} + T_u\right) \times V_{m(std)}}{\left(\Theta \times \left(v_{s(l)}\right)_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right) \times \left(1 - \frac{B_{ws}}{100}\right)}$$

$$I(\%) = \frac{\frac{0.0945\ \text{min•in. Hg}}{\text{sec•}^{o}\text{R}} \times (65.48\ ^{o}\text{F} + 460\ ^{o}\text{R}) \times 34.39\ \text{dscf}}{60.00\ \text{min} \times \frac{18.15\ \text{ft}}{\text{sec}} \times 29.54\ \text{in. Hg} \times 3.14 \times \left(\frac{0.31\ \text{in.}}{2} \times \frac{\text{ft.}}{12\ \text{in.}}\right)^2 \times \left(1 - \frac{0.92\ \%}{100}\right)} = 100.91\ \%$$

Raw Data Percent Isokinetic (%)
[utilizes the raw data equation for isokinetics from Method 5]

$$I(\%) = \frac{100\left((t_s)_{avg} + T_u\right)\left[K_4 V_{1c} + \frac{V_m Y}{(t_m)_{avg} + T_u}\left(P_{bar} + \frac{\Delta H}{13.6}\right)\right]}{60\left(\Theta \times \left(v_{s(l)}\right)_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right)}$$

$$I(\%) = \frac{100 \times (65.48\ ^{o}\text{F} + 460\ ^{o}\text{R}) \times \left[\frac{0.002669\ \text{ft}^3\text{•in. Hg}}{\text{ml•}^{o}\text{R}} \times 6.812\ \text{ml} + \frac{35.53\ \text{dcf} \times 0.995}{77.32\ ^{o}\text{F} + 460\ ^{o}\text{R}}\left(29.54\ \text{in Hg} + \frac{0.326}{13.6}\right)\right]}{60 \times 60.00\ \text{min} \times \frac{18.15\ \text{ft}}{\text{sec}} \times 29.54\ \text{in. Hg} \times 3.14 \times \left(\frac{0.31\ \text{in.}}{2} \times \frac{\text{ft.}}{12\ \text{in.}}\right)^2} = 100.65\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Analysis) [Values from Run 1 test - Lead Mass]

Stack Lead Concentration (g/dscf)

$$c_s(g/dscf) = 0.001 \times \frac{M_n}{V_{m(std)}}$$

$$c_s \text{ (g/dscf)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{\text{0.00 mg}}{\text{34.39 dscf}} = \frac{\text{2.00E-08 g}}{\text{dscf}}$$

Stack Lead Concentration (gr/dscf)

$$c'_s(gr/dscf) = 0.001 \times \frac{M_n}{V_{m(std)}} \times \frac{7000}{453.592}$$

$$c'_s \text{ (gr/dscf)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{\text{0.00 mg}}{\text{34.39 dscf}} \times \frac{\text{7000 gr}}{\text{lb}} \times \frac{\text{lb}}{\text{453.592 g}} = \frac{\text{3.60E-07 gr}}{\text{dscf}}$$

Lead Emissions Rate (kg/hr)

$$E(kg/hr) = c_s \times Q_{sd} \times \frac{kg}{1000\ g}$$

$$E \text{ (kg/hr)} = \frac{\text{kg}}{\text{1000 g}} \times \frac{\text{2.33E-08 g}}{\text{dscf}} \times \frac{\text{843,962 dscf}}{\text{hr}} = \frac{\text{1.96E-05 kg}}{\text{hr}}$$

Lead Emissions Rate (lb/hr)

$$E'(lb/hr) = \frac{M_n \times Q_{sd}}{V_{m(std)}} \times \frac{lb \times g}{453.592 g \times 1000 mg}$$

$$E' \text{ (lb/hr)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{\text{lb}}{\text{453.592 g}} \times \frac{\text{0.00 mg}}{\text{34.39 dscf}} \times \frac{\text{843,962 dscf}}{\text{hr}} = \frac{\text{4.33E-05 lb}}{\text{hr}}$$

Lead Emissions Rate (tpy)

$$E''(ton/yr) = E' \times \frac{8760}{2000}$$

$$E'' \text{ (tpy)} = \frac{\text{ton}}{\text{2000 lb}} \times \frac{\text{8,760 hr}}{\text{yr}} \times \frac{\text{0.00 lb}}{\text{hr}} = \frac{\text{1.90E-04 ton}}{\text{yr}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

TEST RESULTS AND CALCULATIONS

Vent #3 Emissions Data

METHOD 12 (LEAD) - RESULTS

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Historical Data	**V3Pb-1**	**V3Pb-2**	**V3Pb-3**	**Average**	**Units**
Run Start Time	12:01	13:47	15:11		hh:mm
Run Stop Time	13:08	14:54	16:18		hh:mm
Test Date	12/19/19	12/19/19	12/19/19		mm/dd/yy
Production Rate	Max	Max	Max		ton/hr
Meter Calibration Factor	0.995	0.995	0.995		
Pitot Tube Coefficient	0.8290	0.8190	0.8290		
Average Nozzle Diameter	0.386	0.433	0.436		in
Stack Test Data	**V3Pb-1**	**V3Pb-2**	**V3Pb-3**	**Average**	**Units**
Initial Meter Volume	870.050	884.816	906.315		ft^3
Final Meter Volume	884.617	905.869	926.291		ft^3
Total Meter Volume	14.567	21.053	19.976	18.532	ft^3
Total Sampling Time	60.00	60.00	60.00	60.00	min
Average Meter Temperature	66.72	71.92	73.00	70.55	°F
Average Stack Temperature	64.28	63.60	63.36	63.75	°F
Barometric Pressure	29.53	29.45	29.45	29.48	in Hg
Stack Static Pressure	0.02	0.02	0.02	0.02	in H_2O
Absolute Stack Pressure	29.53	29.45	29.45	29.48	in Hg
Average Orifice Pressure Drop	0.21	0.41	0.38	0.33	in H_2O
Absolute Meter Pressure	29.67	29.59	29.59	29.62	in Hg
Avg Square Root Pitot Pressure	0.09	0.10	0.10	0.10	$\sqrt{(\text{in } H_2O)}$
Moisture Content Data	**V3Pb-1**	**V3Pb-2**	**V3Pb-3**	**Average**	**Units**
Impinger Water Weight Gain	1.40	0.90	-1.00	0.43	g
Silica Gel Weight Gain	2.70	3.50	3.50	3.23	g
Total Water Volume Collected	4.11	4.41	2.50	3.67	ml
Standard Water Vapor Volume	0.19	0.21	0.12	0.17	scf
Standard Meter Volume	14.3	20.5	19.4	18.1	dscf
Standard Metric Meter Volume	0.4	0.6	0.5	0.5	dscm
Calculated Stack Moisture	1.33	1.00	0.60	0.98	%
Saturated Stack Moisture	2.06	2.01	2.00	2.02	%
Reported Stack Moisture Content	1.33	1.00	0.60	0.98	%
Gas Analysis Data	**V3Pb-1**	**V3Pb-2**	**V3Pb-3**	**Average**	**Units**
Carbon Dioxide Content	0.0	0.0	0.0	0.0	%
Oxygen Content	20.9	20.9	20.9	20.9	%
Carbon Monoxide Content	0.0	0.0	0.0	0.0	ppm
Nitrogen Content	79.1	79.1	79.1	79.1	%
Stack Dry Molecular Weight	28.84	28.84	28.84	28.84	lb/lb-mole
Stack Wet Molecular Weight	28.69	28.73	28.77	28.73	lb/lb-mole

METHOD 12 (LEAD) - RESULTS

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Volumetric Flow Rate Data	**V3Pb-1**	**V3Pb-2**	**V3Pb-3**	**Average**	**Units**
Average Stack Gas Velocity	5.07	5.67	5.38	5.37	ft/sec
Stack Cross-Sectional Area	9.00	9.00	9.00	9.00	ft²
Actual Stack Flow Rate	2,739	3,060	2,904	2,901	acfm
Wet Standard Stack Flow Rate	163	182	173	173	wkscfh
Dry Standard Stack Flow Rate	161,180	180,386	172,013	171,193	dscfh
Percent of Isokinetic Rate	100.0	100.4	100.9	100.4	%
Emission Rate Data	**V3Pb-1**	**V3Pb-2**	**V3Pb-3**	**Average**	**Units**
Lead Mass	0.0008	0.0005	0.0006	0.0006	mg
Lead Concentration	5.58E-08	2.44E-08	3.09E-08	3.70E-08	g/dscf
	8.60E-07	3.77E-07	4.77E-07	5.71E-07	gr/dscf
Lead Emission Rate	8.99E-06	4.40E-06	5.32E-06	6.24E-06	kg/hr
	1.98E-05	9.71E-06	1.17E-05	1.37E-05	lb/hr
	8.68E-05	4.25E-05	5.14E-05	6.02E-05	tpy

Note: HNO_3 blank concentration of 0.6 µg subtracted from each result

EXAMPLE CALCULATIONS (Reference Method 1 - Rectangular Stack)

Length of Stack (in.)

$$L(in.) = L_{fw} - L_{nw}$$

L (in.) = 36.13 in. - 0.13 in. = 36.00 in.

Area of Stack (ft^2)

$$A_s(ft^2) = w \times l$$

$A_s\ (ft^2) = \dfrac{36.00}{12}\ ft \times \dfrac{36.00}{12}\ ft = 9.00\ ft^2$

Equivalent Diameter of Stack (in.)

$$D_e(in.) = \frac{2 \times L \times W}{L + W}$$

$D_e\ (in.) = \dfrac{2 \times 36.00\ in. \times 36.00\ in.}{36.00\ in. + 36.00\ in.} = 36.00\ in.$

Stack Diameters Downstream

$$B_D(dia.) = \frac{B}{D_e}$$

$B_D\ (dia.) = \dfrac{44.00\ in.}{36.00\ in.} = 1.22$ diameters

Stack Diameters Upstream

$$A_D(dia.) = \frac{A}{D_e}$$

$A_D\ (dia.) = \dfrac{12.00\ in.}{36.00\ in.} = 0.33$ diameters

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 3a) [Values from Run 1 test]

Carbon Monoxide Concentration (%)

$$\%CO = \frac{ppmCO}{10{,}000}$$

$\%CO\ (\%) = \dfrac{0.00 \text{ ppm}}{10{,}000 \text{ ppm/\%}} = 0.0000\ \%$

Nitrogen Concentration (%)

$$\%N_2 = 100 - \%CO_2 - \%O_2 - \%CO$$

$\%N_2\ (\%) = 100 - 0.00\ \% - 20.90\ \% - 0.00\ /\ 10{,}000\ \% = 79.1\ \%$

Stack Dry Molecular Weight (lb/lb-mole)

$$M_d\,(lb/lb-mol) = \sum\left(\frac{MW_{comp}}{100} \times \%component\right)$$

$M_d\ (\text{lb/lb-mol}) = \left(\dfrac{44 \text{ lb/lb-mol}}{100} \times 0.00\ \%\right) + \left(\dfrac{32 \text{ lb/lb-mol}}{100} \times 20.90\ \%\right) + \left(\dfrac{28 \text{ lb/lb-mol}}{100} \times \left[\dfrac{0.00}{10{,}000} + 79.10\right]\right) = \dfrac{28.84 \text{ lb}}{\text{lb-mol}}$

Stack Wet Molecular Weight (lb/lb-mole)

$$M_S\,(lb/lb-mol) = \left[M_d \times \left(1 - \frac{B_{WS}}{100}\right)\right] + \left[MW_{H_2O} \times \frac{B_{WS}}{100}\right]$$

$M_S\ (\text{lb/lb-mol}) = \left\{\dfrac{28.84 \text{ lb}}{\text{lb-mol}} \times \left(1 - \dfrac{1.33\ \%}{100}\right)\right\} + \left\{\dfrac{18 \text{ lb}}{\text{lb-mol}} \times \dfrac{1.33\ \%}{100}\right\} = \dfrac{28.69 \text{ lb}}{\text{lb-mol}}$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 2) [Values from Run 1 test]

Absolute Stack Pressure (in. Hg)

$$P_S\,(in.Hg) = P_b + \frac{P_{static}}{13.6}$$

$$P_s \text{ (in. Hg)} = 29.53 \text{ in. Hg} + \frac{0.02 \text{ in. } H_2O}{13.6 \text{ in. } H_2O\text{/in. Hg}} = 29.53 \text{ in. Hg}$$

Average Stack Gas Velocity (ft/sec)

$$v_s\,(ft/\sec) = K_p \times C_p \times \left(\sqrt{\Delta p}\right)_{avg} \times \sqrt{\frac{(t_s)_{avg} + T_u}{P_s \times M_s}}$$

v_{sl} (ft/sec) =

$$\left(\frac{85.49 \text{ ft (lb/lb-mol)(in. Hg)}}{\text{sec } (^oR)(\text{in. } H_2O)}\right)^{1/2} \times 0.83 \times 0.09 \text{ in.}H_2O^{1/2} \times \sqrt{\frac{64.28 + 460\ ^oR}{29.53 \text{ in. Hg} \times 28.69 \text{ lb/lb-mol}}} = \frac{5.0 \text{ ft}}{\text{sec}}$$

Average Stack Dry Standard Flow Rate (dscfh)

$$Q_{sd}(dscfh) = \frac{60 \times 60 \times \left(1 - \frac{B_{ws}}{100}\right) \times v_s \times A_s \times T_{std} \times P_s}{(t_s + T_u) \times P_{std}}$$

$$Q_{sd} \text{ (dscf/hr)} = \frac{3600 \text{ sec}}{\text{hr}} \times \left(1 - \frac{1.33\ \%}{100}\right) \times \frac{5.07 \text{ ft}}{\text{sec}} \times 9.00 \text{ ft}^2 \times \frac{68.00 + 460\ ^oR}{64.28 + 460\ ^oR} \times \frac{29.53 \text{ in. Hg}}{29.92 \text{ in. Hg}} = \frac{161{,}179.87 \text{ dscf}}{\text{hr}}$$

Average Stack Wet Flow Rate (acfm)

$$Q_{aw}(acfm) = 60 \times v_s \times A_s$$

$$Q_{aw} \text{ (acf/min)} = \frac{60 \text{ sec}}{\text{min}} \times \frac{5.07 \text{ ft}}{\text{sec}} \times 9.00 \text{ ft}^2 = \frac{2{,}738.91 \text{ acf}}{\text{min}}$$

Average Stack Wet Standard Flow Rate (ascfh)

$$Q_{sw}(ascfh) = \frac{60 \times Q_{aw} \times T_{std} \times P_s}{(t_s + T_u) \times P_{std}}$$

$$Q_{sw} \text{ (ascf/hr)} = \frac{60 \text{ min}}{\text{hr}} \times \frac{2{,}738.91 \text{ acf}}{\text{min}} \times \frac{68.00 + 460\ ^oR}{64.28 + 460\ ^oR} \times \frac{29.53 \text{ in. Hg}}{29.92 \text{ in. Hg}} = \frac{163{,}351.56 \text{ ascf}}{\text{hr}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 4) [Values from Run 1 test]

Water Volume Weighed (scf)

$$V_{wsg\,(std)}(scf) = W_t \times K_5$$

$V_{wsg(std)}$ = 4.10 g x 0.04715 ft^3/g = 0.193 scf

Standard Meter Volume (dscf)

$$V_{m(std)}(dscf) = \frac{K_1 \times Y \times V_m \times \left(P_b + \frac{\Delta H_{avg}}{13.6}\right)}{(t_m)_{avg} + T_u}$$

$$V_{m(std)} = \frac{\frac{17.65\ ^oR}{in.\ Hg} \times 1.00 \times 14.57\ dcf \times \left(29.53\ in.\ Hg + \frac{0.21\ in.\ H_2O}{13.6\ in.\ H_2O / in.\ Hg}\right)}{66.72\ ^oF + 460\ ^oR} = 14.35\ dscf$$

Calculated Moisture Content (%)

$$B_{ws(calc)}(\%) = 100 \times \frac{V_{wsg(std)}}{V_{wsg(std)} + V_{m(std)}}$$

$$B_{ws(calc)} = 100 \times \frac{0.19\ dscf}{0.19\ dscf + 14.35\ dscf} = 1.33\ \%$$

Saturated Moisture Content (%)

$$B_{ws(svp)}(\%) = 100 \times \frac{10^{6.691 - \frac{3144}{t_{s(avg)} + 390.86}}}{P_b + \frac{P_{static}}{13.6}} \leq 100$$

$$B_{ws(svp)} = 100 \times \frac{10^{\left(6.691 - \frac{3144}{64.28\ ^oF + 390.86}\right)}}{29.53\ in.\ Hg + \frac{0.02\ in.\ H_2O}{13.6\ in.\ H_2O / in.\ Hg}} \leq 100 = 2.06\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Isokinetic Sampling) [Values from Run 1 test]

Desired Orifice (in. H_2O) (first point)

$$\Delta H_d(in.H_2O) = K \times \Delta p$$

ΔH_d (in. H_2O) = 23.96 x 0.01 in. H_2O = 0.12 in. H_2O

Absolute Meter Pressure (in. Hg)

$$P_m(in.Hg) = P_b + \frac{\Delta H @}{13.6}$$

$$P_m \text{ (in. Hg)} = 29.53 \text{ in. Hg} + \frac{1.88 \text{ in. } H_2O}{13.6 \text{ in. } H_2O\text{/in. Hg}} = 29.67 \text{ in. Hg}$$

Recommended Nozzle Diameter (in.)

$$D_{ni}(in.) = \sqrt{\frac{C_n \times Q_m \times P_m}{(t_m + T_u) \times C_p} \times \left(\frac{1-\frac{B_{wm}}{100}}{1-\frac{B_{ws}}{100}}\right) \times \sqrt{(t_s + T_u) \times \left[\frac{M_d \times \left(1-\frac{B_{ws}}{100}\right) + \left(18 \times \frac{B_{ws}}{100}\right)}{P_s \times \Delta p_{avg}}\right]}}$$

$$D_{ni}\text{ (in.)} = \sqrt{\frac{\frac{0.03575 \text{ (lb-mole}\cdot{}^oR\cdot\text{in. } H_2O)^{1/2}\cdot\text{min}\cdot\text{in.}^2}{\text{acf}\cdot\text{in. Hg}^{3/4}\cdot\text{lb}^{1/2}} \times 0.75 \text{ acf} \times 29.67 \text{ in. Hg}}{(66.72\ {}^oF + 460{}^oR) \times 0.83} \times \left(\frac{1-\frac{0.00\ \%}{100}}{1-\frac{1.33\ \%}{100}}\right) \times \sqrt{(64.28\ {}^oF + 460{}^oR) \times \frac{\frac{28.84 \text{ lb}}{\text{lb-mole}} \times \left(1-\frac{1.33\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{1.33\ \%}{100}\right)}{29.53 \text{ in. Hg} \times 0.09 \text{ in. } H_2O}}} = 0.369 \text{ in.}$$

ΔP to ΔH Isokinetic Factor

$$K = C_k \times C_p^2 \times \Delta H @ \times D_{na}^4 \times \left[\frac{M_d \times \left(1-\frac{B_{wm}}{100}\right) + \left(18 \times \frac{B_{wm}}{100}\right)}{M_d \times \left(1-\frac{B_{ws}}{100}\right) + \left(18 \times \frac{B_{ws}}{100}\right)}\right] \times \left(\frac{1-\frac{B_{ws}}{100}}{1-\frac{B_{wm}}{100}}\right)^2 \times \left(\frac{t_m + T_u}{ts + T_u}\right) \times \frac{P_s}{P_m}$$

$$K = \frac{849.8}{\text{in. } H_2O\cdot\text{in.}^4} \times 0.83^2 \times 1.88 \text{ in. } H_2O \times 0.39^4 \times \left(\frac{1-\frac{1.33\ \%}{100}}{1-\frac{0.00\ \%}{100}}\right)^2 \times \left(\frac{66.72\ {}^oF + 460{}^oR}{64.28\ {}^oF + 460{}^oR}\right) \times \left(\frac{\frac{28.84 \text{ lb}}{\text{lb/mole}} \times \left(1-\frac{0.00\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{0.00\ \%}{100}\right)}{\frac{28.84 \text{ lb}}{\text{lb/mole}} \times \left(1-\frac{1.33\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{1.33\ \%}{100}\right)}\right) \times \frac{29.53 \text{ in. Hg}}{29.67 \text{ in. Hg}} = 23.96$$

Percent Isokinetic (%) (first point)

$$I(\%) = \frac{K_4 \times ((t_s)_{avg} + T_u) \times V_{m(std)}}{\left(\Theta \times (v_{s(l)})_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right) \times \left(1-\frac{B_{ws}}{100}\right)}$$

$$I(\%) = \frac{\frac{0.0945 \text{ min}\cdot\text{in. Hg}}{\text{sec}\cdot{}^oR} \times (63.00\ {}^oF + 460\ {}^oR) \times 0.35 \text{ dscf}}{2.40 \text{ min} \times \frac{3.94 \text{ ft}}{\text{sec}} \times 29.53 \text{ in. Hg} \times 3.14 \times \left(\frac{0.39 \text{ in.}}{2} \times \frac{\text{ft.}}{12 \text{ in.}}\right)^2 \times \left(1-\frac{1.33\ \%}{100}\right)} = 76.54\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Isokinetic Sampling) [Values from Run 1 test]

Cumulative Percent Isokinetic (%) (weighted average of all points)

$$I(\%) = \sum_{1-n} \frac{\lfloor I(\%) \times V_{m(std)} \rfloor_{1-n}}{V_{m(std)1-n}}$$

Using Method 5, Eq 5-8 to determine intermediate isokinetics at each point, weighted averaging of the cumulative isokinetics is necessary since all points are not equal, and determined by using the dry standard meter volume collected at each point to weight the cumulative average. Intermediate isokinetics and dry standard meter volumes are found at each point. At each point the cumulative sum is found of each value and the quotient of the two used to determine the cumulative isokinetics for each residual point (n).

Pt	In (%)	x	Vm(std)n	=	I (%)n	∑(I (%)n)	/	∑(Vm(std)n)	=	I (%)
A-1	76.54	x	0.347	=	26.57	26.57	/	0.35	=	76.5
A-2	61.87	x	0.397	=	24.55	51.12	/	0.74	=	68.7
A-3	134.31	x	0.861	=	115.70	166.82	/	1.61	=	103.9
A-4	100.35	x	0.644	=	64.58	231.40	/	2.25	=	102.9
A-5	99.96	x	0.453	=	45.32	276.72	/	2.70	=	102.4
B-1	96.03	x	0.616	=	59.14	335.86	/	3.32	=	101.2
B-2	111.10	x	0.504	=	55.98	391.83	/	3.82	=	102.5
B-3	92.45	x	0.593	=	54.82	446.66	/	4.41	=	101.2
B-4	100.02	x	0.454	=	45.37	492.02	/	4.87	=	101.1
B-5	87.27	x	0.395	=	34.51	526.53	/	5.26	=	100.0
C-1	99.20	x	0.778	=	77.23	603.76	/	6.04	=	99.9
C-2	99.87	x	0.640	=	63.91	667.67	/	6.68	=	99.9
C-3	90.74	x	0.581	=	52.71	720.38	/	7.26	=	99.2
C-4	110.52	x	0.708	=	78.20	798.57	/	7.97	=	100.2
C-5	98.17	x	0.770	=	75.55	874.13	/	8.74	=	100.0
D-1	99.32	x	0.636	=	63.14	937.27	/	9.38	=	100.0
D-2	102.81	x	0.806	=	82.86	1020.13	/	10.18	=	100.2
D-3	101.81	x	0.461	=	46.91	1067.05	/	10.64	=	100.3
D-4	99.64	x	0.451	=	44.94	1111.98	/	11.09	=	100.2
D-5	95.96	x	0.434	=	41.68	1153.66	/	11.53	=	100.1

Pt	In (%)	x	Vm(std)n	=	I (%)n	∑(I (%)n)	/	∑(Vm(std)n)	=	I (%)
E-1	102.19	x	0.654	=	66.85	1220.52	/	12.18	=	100.2
E-2	99.59	x	0.638	=	63.49	1284.01	/	12.82	=	100.2
E-3	101.90	x	0.461	=	46.96	1330.97	/	13.28	=	100.2
E-4	101.90	x	0.461	=	46.96	1377.93	/	13.74	=	100.3
E-5	94.62	x	0.605	=	57.26	1435.19	/	14.35	=>	100.0
Last Pt										

Percent Isokinetic (%) (intermediate equation, all points)
[equivalent to taking an average of point-by-point isokinetics without weighting the average (e.g. all points equal)]

$$I(\%) = \frac{K_4 \times \left((t_s)_{avg} + T_u\right) \times V_{m(std)}}{\left(\Theta \times \left(v_{s(l)}\right)_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right) \times \left(1 - \frac{B_{ws}}{100}\right)}$$

$$I(\%) = \frac{\frac{0.0945 \text{ min•in. Hg}}{\text{sec•}^oR} \times (64.28\ ^oF + 460\ ^oR) \times 14.35 \text{ dscf}}{60.00 \text{ min} \times \frac{5.07 \text{ ft}}{\text{sec}} \times 29.53 \text{ in. Hg} \times 3.14 \times \left(\frac{0.39 \text{ in.}}{2} \times \frac{\text{ft.}}{12 \text{ in.}}\right)^2 \times \left(1 - \frac{1.33\ \%}{100}\right)} = 98.47\ \%$$

Raw Data Percent Isokinetic (%)
[utilizes the raw data equation for isokinetics from Method 5]

$$I(\%) = \frac{100\left((t_s)_{avg} + T_u\right)\left[K_4 V_{1c} + \frac{V_m Y}{(t_m)_{avg} + T_u}\left(P_{bar} + \frac{\Delta H}{13.6}\right)\right]}{60\left(\Theta \times \left(v_{s(l)}\right)_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right)}$$

$$I(\%) = \frac{100 \times (64.28\ ^oF + 460\ ^oR) \times \left[\frac{0.002669 \text{ ft}^3\text{•in. Hg}}{\text{ml•}^oR} \times 4.107 \text{ ml} + \frac{14.57 \text{ dcf} \times 0.995}{66.72\ ^oF + 460\ ^oR}\left(29.53 \text{ in Hg} + \frac{0.091}{13.6}\right)\right]}{60 \times 60.00 \text{ min} \times \frac{5.07 \text{ ft}}{\text{sec}} \times 29.53 \text{ in. Hg} \times 3.14 \times \left(\frac{0.39 \text{ in.}}{2} \times \frac{\text{ft.}}{12 \text{ in.}}\right)^2} = 98.39\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Analysis) [Values from Run 1 test - Lead Mass]

Stack Lead Concentration (g/dscf)

$$c_s(g/dscf) = 0.001 \times \frac{M_n}{V_{m(std)}}$$

$$c_s \text{ (g/dscf)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{\text{0.00 mg}}{\text{14.35 dscf}} = \frac{\text{6.00E-08 g}}{\text{dscf}}$$

Stack Lead Concentration (gr/dscf)

$$c_s^{'}(gr/dscf) = 0.001 \times \frac{M_n}{V_{m(std)}} \times \frac{7000}{453.592}$$

$$c'_s \text{ (gr/dscf)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{\text{0.00 mg}}{\text{14.35 dscf}} \times \frac{\text{7000 gr}}{\text{lb}} \times \frac{\text{lb}}{\text{453.592 g}} = \frac{\text{8.60E-07 gr}}{\text{dscf}}$$

Lead Emissions Rate (kg/hr)

$$E(kg/hr) = c_s \times Q_{sd} \times \frac{kg}{1000\ g}$$

$$E \text{ (kg/hr)} = \frac{\text{kg}}{\text{1000 g}} \times \frac{\text{5.58E-08 g}}{\text{dscf}} \times \frac{\text{161,180 dscf}}{\text{hr}} = \frac{\text{8.99E-06 kg}}{\text{hr}}$$

Lead Emissions Rate (lb/hr)

$$E^{'}(lb/hr) = \frac{M_n \times Q_{sd}}{V_{m(std)}} \times \frac{lb \times g}{453.592g \times 1000mg}$$

$$E' \text{ (lb/hr)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{\text{lb}}{\text{453.592 g}} \times \frac{\text{0.00 mg}}{\text{14.35 dscf}} \times \frac{\text{161,180 dscf}}{\text{hr}} = \frac{\text{1.98E-05 lb}}{\text{hr}}$$

Lead Emissions Rate (tpy)

$$E^{''}(ton/yr) = E^{'} \times \frac{8760}{2000}$$

$$E'' \text{ (tpy)} = \frac{\text{ton}}{\text{2000 lb}} \times \frac{\text{8,760 hr}}{\text{yr}} \times \frac{\text{0.00 lb}}{\text{hr}} = \frac{\text{8.68E-05 ton}}{\text{yr}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

APPENDIX B

EMISSION DATA RECORDS

EMISSION DATA RECORDS

Operations Data
(provided by Choctaw Defense Facility)

Date	Press	Caliber	Prod TOTAL during TEST	Weight of BLEMS (lbs)	Prod BLEMS	Lead Core Weight (Gr)	Brass Weight (Gr)	Lead (Lbs)	Brass (Lbs)	SCRAP Brass	SCRAP Bullets
18-Dec	1	38 SPL 142 GR FMJTC	43448	0	0	117.8	24.2	731.167771	150.205943	354	0.24
18-Dec	2	9MM 147 GR JHP	25902	0	0	97.2	26.8	359.667771	99.1676571	48	0
18-Dec	3	.380 90 GR JHP	20182	0	0	69	21	198.936857	60.546	54	
18-Dec	4	7.62 MM 147GR FMJ BT	14250	45.8	2181	100	47	203.571429	95.6785714	98	0
19-Dec	1	38 SPL 142 GR FMJTC	32539	0	0	117.8	24.2	547.584886	112.491971	333	0
19-Dec	2	9MM 147 GR JHP	32018	0	0	97.2	26.8	444.5928	122.5832	153	0
19-Dec	3	.380 90 GR JHP	31158	0	0	69	21	307.128857	93.474	88	0
19-Dec	4	7.62 MM 147GR FMJ BT	28588	47.5	2262	100	47	408.4	191.948	144	0

		Lbs of Lead Core Produced	SCRAP Cores (Lbs)	SCRAP Bleed(Lbs)	TOTAL LEAD SCRAPED
18-Dec	Header 1	1790.5	0	118	118
18-Dec	Header 2	765		30	30
18-Dec	Header 3	1632	0	55	55
18-Dec	Header 4	966	119	86	256
19-Dec	Header 1	1285	0	54	54
19-Dec	Header 2	635	0	0	0
19-Dec	Header 3	1593	0	60	60
19-Dec	Header 4	754	93	74	167

EMISSION DATA RECORDS

Vent #1 Reference Method Data

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE

Source Information	
Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room

Test Information			
Project #		amee-19-mcalester.ok-perf#1	
Operator		JW	
Date for Preliminary Run	(mm/dd/yy)	12/17/19	
Standard Temperature		68	°F
Standard Pressure		29.92	in Hg
Required Sample Vol.	indust. spec.	30	scf
Run Duration	≥ 2 min/point	60	minutes
Unit Number		Vent #1	
Base Run Number		V1Pb	
Number of Ports Available		5	
Number of Ports Used		5	
Port Inside Diameter		3.00	in
Stack Shape		Rectangular	

Test Equipment Information					
Run		**1**	**2**	**3**	
Test Date	(mm/dd/yy)	12/18/19	12/18/19	12/18/19	
Production Rate		Max	Max	Max	
Meter Box Number	from ACS	samp-cp-0029	samp-cp-0029	samp-cp-0029	
Meter Calibration Factor	(Y)	0.995	0.995	0.995	
Orifice Meter Coefficient	($\Delta H_{@}$)	1.882	1.882	1.882	in H_2O
Non-Console Manometer Used		No	No	No	
Pitot Identification	from ACS	A8877	2428	A8877	
Pitot Tube Coefficient	(C_p)	0.8290	0.8190	0.8290	
Nozzle Number	from ACS	G10	A10	G10	
Nozzle Diameter	(D_n)	0.312	0.314	0.312	in
Probe Number	from ACS	samp-hp-0067	samp-hp-0066	samp-hp-0067	
Probe Length		60.0	60.0	60.0	in
(SS, Glass ….) Liner Material	from list	glass	glass	glass	
Sample Case / Oven Number	from ACS	samp-bh-0039	samp-bh-0039	samp-bh-0039	
Impinger Case Number	from ACS	samp-bc-0019	samp-bc-0015	samp-bc-0019	

Testing Company Information	
Company Name	Air Hygiene International, Inc. (Tulsa, Oklahoma)
Address	1600 W Tacoma Street
City, State Zip	Broken Arrow, Oklahoma 74012
Project Manager	Paul Little
Phone Number	(918) 307-8865
Fax Number	(918) 307-9131

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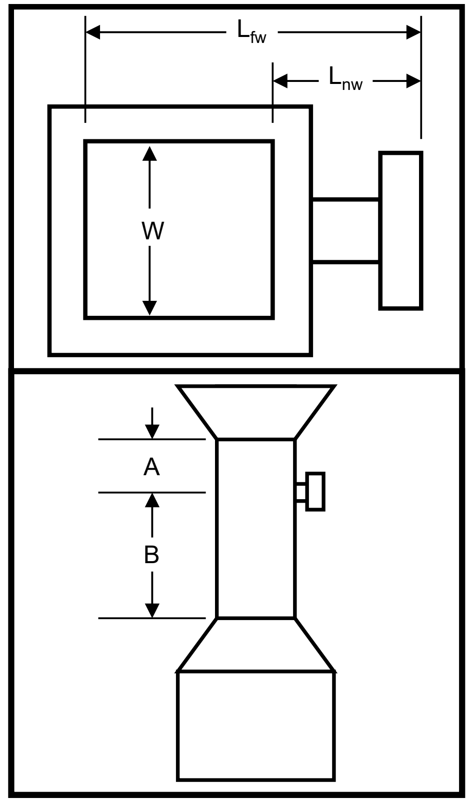
METHOD 1 - SAMPLE AND VELOCITY TRAVERSES FOR RECTANGULAR SOURCES

Plant Name	Choctaw Defense Facility	**Date**	12/17/19
Sampling Location	Centerfire Room	**Stack Type**	Rectangular
Operator	JW	**Ports Available**	5
Project #	amee-19-mcalester.ok-perf#1	**Ports Used**	5
Stack Size	Large (>24 inch diameter)	**Port ID (inches)**	3.00

Rectangular Stacks or Ducts			
Length to Far Wall of Stack	(L_{fw})	44.13	in
Length to Near Wall of Stack	(L_{nw})	0.13	in
Length of Stack	(L)	44.00	in
Width of Stack	(W)	43.00	in
Equivalent Stack Diam	(D_e)	43.49	in
Area of Stack	(A_s)	13.14	ft²



Distance from Port to Disturbances			
Distance Upstream	(A)	46.00	in
Diameters Upstream	(A_D)	1.06	diameters
Distance Downstream	(B)	101.00	in
Diameters Downstream	(B_D)	2.32	diameters

Number of Traverse Points Required

Diameters to Flow Disturbance: Down Stream	Diameters to Flow Disturbance: Up Stream	Minimum Number of Traverse Points[1]: Particulate Points	Minimum Number of Traverse Points[1]: Velocity Points
2.00-4.99	0.50-1.24	25	16
5.00-5.99	1.25-1.49	20	16
6.00-6.99	1.50-1.74	16	12
7.00-7.99	1.75-1.99	12	12
>= 8.00	>=2.00	9 or 12[2]	9 or 12[2]
Upstream Spec		25	16
Downstream Spec		25	16
Traverse Pts Required		25	16

[1] Check Minimum Number of Points for the Upstream and Downstream conditions, then use the largest.

[2] 9 for Rectangular Stacks 12 to 24 inches
12 for All Stacks over 24 inches

(●) Method 1 Trav
( ) 12 Point PM Trav (M201a ONLY)
( ) Velocity

Number of Traverse Points Used

5	**Ports by**	5	**Across**
25	**Pts Used**	25	**Required**

LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS

Percent of Stack Diameter from Inside Wall to Traverse Point

Traverse Point Number	Number of Traverse Points on a Diameter: 1	2	3	4	5	6	7	8	9
1	0.500	0.250	0.167	0.125	0.100	0.083	0.071	0.063	0.056
2		0.750	0.500	0.375	0.300	0.250	0.214	0.188	0.167
3			0.833	0.625	0.500	0.417	0.357	0.313	0.278
4				0.875	0.700	0.583	0.500	0.438	0.389
5					0.900	0.750	0.643	0.563	0.500
6						0.917	0.786	0.688	0.611
7							0.929	0.813	0.722
8								0.938	0.833
9									0.944

Traverse Point Locations

Traverse Point Number	Fraction of Stack Dimension	Distance from Inside Wall (in)	Distance Including Reference Length (in)
1	0.100	4 3/8	4 4/8
2	0.300	13 2/8	13 3/8
3	0.500	22	22 1/8
4	0.700	30 6/8	30 7/8
5	0.900	39 5/8	39 6/8
6			
7			
8			
9			

METHOD 2 - DETERMINATION OF STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant Name	Choctaw Defense Facility			
Sampling Location	Centerfire Room			
Operator	JW			
Project #	amee-19-mcalester.ok-perf#1			
Pitot Leak Check	x	**PreTest**	x	**PostTest**

Preliminary Run Date	12/17/19		
Stack Type	Rectangular		
Ports Available	5		
Thermocouple ID	samp-hp-0067		
Pitot Coefficient	0.8290	**Pitot Identification**	A8877

Stack Dimensions			
Area of Stack	(A_s)	13.14	ft²
Length of Stack	(L)	44.00	in
Width of Stack	(W)	43.00	in

Pressures			
Barometric Pressure	(P_b)	29.57	in Hg
Static Pressure	(P_{static})	0.10	in H_2O
Absolute Stack Pressure	(P_s)	29.58	in Hg

Stack Gas Composition			
Composition Data:	**Estimated Composition**		
Carbon Dioxide Concentration	(%CO_2)	0.00	%vd
Oxygen Concentration	(%O_2)	20.90	%vd
Carbon Monoxide Concentration	(ppmCO)	0.00	ppmvd
Nitrogen Concentration	(%N_2)	79.10	%vd
Stack Moisture Content	(B_{ws})	1.50	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Stack Wet Molecular Weight	(M_w)	28.67	lb/lb-mole

Results			
Avg Stack Gas Velocity	(v_s)	15.58	ft/sec
Avg Stack Dry Std Flow Rate	(Q_{sd})	733,024	dscf/hr
Avg Stack Dry Std Flow Rate	(Q_{sd})	12,217	dscf/min
Avg Stack Wet Flow Rate	(Q_{aw})	12,284	acf/min
Avg Stack Wet Std Flow Rate	(Q_{sw})	744,186	ascf/hr

40 CFR 60, Method 2G, Section 8.11.1 (but applies to all Method 2 type static pressure measurements):
If a Type S probe is used for this measurement, position the probe at or between any traverse point(s) and rotate the probe until a null differential pressure reading is obtained. Disconnect the tubing from one of the pressure ports; read and record the ∆P. For pressure devices with one-directional scales, if a deflection in the positive direction is noted with the negative side disconnected, then the static pressure is positive. Likewise, if a deflection in the positive direction is noted with the positive side disconnected, then the static pressure is negative.

Stack Cross Section Schematic

Velocity Traverse Data					
Run Number	V1Pb-V1				
Run Time	08:08	**Start**	08:48	**End**	
Traverse Point	**Velocity Head** (∆p)	**Null Angle** (N_a)	**Zero Deg Pressure** ($0^o{}_a$)	**Stack Temp** (t_s)	**Local Velocity** ($v_{s(l)}$)
	in H_2O	deg	in H_2O	°F	ft/sec
A-1	0.12	-3	0.03	55	19.13
A-2	0.12	-1	0.02	57	19.17
A-3	0.12	3	0.00	57	19.17
A-4	0.13	5	0.00	57	19.95
A-5	0.11	5	0.00	57	18.35
B-1	0.12	-3	0.04	57	19.17
B-2	0.07	0	0.00	57	14.64
B-3	0.03	0	0.00	57	9.58
B-4	0.07	0	0.00	57	14.64
B-5	0.10	5	0.20	57	17.50
C-1	0.12	5	0.20	57	19.17
C-2	0.06	0	0.00	57	13.55
C-3	0.06	0	0.00	57	13.55
C-4	0.03	0	0.00	57	9.58
C-5	0.09	5	0.30	57	16.60
D-1	0.11	0	0.00	57	18.35
D-2	0.07	-3	0.10	57	14.64
D-3	0.07	0	0.00	57	14.64
D-4	0.06	0	0.00	57	13.55
D-5	0.06	0	0.00	57	13.55
E-1	0.07	0	0.00	57	14.64
E-2	0.07	0	0.00	57	14.64
E-3	0.07	-3	0.10	57	14.64
E-4	0.06	-2	0.00	57	13.55
E-5	0.06	-2	0.10	57	13.55
Average	0.08	2		57	
	0.28	**= Square roots of ∆p**			
Standard deviation of null angles =				2.0	

METHOD 3a - DETERMINATION OF DRY MOLECULAR WEIGHT BY ANALYZER

Plant Name	Choctaw Defense Facility	**Preliminary Run Date**	12/17/19
Sampling Location	Centerfire Room	**Operator**	JW

Gas Analysis Data

Run Number	V1Pb-1	**Date**	12/18/19	**Run Start Time**	07:55	**Run Stop Time**	11:00
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**		
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)		
hh:mm	%	%	ppm	%	lb/lb-mole		
03:05	0.0	20.9	0.0	79.1	28.84		

Gas Analysis Data

Run Number	V1Pb-2	**Date**	12/18/19	**Run Start Time**	12:47	**Run Stop Time**	13:59
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**		
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)		
hh:mm	%	%	ppm	%	lb/lb-mole		
01:12	0.0	20.9	0.0	79.1	28.84		

Gas Analysis Data

Run Number	V1Pb-3	**Date**	12/18/19	**Run Start Time**	14:26	**Run Stop Time**	15:35
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**		
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)		
hh:mm	%	%	ppm	%	lb/lb-mole		
01:09	0.0	20.9	0.0	79.1	28.84		

METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES

Plant Name	Choctaw Defense Facility	**Preliminary Run Date**	12/17/19
Sampling Location	Centerfire Room	**Operator**	JW
Project #	amee-19-mcalester.ok-perf#1	**Ports Used**	5

Scale Daily Calibration					
Scale Number	SAMP-SC-0035	**Standard**	**Result**	**Difference**	**Pass/Fail**
Date		(g)	(g)	(g)	(± 0.5 g)
Preliminary Date	12/17/19	500	499.7	-0.3	Pass
Test Day 1	12/18/19	500	499.8	-0.2	Pass

Moisture Content Data									
Run Number		V1Pb-1		**Date**	12/18/19	**Start Time**	07:55	**Stop Time**	11:00
Meter Box Number		samp-cp-0029			**Meter Cal Factor**		(Y)	0.995	
Total Meter Volume		(V_m)	32.776	dcf	**Barometric Pressure**		(P_b)	29.54	in Hg
Average Stack Temp		$(t_s)_{avg}$	60	°F	**Stack Static Pressure**		(P_{static})	0.01	in H_2O
Average Meter Temp		$(t_m)_{avg}$	74	°F	**Avg Orifice Pressure**		$(\Delta H)_{avg}$	1.02	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	$(V_f),(W_f)$	698.40	671.60	614.40	817.70				
Initial Value	$(V_i),(W_i)$	704.80	668.50	613.90	811.50				
Net Value	$(V_n),(W_n)$	-6.4	3.1	0.5	6.2				
Results									
Total Weight		(W_t)	3.40	g	**Water Vol Weighed**		($V_{wsg(std)}$)	0.160	scf
Std Meter Volume		($V_{m(std)}$)	31.912	dscf	**Sat. Moisture Content**		($B_{ws(svp)}$)	1.79	%
Calc Moisture Content		($B_{ws(calc)}$)	0.50	%	**Final Moisture Content**		(B_{ws})	0.50	%

Moisture Content Data									
Run Number		V1Pb-2		**Date**	12/18/19	**Start Time**	12:47	**Stop Time**	13:59
Meter Box Number		samp-cp-0029			**Meter Cal Factor**		(Y)	0.995	
Total Meter Volume		(V_m)	32.421	dcf	**Barometric Pressure**		(P_b)	29.56	in Hg
Average Stack Temp		$(t_s)_{avg}$	69	°F	**Stack Static Pressure**		(P_{static})	0.01	in H_2O
Average Meter Temp		$(t_m)_{avg}$	72	°F	**Avg Orifice Pressure**		$(\Delta H)_{avg}$	1.05	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	$(V_f),(W_f)$	690.90	698.20	562.20	870.50				
Initial Value	$(V_i),(W_i)$	693.50	693.30	559.00	860.40				
Net Value	$(V_n),(W_n)$	-2.6	4.9	3.2	10.1				
Results									
Total Weight		(W_t)	15.60	g	**Water Vol Weighed**		($V_{wsg(std)}$)	0.736	scf
Std Meter Volume		($V_{m(std)}$)	31.695	dscf	**Sat. Moisture Content**		($B_{ws(svp)}$)	2.39	%
Calc Moisture Content		($B_{ws(calc)}$)	2.27	%	**Final Moisture Content**		(B_{ws})	2.27	%

Moisture Content Data									
Run Number		V1Pb-3		**Date**	12/18/19	**Start Time**	14:26	**Stop Time**	15:35
Meter Box Number		samp-cp-0029			**Meter Cal Factor**		(Y)	0.995	
Total Meter Volume		(V_m)	32.722	dcf	**Barometric Pressure**		(P_b)	29.54	in Hg
Average Stack Temp		$(t_s)_{avg}$	71	°F	**Stack Static Pressure**		(P_{static})	0.01	in H_2O
Average Meter Temp		$(t_m)_{avg}$	78	°F	**Avg Orifice Pressure**		$(\Delta H)_{avg}$	0.96	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	$(V_f),(W_f)$	694.90	676.50	617.20	825.10				
Initial Value	$(V_i),(W_i)$	704.60	671.20	615.60	817.70				
Net Value	$(V_n),(W_n)$	-9.7	5.3	1.6	7.4				
Results									
Total Weight		(W_t)	4.60	g	**Water Vol Weighed**		($V_{wsg(std)}$)	0.217	scf
Std Meter Volume		($V_{m(std)}$)	31.618	dscf	**Sat. Moisture Content**		($B_{ws(svp)}$)	2.57	%
Calc Moisture Content		($B_{ws(calc)}$)	0.68	%	**Final Moisture Content**		(B_{ws})	0.68	%

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/18/19
Operator	JW
Run Number	V1Pb-1

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8290	A8877
Average Stack Temp	(t_s)	60.4	°F
Average Meter Temp	(t_m)	74.1	
Orifice Meter Coefficient	($\Delta H@$)	1.882	in H_2O
Square Root ΔP	($\Delta p^{1/2}_{avg}$)	0.30	in H_2O
Stack Moisture Content	(B_{ws})	0.50	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.75	acfm
ΔP to ΔH Isokinetic Factor	(K)	10.55	

Leak Checks		*[change]*		*[level]*		*[time]*	
Train	**Pre**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	**Post**	0.000	ft³/min@	7.0	in Hg for	65.0	sec [≥60]
Pitot	**Pre (+)**	0.00	in H_2O	7.0	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.00	in H_2O	5.0	in H_2O for	20.0	sec [≥15]
PASS	**Post (+)**	0.00	in H_2O	8.0	in H_2O for	20.0	sec [≥15]
	Post (-)	0.00	in H_2O	6.0	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	G10		
Average Nozzle Diameter	(D_{na})	0.3120	in
Suggested Nozzle Diameter	(D_{ni})	0.2710	in
Probe Number	samp-hp-0067		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0039		
Impinger Case Number	samp-bc-0019		

Nozzle Measurements			**ID: G10**	
Pre	0.312	0.313	0.311	**PASS**
Post	0.312	0.313	0.311	**PASS**

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Pressures			
Barometric Pressure	(P_b)	29.54	in Hg
Stack Static Pressure	(P_{static})	0.01	in H_2O
Absolute Stack Pressure	(P_s)	29.54	in Hg
Absolute Meter Pressure	(P_m)	29.68	in Hg

Run Time			
Start	07:55	**End**	11:00

Weights	**Imp 1**	**Imp 2**	**Imp 3**	**Imp 4**	**Imp 5**	**Imp 6**	**Imp 7**	**Imp 8**
Pre	704.8	668.5	613.9	811.5				
Post	698.4	671.6	614.4	817.7				

Wash Volumes					
					ml
					ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0067	samp-hp-0067	samp-bh-0039	samp-bc-0019			**samp-cp-0029**		samp-cp-0029					
Traverse Point #	**Sampling Time (Θ)**	**Timer Time**	**Dry Gas Meter Reading (V_m)**	**Velocity Head (Δp)**	**Desired Orifice ΔH (ΔH_d)**	**Actual Orifice ΔH (ΔH_a)**	**Stack Temp (t_s)**	**Probe Temp (248±25°F)**	**Filter Temp (248±25°F)**	**Impinger Exit Temp (≤68°F)**	**Cond. Temp (≤--°F)**	**CPM Filter Temp (--±--°F)**	**Meter Inlet Temp (t_{mi})**	**Meter Outlet Temp (t_{mo})**	**Pump Vacuum**	**Square Root ΔP ($\Delta p^{1/2}$)**	**Local Stack Velocity (v_s)$_i$**	**Cumul. Meter Volume (V_m)$_{std}$**	**Cumul. Percent IsoKinetic (I)**	**Est-Run Meter Volume (V_m)$_{std}$**
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	663.978	0.14	1.477	1.50	56	252	250	39			60	60	3.0	0.37	20.66	1.634	103.0	40.849
A-2	2.4	00:02:24	665.610	0.13	1.372	1.40	56	253	249	41			60	60	3.0	0.36	19.91	3.266	104.8	40.819
A-3	4.8	00:04:48	667.240	0.16	1.688	1.70	56	251	250	39			61	61	3.5	0.40	22.08	4.825	100.7	40.210
A-4	7.2	00:07:12	668.800	0.14	1.477	1.50	56	253	250	32			68	68	3.0	0.37	20.66	6.413	100.5	40.079
A-5	9.6	00:09:36	670.410	0.15	1.583	1.60	56	254	251	33			69	69	3.0	0.39	21.38	7.965	99.3	39.825
B-1	12.0	00:12:00	671.987	0.12	1.266	1.30	56	252	252	34			74	74	3.0	0.35	19.13	9.391	99.0	39.128
B-2	14.4	00:14:24	673.450	0.11	1.161	1.20	56	253	249	43			75	75	3.0	0.33	18.31	10.801	99.2	38.574
B-3	16.8	00:16:48	674.900	0.07	0.739	0.75	57	254	250	43			75	75	3.0	0.26	14.62	12.258	102.8	38.305
B-4	19.2	00:19:12	676.400	0.07	0.739	0.75	57	254	253	43			75	75	3.0	0.26	14.62	13.074	101.0	36.316
B-5	21.6	00:21:36	677.240	0.13	1.372	1.40	59	249	252	44			76	76	3.5	0.36	19.96	14.541	100.5	36.352
C-1	24.0	00:24:00	678.751	0.12	1.266	1.30	60	250	253	44			76	76	3.5	0.35	19.20	16.025	100.6	36.421
C-2	26.4	00:26:24	680.280	0.06	0.633	0.64	60	253	251	44			77	77	3.0	0.24	13.58	17.070	100.6	35.563
C-3	28.8	00:28:48	681.360	0.06	0.633	0.64	61	254	250	44			77	77	3.0	0.24	13.59	18.096	100.5	34.799
C-4	31.2	00:31:12	682.420	0.05	0.528	0.53	62	252	248	45			77	77	3.0	0.22	12.42	19.053	100.6	34.023
C-5	33.6	00:33:36	683.410	0.08	0.844	0.85	63	254	250	45			77	77	3.0	0.28	15.72	20.194	100.3	33.657
D-1	36.0	00:36:00	684.589	0.08	0.844	0.85	63	253	249	45			77	77	3.0	0.28	15.72	21.367	100.2	33.385
D-2	38.4	00:38:24	685.800	0.07	0.739	0.75	63	254	249	45			77	77	3.0	0.26	14.71	22.470	100.1	33.044
D-3	40.8	00:40:48	686.940	0.07	0.739	0.75	64	253	250	45			77	77	3.0	0.26	14.72	23.592	100.2	32.767
D-4	43.2	00:43:12	688.100	0.08	0.844	0.85	64	254	252	45			77	77	3.0	0.28	15.74	24.773	100.1	32.596
D-5	45.6	00:45:36	689.320	0.08	0.844	0.85	64	249	255	45			77	77	3.0	0.28	15.74	25.978	100.2	32.473
E-1	48.0	00:48:00	690.565	0.10	1.055	1.10	64	250	250	47			78	78	3.0	0.32	17.59	26.785	99.0	31.887
E-2	50.4	00:50:24	691.400	0.09	0.950	1.00	64	253	249	47			78	78	3.0	0.30	16.69	28.631	102.0	32.536
E-3	52.8	00:52:48	693.310	0.08	0.844	0.85	64	252	249	47			78	78	3.0	0.28	15.74	29.810	101.9	32.402
E-4	55.2	00:55:12	694.530	0.07	0.739	0.75	65	251	249	49			78	78	3.0	0.26	14.73	30.921	101.8	32.209
E-5	57.6	00:57:36	695.680	0.06	0.633	0.64	65	254	249	49			78	78	3.0	0.24	13.64	31.958	101.8	31.958
Last Pt	60.0	01:00:00	696.754																	
Final Val	60.0	01:00:00	696.754											**Max Vac**	3.5	**Final Values**		31.958	101.8	
Average Values				0.09		1.02	60	252	250	43			74	74		0.30	16.83			
													74							

Notes:

Run Time: Run started at 07:55, but process experienced three lengthy delays because of site equipment issues. Test train was paused in place until production was re-established.

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/18/19
Operator	JW
Run Number	V1Pb-2

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8190	2428
Average Stack Temp	(t_s)	68.7	°F
Average Meter Temp	(t_m)	72.3	
Orifice Meter Coefficient	($\Delta H@$)	1.882	in H_2O
Square Root ΔP	($\Delta p^{1/2}_{avg}$)	0.31	in H_2O
Stack Moisture Content	(B_{ws})	2.27	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.53	acfm
ΔP to ΔH Isokinetic Factor	(K)	10.03	

Leak Checks		*[change]*		*[level]*		*[time]*	
Train	**Pre**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	**Post**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
Pitot	**Pre (+)**	0.00	in H_2O	5.0	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.00	in H_2O	6.0	in H_2O for	20.0	sec [≥15]
PASS	**Post (+)**	0.00	in H_2O	5.0	in H_2O for	20.0	sec [≥15]
	Post (-)	0.00	in H_2O	4.0	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	A10		
Average Nozzle Diameter	(D_{na})	0.3137	in
Suggested Nozzle Diameter	(D_{ni})	0.2294	in
Probe Number	samp-hp-0066		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0039		
Impinger Case Number	samp-bc-0015		

Pressures			
Barometric Pressure	(P_b)	29.56	in Hg
Stack Static Pressure	(P_{static})	0.01	in H_2O
Absolute Stack Pressure	(P_s)	29.56	in Hg
Absolute Meter Pressure	(P_m)	29.70	in Hg

Nozzle Measurements			**ID: A10**	
Pre	0.314	0.314	0.313	**PASS**
Post	0.314	0.314	0.313	**PASS**

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Run Time			
Start	12:47	**End**	13:59

Weights	**Imp 1**	**Imp 2**	**Imp 3**	**Imp 4**	**Imp 5**	**Imp 6**	**Imp 7**	**Imp 8**
Pre	693.5	693.3	559.0	860.4				
Post	690.9	698.2	562.2	870.5				

Wash Volumes					
					ml
					ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0066	samp-hp-0066	samp-bh-0039	samp-bc-0015			**samp-cp-0029**		samp-cp-0029					
Traverse Point #	**Sampling Time (Θ)**	**Timer Time**	**Dry Gas Meter Reading (V_m)**	**Velocity Head (Δp)**	**Desired Orifice ΔH (ΔH_d)**	**Actual Orifice ΔH (ΔH_a)**	**Stack Temp (t_s)**	**Probe Temp (248±25°F)**	**Filter Temp (248±25°F)**	**Impinger Exit Temp (≤68°F)**	**Cond. Temp (≤--°F)**	**CPM Filter Temp (--±--°F)**	**Meter Inlet Temp (t_{mi})**	**Meter Outlet Temp (t_{mo})**	**Pump Vacuum**	**Square Root ΔP ($\Delta p^{1/2}$)**	**Local Stack Velocity ($(v_s)_i$)**	**Cumul. Meter Volume ($(V_m)_{std}$)**	**Cumul. Percent IsoKinetic (I)**	**Est-Run Meter Volume ($(V_m)_{std}$)**
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	697.000	0.14	1.404	1.50	67	253	249	64			70	70	3.0	0.37	20.69	1.573	101.8	39.319
A-2	2.4	00:02:24	698.600	0.13	1.303	1.40	67	253	246	62			70	70	3.0	0.36	19.93	3.125	103.0	39.068
A-3	4.8	00:04:48	700.180	0.16	1.604	1.70	67	253	247	61			70	70	3.0	0.40	22.12	4.522	97.3	37.683
A-4	7.2	00:07:12	701.600	0.18	1.805	1.90	68	253	250	60			70	70	3.0	0.42	23.48	6.293	98.4	39.332
A-5	9.6	00:09:36	703.400	0.16	1.604	1.70	68	253	248	60			70	70	3.0	0.40	22.14	7.876	97.9	39.382
B-1	12.0	00:12:00	705.010	0.12	1.203	1.30	68	253	251	61			71	71	3.0	0.35	19.17	9.799	105.1	40.827
B-2	14.4	00:14:24	706.970	0.12	1.203	1.30	68	251	249	61			71	71	3.0	0.35	19.17	11.299	105.0	40.353
B-3	16.8	00:16:48	708.500	0.06	0.602	0.63	68	249	252	60			72	72	3.0	0.24	13.56	11.905	102.7	37.202
B-4	19.2	00:19:12	709.120	0.08	0.802	0.84	68	257	247	60			72	72	3.0	0.28	15.65	13.498	106.7	37.495
B-5	21.6	00:21:36	710.750	0.13	1.303	1.40	68	254	247	58			72	72	3.0	0.36	19.95	15.036	106.4	37.591
C-1	24.0	00:24:00	712.321	0.13	1.303	1.40	69	256	248	59			73	73	3.0	0.36	19.97	16.579	106.2	37.680
C-2	26.4	00:26:24	713.900	0.07	0.702	0.74	69	256	248	57			73	73	3.0	0.26	14.66	16.872	104.8	35.150
C-3	28.8	00:28:48	714.200	0.07	0.702	0.74	69	254	249	55			73	73	3.0	0.26	14.66	17.945	104.4	34.510
C-4	31.2	00:31:12	715.300	0.08	0.802	0.84	69	245	248	54			73	73	3.0	0.28	15.67	19.702	108.5	35.182
C-5	33.6	00:33:36	717.100	0.07	0.702	0.74	69	259	249	54			73	73	3.0	0.26	14.66	20.872	108.4	34.787
D-1	36.0	00:36:00	718.300	0.07	0.702	0.74	69	253	249	55			73	73	3.0	0.26	14.66	21.555	107.0	33.680
D-2	38.4	00:38:24	719.000	0.08	0.802	0.84	69	254	250	54			73	73	3.0	0.28	15.67	22.746	106.7	33.450
D-3	40.8	00:40:48	720.220	0.07	0.702	0.74	69	254	249	54			73	73	3.0	0.26	14.66	23.868	106.6	33.150
D-4	43.2	00:43:12	721.370	0.07	0.702	0.74	69	255	249	53			73	73	3.0	0.26	14.66	25.165	107.2	33.112
D-5	45.6	00:45:36	722.700	0.07	0.702	0.74	69	253	250	53			73	73	3.0	0.26	14.66	26.049	106.3	32.562
E-1	48.0	00:48:00	723.606	0.07	0.702	0.74	70	253	247	51			74	74	3.0	0.26	14.67	27.144	106.1	32.314
E-2	50.4	00:50:24	724.730	0.10	1.003	1.10	70	254	248	51			74	74	3.0	0.32	17.53	28.245	105.2	32.097
E-3	52.8	00:52:48	725.860	0.09	0.902	0.95	70	252	248	50			74	74	3.0	0.30	16.63	29.161	104.3	31.697
E-4	55.2	00:55:12	726.800	0.08	0.802	0.84	70	254	249	50			74	74	3.0	0.28	15.68	30.651	105.4	31.928
E-5	57.6	00:57:36	728.330	0.07	0.702	0.74	70	254	251	50			74	74	3.0	0.26	14.67	31.714	105.1	31.714
Last Pt	60.0	01:00:00	729.421																	
Final Val	60.0	01:00:00	729.421											**Max Vac**	3.0	**Final Values**		31.714	105.1	
Average Values				0.10		1.05	69	253	249	56			72	72		0.31	17.16			
													72							

Notes:

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/18/19
Operator	JW
Run Number	V1Pb-3

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8290	A8877
Average Stack Temp	(t_s)	70.8	°F
Average Meter Temp	(t_m)	78.1	
Orifice Meter Coefficient	($\Delta H@$)	1.882	in H_2O
Square Root ΔP	($\Delta p^{1/2}_{avg}$)	0.31	in H_2O
Stack Moisture Content	(B_{ws})	0.68	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.53	acfm
ΔP to ΔH Isokinetic Factor	(K)	10.39	

Leak Checks		*[change]*		*[level]*		*[time]*	
Train	**Pre**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	**Post**	0.000	ft³/min@	9.0	in Hg for	65.0	sec [≥60]
Pitot	**Pre (+)**	0.00	in H_2O	5.0	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.00	in H_2O	7.0	in H_2O for	20.0	sec [≥15]
PASS	**Post (+)**	0.00	in H_2O	6.0	in H_2O for	20.0	sec [≥15]
	Post (-)	0.00	in H_2O	6.0	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	G10		
Average Nozzle Diameter	(D_{na})	0.3120	in
Suggested Nozzle Diameter	(D_{ni})	0.2271	in
Probe Number	samp-hp-0067		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0039		
Impinger Case Number	samp-bc-0019		

Pressures			
Barometric Pressure	(P_b)	29.54	in Hg
Stack Static Pressure	(P_{static})	0.01	in H_2O
Absolute Stack Pressure	(P_s)	29.54	in Hg
Absolute Meter Pressure	(P_m)	29.68	in Hg

Nozzle Measurements			**ID: G10**	
Pre	0.312	0.313	0.311	**PASS**
Post	0.312	0.313	0.311	**PASS**

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Run Time			
Start	14:26	**End**	15:35

Weights	**Imp 1**	**Imp 2**	**Imp 3**	**Imp 4**	**Imp 5**	**Imp 6**	**Imp 7**	**Imp 8**
Pre	704.6	671.2	615.6	817.7				
Post	694.9	676.5	617.2	825.1				

Wash Volumes					
					ml
					ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0067	samp-hp-0067	samp-bh-0039	samp-bc-0019			samp-cp-0029		samp-cp-0029					
Traverse Point #	**Sampling Time (Θ)**	**Timer Time**	**Dry Gas Meter Reading (V_m)**	**Velocity Head (Δp)**	**Desired Orifice ΔH (ΔH_d)**	**Actual Orifice ΔH (ΔH_a)**	**Stack Temp (t_s)**	**Probe Temp (248±25°F)**	**Filter Temp (248±25°F)**	**Impinger Exit Temp (≤68°F)**	**Cond. Temp (≤--°F)**	**CPM Filter Temp (--±--°F)**	**Meter Inlet Temp (t_{mi})**	**Meter Outlet Temp (t_{mo})**	**Pump Vacuum**	**Square Root ΔP ($\Delta p^{1/2}$)**	**Local Stack Velocity (v_s)$_i$**	**Cumul. Meter Volume (V_m)$_{std}$**	**Cumul. Percent IsoKinetic (I)**	**Est-Run Meter Volume (V_m)$_{std}$**
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	729.733	0.16	1.663	1.60	69	258	247	63			76	76	3.5	0.40	22.37	1.717	102.6	42.918
A-2	2.4	00:02:24	731.500	0.15	1.559	1.50	69	257	248	63			76	76	3.5	0.39	21.66	3.232	98.4	40.400
A-3	4.8	00:04:48	733.060	0.15	1.559	1.50	69	253	250	63			76	76	3.5	0.39	21.66	4.922	100.4	41.017
A-4	7.2	00:07:12	734.800	0.14	1.455	1.40	69	255	249	60			76	76	3.5	0.37	20.92	6.418	99.3	40.110
A-5	9.6	00:09:36	736.340	0.14	1.455	1.40	69	255	249	58			76	76	3.5	0.37	20.92	8.008	99.8	40.041
B-1	12.0	00:12:00	737.978	0.13	1.351	1.30	71	248	248	56			76	76	3.5	0.36	20.20	9.457	99.2	39.403
B-2	14.4	00:14:24	739.470	0.10	1.039	1.00	71	254	250	55			76	76	3.5	0.32	17.72	10.747	99.0	38.382
B-3	16.8	00:16:48	740.800	0.08	0.831	0.80	71	250	250	54			76	76	3.5	0.28	15.85	12.104	100.8	37.826
B-4	19.2	00:19:12	742.200	0.08	0.831	0.80	71	256	249	52			77	77	3.5	0.28	15.85	13.179	100.0	36.607
B-5	21.6	00:21:36	743.310	0.07	0.728	0.70	71	255	252	50			78	78	3.5	0.26	14.82	14.312	100.2	35.781
C-1	24.0	00:24:00	744.484	0.13	1.351	1.30	71	253	247	51			78	78	3.5	0.36	20.20	15.779	100.0	35.861
C-2	26.4	00:26:24	746.000	0.08	0.831	0.80	71	253	252	50			79	79	3.5	0.28	15.85	16.945	99.9	35.303
C-3	28.8	00:28:48	747.210	0.08	0.831	0.80	71	250	248	49			79	79	3.5	0.28	15.85	18.112	99.8	34.831
C-4	31.2	00:31:12	748.420	0.06	0.624	0.60	71	250	246	49			79	79	3.5	0.24	13.72	19.124	99.8	34.150
C-5	33.6	00:33:36	749.470	0.08	0.831	0.80	71	255	246	49			79	79	4.0	0.28	15.85	20.253	99.6	33.755
D-1	36.0	00:36:00	750.641	0.08	0.831	0.80	71	252	250	49			79	79	4.0	0.28	15.85	21.400	99.4	33.437
D-2	38.4	00:38:24	751.830	0.08	0.831	0.80	71	256	248	49			80	80	4.0	0.28	15.85	22.526	99.2	33.126
D-3	40.8	00:40:48	753.000	0.07	0.728	0.70	71	253	258	49			80	80	4.0	0.26	14.82	23.584	99.1	32.756
D-4	43.2	00:43:12	754.100	0.07	0.728	0.70	71	256	249	49			80	80	4.0	0.26	14.82	24.479	98.4	32.209
D-5	45.6	00:45:36	755.030	0.07	0.728	0.70	71	252	250	49			80	80	4.0	0.26	14.82	25.786	99.4	32.232
E-1	48.0	00:48:00	756.388	0.10	1.039	1.00	72	256	249	54			80	80	4.0	0.32	17.73	27.049	99.2	32.201
E-2	50.4	00:50:24	757.700	0.09	0.935	0.90	72	255	248	51			79	79	4.0	0.30	16.82	28.293	99.3	32.151
E-3	52.8	00:52:48	758.990	0.08	0.831	0.80	72	252	249	50			79	79	4.0	0.28	15.86	29.479	99.3	32.043
E-4	55.2	00:55:12	760.220	0.07	0.728	0.70	72	254	251	49			79	79	4.0	0.26	14.84	30.559	99.3	31.832
E-5	57.6	00:57:36	761.340	0.07	0.728	0.70	72	253	249	49			79	79	4.0	0.26	14.84	31.634	99.2	31.634
Last Pt	60.0	01:00:00	762.455																	
Final Val	60.0	01:00:00	762.455											**Max Vac**	4.0	**Final Values**		31.634	99.2	
Average Values				0.10		0.96	71	254	249	53			78	78		0.31	17.19			
													78							

Notes:

EMISSION DATA RECORDS

Vent #2 Reference Method Data

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE

Source Information	
Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room

Test Information			
Project #		amee-19-mcalester.ok-perf#1	
Operator		JW	
Date for Preliminary Run	(mm/dd/yy)	12/18/19	
Standard Temperature		68	°F
Standard Pressure		29.92	in Hg
Required Sample Vol.	indust. spec.	30	scf
Run Duration	≥ 2 min/point	60	minutes
Unit Number		Vent #2	
Base Run Number		V2Pb	
Number of Ports Available		5	
Number of Ports Used		5	
Port Inside Diameter		3.00	in
Stack Shape		Rectangular	

Test Equipment Information					
Run		**1**	**2**	**3**	
Test Date	(mm/dd/yy)	12/18/19	12/19/19	12/19/19	
Production Rate		Max	Max	Max	ton/hr
Meter Box Number	from ACS	samp-cp-0029	samp-cp-0029	samp-cp-0029	
Meter Calibration Factor	(Y)	0.995	0.995	0.995	
Orifice Meter Coefficient	($\Delta H_@$)	1.882	1.882	1.882	in H_2O
Non-Console Manometer Used		No	No	No	
Pitot Identification	from ACS	A8877	2428	A8877	
Pitot Tube Coefficient	(C_p)	0.8290	0.8190	0.8290	
Nozzle Number	from ACS	G10	A10	G10	
Nozzle Diameter	(D_n)	0.312	0.314	0.312	in
Probe Number	from ACS	samp-hp-0067	samp-hp-0066	samp-hp-0067	
Probe Length		60.0	60.0	60.0	in
(SS, Glass ….) Liner Material	from list	glass	glass	glass	
Sample Case / Oven Number	from ACS	samp-bh-0039	samp-bh-0039	samp-bh-0039	
Impinger Case Number	from ACS	samp-bc-0019	samp-bc-0015	samp-bc-0019	

Testing Company Information	
Company Name	Air Hygiene International, Inc. (Tulsa, Oklahoma)
Address	1600 W Tacoma Street
City, State Zip	Broken Arrow, Oklahoma 74012
Project Manager	Paul Little
Phone Number	(918) 307-8865
Fax Number	(918) 307-9131

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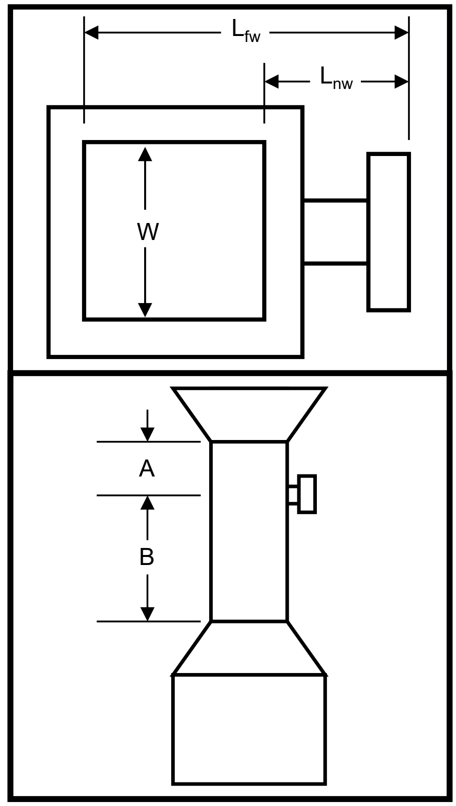
METHOD 1 - SAMPLE AND VELOCITY TRAVERSES FOR RECTANGULAR SOURCES

Plant Name	Choctaw Defense Facility	**Date**	12/18/19
Sampling Location	Centerfire Room	**Stack Type**	Rectangular
Operator	JW	**Ports Available**	5
Project #	amee-19-mcalester.ok-perf#1	**Ports Used**	5
Stack Size	Large (>24 inch diameter)	**Port ID (inches)**	3.00

Rectangular Stacks or Ducts			
Length to Far Wall of Stack	(L_{fw})	44.13	in
Length to Near Wall of Stack	(L_{nw})	0.13	in
Length of Stack	(L)	44.00	in
Width of Stack	(W)	43.00	in
Equivalent Stack Diam	(D_e)	43.49	in
Area of Stack	(A_s)	13.14	ft²



Distance from Port to Disturbances			
Distance Upstream	(A)	46.00	in
Diameters Upstream	(A_D)	1.06	diameters
Distance Downstream	(B)	101.00	in
Diameters Downstream	(B_D)	2.32	diameters

Number of Traverse Points Required			
Diameters to Flow Disturbance		**Minimum Number of[1] Traverse Points**	
Down Stream	**Up Stream**	**Particulate Points**	**Velocity Points**
2.00-4.99	0.50-1.24	25	16
5.00-5.99	1.25-1.49	20	16
6.00-6.99	1.50-1.74	16	12
7.00-7.99	1.75-1.99	12	12
>= 8.00	>=2.00	9 or 12[2]	9 or 12[2]
Upstream Spec		25	16
Downstream Spec		25	16
Traverse Pts Required		25	16

[1] Check Minimum Number of Points for the Upstream and Downstream conditions, then use the largest.

[2] 9 for Rectangular Stacks 12 to 24 inches
12 for All Stacks over 24 inches

- ◉ Method 1 Trav
- ○ 12 Point PM Trav (M201a ONLY)
- ○ Velocity

Number of Traverse Points Used			
5	**Ports by**	5	**Across**
25	**Pts Used**	25	**Required**

LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS									
Traverse Point Number	Percent of Stack Diameter from Inside Wall to Traverse Point								
	Number of Traverse Points on a Diameter								
	1	2	3	4	5	6	7	8	9
1	0.500	0.250	0.167	0.125	0.100	0.083	0.071	0.063	0.056
2		0.750	0.500	0.375	0.300	0.250	0.214	0.188	0.167
3			0.833	0.625	0.500	0.417	0.357	0.313	0.278
4				0.875	0.700	0.583	0.500	0.438	0.389
5					0.900	0.750	0.643	0.563	0.500
6						0.917	0.786	0.688	0.611
7							0.929	0.813	0.722
8								0.938	0.833
9									0.944

Traverse Point Locations			
Traverse Point Number	**Fraction of Stack Dimension**	**Distance from Inside Wall**	**Distance Including Reference Length**
		in	in
1	0.100	4 3/8	4 4/8
2	0.300	13 2/8	13 3/8
3	0.500	22	22 1/8
4	0.700	30 6/8	30 7/8
5	0.900	39 5/8	39 6/8
6			
7			
8			
9			

METHOD 2 - DETERMINATION OF STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant Name	Choctaw Defense Facility		
Sampling Location	Centerfire Room		
Operator	JW		
Project #	amee-19-mcalester.ok-perf#1		
Pitot Leak Check	x	**PreTest**	x	**PostTest**

Preliminary Run Date	12/18/19		
Stack Type	Rectangular		
Ports Available	5		
Thermocouple ID	samp-hp-0067		
Pitot Coefficient	0.8290	**Pitot Identification**	A8877

Stack Dimensions			
Area of Stack	(A_s)	13.14	ft²
Length of Stack	(L)	44.00	in
Width of Stack	(W)	43.00	in

Pressures			
Barometric Pressure	(P_b)	29.57	in Hg
Static Pressure	(P_{static})	0.01	in H_2O
Absolute Stack Pressure	(P_s)	29.57	in Hg

Stack Gas Composition			
Composition Data:	**Estimated Composition**		
Carbon Dioxide Concentration	(%CO_2)	0.00	%vd
Oxygen Concentration	(%O_2)	20.90	%vd
Carbon Monoxide Concentration	(ppmCO)	0.00	ppmvd
Nitrogen Concentration	(%N_2)	79.10	%vd
Stack Moisture Content	(B_{ws})	1.50	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Stack Wet Molecular Weight	(M_w)	28.67	lb/lb-mole

Results			
Avg Stack Gas Velocity	(v_s)	16.46	ft/sec
Avg Stack Dry Std Flow Rate	(Q_{sd})	752,538	dscf/hr
Avg Stack Dry Std Flow Rate	(Q_{sd})	12,542	dscf/min
Avg Stack Wet Flow Rate	(Q_{aw})	12,978	acf/min
Avg Stack Wet Std Flow Rate	(Q_{sw})	763,998	ascf/hr

40 CFR 60, Method 2G, Section 8.11.1 (but applies to all Method 2 type static pressure measurements):
If a Type S probe is used for this measurement, position the probe at or between any traverse point(s) and rotate the probe until a null differential pressure reading is obtained. Disconnect the tubing from one of the pressure ports; read and record the ΔP. For pressure devices with one-directional scales, if a deflection in the positive direction is noted with the negative side disconnected, then the static pressure is positive. Likewise, if a deflection in the positive direction is noted with the positive side disconnected, then the static pressure is negative.

Stack Cross Section Schematic

Velocity Traverse Data

Run Number	V2Pb-V1				
Run Time	15:58	**Start**	16:18	**End**	
Traverse Point	**Velocity Head** (Δp)	**Null Angle** (N_a)	**Zero Deg Pressure** ($0^o{}_a$)	**Stack Temp** (t_s)	**Local Velocity** ($v_{s(l)}$)
	in H_2O	deg	in H_2O	°F	ft/sec
A-1	0.09	0	0.00	72	16.84
A-2	0.07	2	0.10	72	14.85
A-3	0.07	2	0.01	72	14.85
A-4	0.09	4	0.02	72	16.84
A-5	0.11	3	0.02	72	18.62
B-1	0.09	-4	0.03	72	16.84
B-2	0.06	-3	0.03	72	13.75
B-3	0.06	0	0.00	72	13.75
B-4	0.06	0	0.02	72	13.75
B-5	0.13	6	0.05	72	20.24
C-1	0.10	0	0.00	72	17.75
C-2	0.06	-5	0.02	72	13.75
C-3	0.05	0	0.00	72	12.55
C-4	0.06	4	0.01	72	13.75
C-5	0.10	7	0.00	72	17.75
D-1	0.10	-5	0.01	72	17.75
D-2	0.06	0	0.02	72	13.75
D-3	0.06	3	0.00	72	13.75
D-4	0.07	8	0.03	72	14.85
D-5	0.13	5	0.03	72	20.24
E-1	0.11	0	0.00	72	18.62
E-2	0.07	-4	0.00	72	14.85
E-3	0.10	-5	0.02	72	17.75
E-4	0.14	3	0.00	71	20.99
E-5	0.17	9	0.03	70	23.10
Average	0.09	3		72	
	0.29	= Square roots of Δp			
Standard deviation of null angles =				2.7	

METHOD 3a - DETERMINATION OF DRY MOLECULAR WEIGHT BY ANALYZER

Plant Name	Choctaw Defense Facility	**Preliminary Run Date**	12/18/19
Sampling Location	Centerfire Room	**Operator**	JW

Gas Analysis Data								
Run Number	V2Pb-1	**Date**	12/18/19	**Run Start Time**	16:42	**Run Stop Time**	17:52	
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**			
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)			
hh:mm	%	%	ppm	%	lb/lb-mole			
01:10	0.0	20.9	0.0	79.1	28.84			

Gas Analysis Data								
Run Number	V2Pb-2	**Date**	12/19/19	**Run Start Time**	07:08	**Run Stop Time**	08:14	
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**			
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)			
hh:mm	%	%	ppm	%	lb/lb-mole			
01:06	0.0	20.9	0.0	79.1	28.84			

Gas Analysis Data								
Run Number	V2Pb-3	**Date**	12/19/19	**Run Start Time**	08:45	**Run Stop Time**	09:50	
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**			
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)			
hh:mm	%	%	ppm	%	lb/lb-mole			
01:05	0.0	20.9	0.0	79.1	28.84			

METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES

Plant Name	Choctaw Defense Facility	**Preliminary Run Date**	12/18/19
Sampling Location	Centerfire Room	**Operator**	JW
Project #	amee-19-mcalester.ok-perf#1	**Ports Used**	5

Scale Daily Calibration					
Scale Number	SAMP-SC-0035	**Standard**	**Result**	**Difference**	**Pass/Fail**
Date		(g)	(g)	(g)	(± 0.5 g)
Test Day 1	12/18/19	500	499.8	-0.2	Pass
Test Day 2	12/19/19	500	499.7	-0.3	Pass

Moisture Content Data									
Run Number		V2Pb-1		**Date**	12/18/19	**Start Time**	16:42	**Stop Time**	17:52
Meter Box Number		samp-cp-0029				**Meter Cal Factor**	(Y)	0.995	
Total Meter Volume		(V_m)	35.527	dcf		**Barometric Pressure**	(P_b)	29.54	in Hg
Average Stack Temp		$(t_s)_{avg}$	65	°F		**Stack Static Pressure**	(P_{static})	0.01	in H_2O
Average Meter Temp		$(t_m)_{avg}$	77	°F		**Avg Orifice Pressure**	$(\Delta H)_{avg}$	1.16	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	(V_f),(W_f)	687.40	700.30	564.90	878.10				
Initial Value	(V_i),(W_i)	695.30	695.80	562.60	870.20				
Net Value	(V_n),(W_n)	-7.9	4.5	2.3	7.9				
Results									
Total Weight		(W_t)	6.80	g		**Water Vol Weighed**	($V_{wsg(std)}$)	0.321	scf
Std Meter Volume		($V_{m(std)}$)	34.394	dscf		**Sat. Moisture Content**	($B_{ws(svp)}$)	2.14	%
Calc Moisture Content		($B_{ws(calc)}$)	0.92	%		**Final Moisture Content**	(B_{ws})	0.92	%

Moisture Content Data									
Run Number		V2Pb-2		**Date**	12/19/19	**Start Time**	07:08	**Stop Time**	08:14
Meter Box Number		samp-cp-0029				**Meter Cal Factor**	(Y)	0.995	
Total Meter Volume		(V_m)	35.771	dcf		**Barometric Pressure**	(P_b)	29.51	in Hg
Average Stack Temp		$(t_s)_{avg}$	58	°F		**Stack Static Pressure**	(P_{static})	0.01	in H_2O
Average Meter Temp		$(t_m)_{avg}$	70	°F		**Avg Orifice Pressure**	$(\Delta H)_{avg}$	1.20	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	(V_f),(W_f)	705.70	663.20	616.00	831.30				
Initial Value	(V_i),(W_i)	714.50	658.80	614.80	825.20				
Net Value	(V_n),(W_n)	-8.8	4.4	1.2	6.1				
Results									
Total Weight		(W_t)	2.90	g		**Water Vol Weighed**	($V_{wsg(std)}$)	0.137	scf
Std Meter Volume		($V_{m(std)}$)	35.064	dscf		**Sat. Moisture Content**	($B_{ws(svp)}$)	1.66	%
Calc Moisture Content		($B_{ws(calc)}$)	0.39	%		**Final Moisture Content**	(B_{ws})	0.39	%

Moisture Content Data									
Run Number		V2Pb-3		**Date**	12/19/19	**Start Time**	08:45	**Stop Time**	09:50
Meter Box Number		samp-cp-0029				**Meter Cal Factor**	(Y)	0.995	
Total Meter Volume		(V_m)	34.793	dcf		**Barometric Pressure**	(P_b)	29.54	in Hg
Average Stack Temp		$(t_s)_{avg}$	59	°F		**Stack Static Pressure**	(P_{static})	0.01	in H_2O
Average Meter Temp		$(t_m)_{avg}$	79	°F		**Avg Orifice Pressure**	$(\Delta H)_{avg}$	1.09	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	(V_f),(W_f)	688.10	697.70	562.50	883.80				
Initial Value	(V_i),(W_i)	692.90	694.30	561.20	872.10				
Net Value	(V_n),(W_n)	-4.8	3.4	1.3	11.7				
Results									
Total Weight		(W_t)	11.60	g		**Water Vol Weighed**	($V_{wsg(std)}$)	0.547	scf
Std Meter Volume		($V_{m(std)}$)	33.600	dscf		**Sat. Moisture Content**	($B_{ws(svp)}$)	1.72	%
Calc Moisture Content		($B_{ws(calc)}$)	1.60	%		**Final Moisture Content**	(B_{ws})	1.60	%

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/18/19
Operator	JW
Run Number	V2Pb-1

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8290	A8877
Average Stack Temp	(t_s)	65.5	°F
Average Meter Temp	(t_m)	77.3	
Orifice Meter Coefficient	($\Delta H@$)	1.882	in H_2O
Square Root ΔP	($\Delta p^{1/2}{}_{avg}$)	0.33	in H_2O
Stack Moisture Content	(B_{ws})	0.92	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.75	acfm
ΔP to ΔH Isokinetic Factor	(K)	10.44	

Leak Checks		*[change]*		*[level]*		*[time]*	
Train	**Pre**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	**Post**	0.000	ft³/min@	7.0	in Hg for	65.0	sec [≥60]
Pitot	**Pre (+)**	0.00	in H_2O	7.0	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.00	in H_2O	5.0	in H_2O for	20.0	sec [≥15]
PASS	**Post (+)**	0.00	in H_2O	8.0	in H_2O for	20.0	sec [≥15]
	Post (-)	0.00	in H_2O	6.0	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	G10		
Average Nozzle Diameter	(D_{na})	0.3120	in
Suggested Nozzle Diameter	(D_{ni})	0.2661	in
Probe Number	samp-hp-0067		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0039		
Impinger Case Number	samp-bc-0019		

Pressures			
Barometric Pressure	(P_b)	29.54	in Hg
Stack Static Pressure	(P_{static})	0.01	in H_2O
Absolute Stack Pressure	(P_s)	29.54	in Hg
Absolute Meter Pressure	(P_m)	29.68	in Hg

Nozzle Measurements			ID: G10
Pre	0.312	0.313	0.311	**PASS**
Post	0.312	0.313	0.311	**PASS**

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Run Time			
Start	16:42	**End**	17:52

Weights	**Imp 1**	**Imp 2**	**Imp 3**	**Imp 4**	**Imp 5**	**Imp 6**	**Imp 7**	**Imp 8**
Pre	695.3	695.8	562.6	870.2				
Post	687.4	700.3	564.9	878.1				

Wash Volumes					
					ml
					ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0067	samp-hp-0067	samp-bh-0039	samp-bc-0019			samp-cp-0029		samp-cp-0029					
Traverse Point #	**Sampling Time (Θ)**	**Timer Time**	**Dry Gas Meter Reading (V_m)**	**Velocity Head (Δp)**	**Desired Orifice ΔH (ΔH_d)**	**Actual Orifice ΔH (ΔH_a)**	**Stack Temp (t_s)**	**Probe Temp (248±25°F)**	**Filter Temp (248±25°F)**	**Impinger Exit Temp (≤68°F)**	**Cond. Temp (≤--°F)**	**CPM Filter Temp (--±--°F)**	**Meter Inlet Temp (t_{mi})**	**Meter Outlet Temp (t_{mo})**	**Pump Vacuum**	**Square Root ΔP ($\Delta p^{1/2}$)**	**Local Stack Velocity (v_s)$_i$**	**Cumul. Meter Volume (V_m)$_{std}$**	**Cumul. Percent IsoKinetic (I)**	**Est-Run Meter Volume (V_m)$_{std}$**
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	763.058	0.11	1.149	1.20	70	248	250	59			74	74	4.0	0.33	18.57	1.473	106.5	36.826
A-2	2.4	00:02:24	764.570	0.11	1.149	1.20	70	248	252	53			75	75	4.0	0.33	18.57	2.893	104.6	36.159
A-3	4.8	00:04:48	766.030	0.10	1.044	1.10	68	250	252	51			75	75	4.0	0.32	17.68	4.322	105.8	36.015
A-4	7.2	00:07:12	767.500	0.10	1.044	1.10	68	252	249	49			75	75	4.0	0.32	17.68	5.683	105.1	35.518
A-5	9.6	00:09:36	768.900	0.08	0.835	0.85	66	252	249	45			75	75	4.0	0.28	15.78	6.811	103.5	34.054
B-1	12.0	00:12:00	770.061	0.09	0.940	0.96	65	256	249	48			76	76	4.0	0.30	16.72	8.100	103.4	33.750
B-2	14.4	00:14:24	771.390	0.12	1.253	1.30	65	249	249	46			76	76	4.0	0.35	19.31	9.547	102.8	34.095
B-3	16.8	00:16:48	772.880	0.07	0.731	0.75	65	252	249	45			76	76	4.0	0.26	14.75	10.671	102.7	33.347
B-4	19.2	00:19:12	774.040	0.07	0.731	0.75	65	253	249	45			77	77	4.0	0.26	14.75	11.774	102.4	32.706
B-5	21.6	00:21:36	775.180	0.09	0.940	0.96	65	255	249	45			77	77	4.0	0.30	16.72	13.164	103.2	32.909
C-1	24.0	00:24:00	776.615	0.09	0.940	0.96	65	250	249	45			77	77	4.0	0.30	16.72	14.282	102.1	32.459
C-2	26.4	00:26:24	777.770	0.11	1.149	1.20	65	256	249	45			77	77	4.0	0.33	18.49	15.929	103.8	33.185
C-3	28.8	00:28:48	779.470	0.07	0.731	0.75	65	256	249	45			77	77	4.0	0.26	14.75	17.139	104.2	32.959
C-4	31.2	00:31:12	780.720	0.09	0.940	0.96	65	253	248	45			77	77	4.0	0.30	16.72	18.368	103.8	32.800
C-5	33.6	00:33:36	781.990	0.11	1.149	1.20	65	256	249	45			78	78	4.0	0.33	18.49	19.774	103.6	32.957
D-1	36.0	00:36:00	783.444	0.11	1.149	1.20	65	257	250	45			78	78	4.0	0.33	18.49	21.143	103.2	33.037
D-2	38.4	00:38:24	784.860	0.10	1.044	1.10	65	245	249	45			78	78	4.0	0.32	17.62	22.468	103.1	33.041
D-3	40.8	00:40:48	786.230	0.11	1.149	1.20	65	254	248	47			79	79	4.0	0.33	18.49	23.790	102.6	33.042
D-4	43.2	00:43:12	787.600	0.10	1.044	1.10	65	257	249	47			79	79	4.0	0.32	17.62	25.112	102.5	33.042
D-5	45.6	00:45:36	788.970	0.09	0.940	0.96	65	254	250	47			80	80	4.0	0.30	16.72	26.328	102.2	32.910
E-1	48.0	00:48:00	790.233	0.16	1.671	1.70	64	256	250	47			79	79	4.0	0.40	22.27	27.987	102.0	33.318
E-2	50.4	00:50:24	791.950	0.16	1.671	1.70	64	255	249	47			79	79	4.0	0.40	22.27	29.698	102.0	33.748
E-3	52.8	00:52:48	793.720	0.16	1.671	1.70	64	252	248	47			79	79	4.0	0.40	22.27	31.331	101.8	34.056
E-4	55.2	00:55:12	795.410	0.14	1.462	1.50	64	252	248	46			80	80	4.0	0.37	20.83	32.854	101.5	34.223
E-5	57.6	00:57:36	796.990	0.15	1.566	1.60	64	253	249	46			80	80	4.0	0.39	21.57	34.393	101.2	34.393
Last Pt	60.0	01:00:00	798.585																	
Final Val	60.0	01:00:00	798.585											**Max Vac**	4.0	**Final Values**		34.393	101.2	
Average Values				0.11		1.16	65	253	249	47			77	77		0.33	18.15			
													77							

Notes:

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/19/19
Operator	JW
Run Number	V2Pb-2

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8190	2428
Average Stack Temp	(t_s)	58.2	°F
Average Meter Temp	(t_m)	70.2	
Orifice Meter Coefficient	($\Delta H@$)	1.882	in H_2O
Square Root ΔP	($\Delta p^{1/2}{}_{avg}$)	0.33	in H_2O
Stack Moisture Content	(B_{ws})	0.39	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.57	acfm
ΔP to ΔH Isokinetic Factor	(K)	10.51	

Leak Checks		*[change]*		*[level]*		*[time]*	
Train	**Pre**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	**Post**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
Pitot	**Pre (+)**	0.00	in H_2O	5.0	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.00	in H_2O	6.0	in H_2O for	20.0	sec [≥15]
PASS	**Post (+)**	0.00	in H_2O	5.0	in H_2O for	20.0	sec [≥15]
	Post (-)	0.00	in H_2O	4.0	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	A10		
Average Nozzle Diameter	(D_{na})	0.3137	in
Suggested Nozzle Diameter	(D_{ni})	0.2336	in
Probe Number	samp-hp-0066		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0039		
Impinger Case Number	samp-bc-0015		

Pressures			
Barometric Pressure	(P_b)	29.51	in Hg
Stack Static Pressure	(P_{static})	0.01	in H_2O
Absolute Stack Pressure	(P_s)	29.51	in Hg
Absolute Meter Pressure	(P_m)	29.65	in Hg

Nozzle Measurements			**ID: A10**	
Pre	0.314	0.314	0.313	**PASS**
Post	0.314	0.314	0.313	**PASS**

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Run Time			
Start	07:08	**End**	08:14

Weights	**Imp 1**	**Imp 2**	**Imp 3**	**Imp 4**	**Imp 5**	**Imp 6**	**Imp 7**	**Imp 8**
Pre	714.5	658.8	614.8	825.2				
Post	705.7	663.2	616.0	831.3				

Wash Volumes					ml
					ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0066	samp-hp-0066	samp-bh-0039	samp-bc-0015			samp-cp-0029		samp-cp-0029					
Traverse Point #	**Sampling Time (Θ)**	**Timer Time**	**Dry Gas Meter Reading (V_m)**	**Velocity Head (Δp)**	**Desired Orifice ΔH (ΔH_d)**	**Actual Orifice ΔH (ΔH_a)**	**Stack Temp (t_s)**	**Probe Temp (248±25°F)**	**Filter Temp (248±25°F)**	**Impinger Exit Temp (≤68°F)**	**Cond. Temp (≤--°F)**	**CPM Filter Temp (--±--°F)**	**Meter Inlet Temp (t_{mi})**	**Meter Outlet Temp (t_{mo})**	**Pump Vacuum**	**Square Root ΔP ($\Delta p^{1/2}$)**	**Local Stack Velocity (v_s)$_i$**	**Cumul. Meter Volume (V_m)$_{std}$**	**Cumul. Percent IsoKinetic (I)**	**Est-Run Meter Volume (V_m)$_{std}$**
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	798.888	0.14	1.471	1.50	59	252	250	37			58	58	3.0	0.37	20.47	1.619	102.4	40.463
A-2	2.4	00:02:24	800.500	0.12	1.261	1.30	59	249	249	37			58	58	3.0	0.35	18.96	3.114	102.3	38.923
A-3	4.8	00:04:48	801.990	0.16	1.681	1.70	59	257	248	37			58	58	3.0	0.40	21.89	4.882	103.2	40.682
A-4	7.2	00:07:12	803.750	0.14	1.471	1.50	59	256	250	37			58	58	3.0	0.37	20.47	6.518	103.3	40.740
A-5	9.6	00:09:36	805.380	0.17	1.786	1.80	59	252	249	37			58	58	3.0	0.41	22.56	8.372	104.0	41.861
B-1	12.0	00:12:00	807.225	0.14	1.471	1.50	57	257	249	39			62	62	3.0	0.37	20.43	9.892	102.7	41.215
B-2	14.4	00:14:24	808.750	0.12	1.261	1.30	57	255	250	43			64	64	3.0	0.35	18.92	11.410	102.8	40.748
B-3	16.8	00:16:48	810.280	0.08	0.841	0.84	57	252	250	43			65	65	3.0	0.28	15.45	12.616	102.6	39.426
B-4	19.2	00:19:12	811.500	0.07	0.736	0.74	57	250	249	44			68	68	3.0	0.26	14.45	13.737	102.4	38.158
B-5	21.6	00:21:36	812.640	0.13	1.366	1.40	57	255	248	44			69	69	3.0	0.36	19.69	15.288	102.4	38.220
C-1	24.0	00:24:00	814.218	0.12	1.261	1.30	58	252	252	48			71	71	3.0	0.35	18.94	16.719	102.0	37.999
C-2	26.4	00:26:24	815.680	0.08	0.841	0.84	58	255	250	48			72	72	3.0	0.28	15.46	17.930	101.9	37.353
C-3	28.8	00:28:48	816.920	0.06	0.631	0.63	58	249	248	48			73	73	3.0	0.24	13.39	19.127	102.8	36.783
C-4	31.2	00:31:12	818.150	0.07	0.736	0.74	59	251	248	48			74	74	3.0	0.26	14.48	20.070	101.9	35.840
C-5	33.6	00:33:36	819.120	0.11	1.156	1.20	59	249	248	47			75	75	3.0	0.33	18.15	21.402	101.5	35.670
D-1	36.0	00:36:00	820.491	0.11	1.156	1.20	59	255	249	46			75	75	3.0	0.33	18.15	22.790	101.3	35.610
D-2	38.4	00:38:24	821.920	0.09	0.946	0.95	59	258	247	48			76	76	3.0	0.30	16.42	24.050	101.2	35.367
D-3	40.8	00:40:48	823.220	0.09	0.946	0.95	59	253	249	48			76	76	3.0	0.30	16.42	25.319	101.2	35.166
D-4	43.2	00:43:12	824.530	0.08	0.841	0.84	58	253	250	49			77	77	3.0	0.28	15.46	26.489	101.0	34.854
D-5	45.6	00:45:36	825.740	0.15	1.576	1.60	58	252	249	49			77	77	3.0	0.39	21.17	27.997	100.6	34.996
E-1	48.0	00:48:00	827.296	0.15	1.576	1.60	58	255	248	50			77	77	3.0	0.39	21.17	29.599	100.4	35.237
E-2	50.4	00:50:24	828.950	0.16	1.681	1.70	58	252	249	50			78	78	3.0	0.40	21.87	31.253	100.3	35.515
E-3	52.8	00:52:48	830.660	0.12	1.261	1.30	58	249	251	50			78	78	3.0	0.35	18.94	32.741	100.3	35.588
E-4	55.2	00:55:12	832.200	0.09	0.946	0.95	58	251	249	50			79	79	3.0	0.30	16.40	34.003	100.3	35.420
E-5	57.6	00:57:36	833.510	0.07	0.736	0.74	58	256	248	50			79	79	3.0	0.26	14.46	35.110	100.3	35.110
Last Pt	60.0	01:00:00	834.659																	
Final Val	60.0	01:00:00	834.659											**Max Vac**	3.0	**Final Values**		35.110	100.3	
Average Values				0.11		1.20	58	253	249	45			70	70		0.33	18.17			
													70							

Notes:

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/19/19
Operator	JW
Run Number	V2Pb-3

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8290	A8877
Average Stack Temp	(t_s)	59.3	°F
Average Meter Temp	(t_m)	78.6	
Orifice Meter Coefficient	($\Delta H@$)	1.882	in H_2O
Square Root ΔP	($\Delta p^{1/2}{}_{avg}$)	0.32	in H_2O
Stack Moisture Content	(B_{ws})	1.60	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.58	acfm
ΔP to ΔH Isokinetic Factor	(K)	10.47	

Leak Checks		*[change]*		*[level]*		*[time]*	
Train	**Pre**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	**Post**	0.000	ft³/min@	9.0	in Hg for	65.0	sec [≥60]
Pitot	**Pre (+)**	0.00	in H_2O	5.0	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.00	in H_2O	7.0	in H_2O for	20.0	sec [≥15]
PASS	**Post (+)**	0.00	in H_2O	6.0	in H_2O for	20.0	sec [≥15]
	Post (-)	0.00	in H_2O	6.0	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	G10		
Average Nozzle Diameter	(D_{na})	0.3120	in
Suggested Nozzle Diameter	(D_{ni})	0.2345	in
Probe Number	samp-hp-0067		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0039		
Impinger Case Number	samp-bc-0019		

Pressures			
Barometric Pressure	(P_b)	29.54	in Hg
Stack Static Pressure	(P_{static})	0.01	in H_2O
Absolute Stack Pressure	(P_s)	29.54	in Hg
Absolute Meter Pressure	(P_m)	29.68	in Hg

Nozzle Measurements			**ID: G10**	
Pre	0.312	0.313	0.311	**PASS**
Post	0.312	0.313	0.311	**PASS**

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Run Time			
Start	08:45	**End**	09:50

Weights	**Imp 1**	**Imp 2**	**Imp 3**	**Imp 4**	**Imp 5**	**Imp 6**	**Imp 7**	**Imp 8**
Pre	692.9	694.3	561.2	872.1				
Post	688.1	697.7	562.5	883.8				

Wash						ml
Volumes						ml

Identification Nos.	samp-cp-0029	samp-cp-0029	samp-cp-0029				samp-hp-0067	samp-hp-0067	samp-bh-0039	samp-bc-0019			**samp-cp-0029**		samp-cp-0029					
Traverse Point #	**Sampling Time (Θ)**	**Timer Time**	**Dry Gas Meter Reading (V_m)**	**Velocity Head (Δp)**	**Desired Orifice ΔH (ΔH_d)**	**Actual Orifice ΔH (ΔH_a)**	**Stack Temp (t_s)**	**Probe Temp (248±25°F)**	**Filter Temp (248±25°F)**	**Impinger Exit Temp (≤68°F)**	**Cond. Temp (≤--°F)**	**CPM Filter Temp (--±--°F)**	**Meter Inlet Temp (t_{mi})**	**Meter Outlet Temp (t_{mo})**	**Pump Vacuum**	**Square Root ΔP ($\Delta p^{1/2}$)**	**Local Stack Velocity (v_s)$_l$**	**Cumul. Meter Volume (V_m)$_{std}$**	**Cumul. Percent IsoKinetic (I)**	**Est-Run Meter Volume (V_m)$_{std}$**
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	834.988	0.12	1.257	1.20	59	249	249	47			77	77	4.0	0.35	19.22	1.407	96.9	35.167
A-2	2.4	00:02:24	836.440	0.13	1.361	1.30	59	255	249	47			77	77	4.0	0.36	20.01	2.880	97.2	35.995
A-3	4.8	00:04:48	837.960	0.15	1.571	1.60	59	257	249	45			77	77	4.0	0.39	21.49	4.509	98.4	37.573
A-4	7.2	00:07:12	839.640	0.15	1.571	1.60	59	245	249	47			78	78	4.0	0.39	21.49	6.154	99.2	38.464
A-5	9.6	00:09:36	841.340	0.15	1.571	1.60	59	249	250	47			78	78	4.0	0.39	21.49	7.805	99.7	39.023
B-1	12.0	00:12:00	843.045	0.12	1.257	1.20	59	244	249	49			78	78	4.0	0.35	19.22	9.241	99.6	38.502
B-2	14.4	00:14:24	844.530	0.11	1.152	1.10	59	246	249	49			79	79	4.0	0.33	18.40	10.582	99.2	37.792
B-3	16.8	00:16:48	845.920	0.07	0.733	0.72	59	252	249	48			79	79	4.0	0.26	14.68	11.681	99.2	36.503
B-4	19.2	00:19:12	847.060	0.07	0.733	0.72	59	258	249	48			79	79	4.0	0.26	14.68	12.780	99.2	35.500
B-5	21.6	00:21:36	848.200	0.13	1.361	1.30	59	252	250	49			79	79	4.0	0.36	20.01	14.267	99.1	35.667
C-1	24.0	00:24:00	849.740	0.12	1.257	1.20	59	245	246	50			79	79	4.0	0.35	19.22	15.657	98.8	35.583
C-2	26.4	00:26:24	851.180	0.06	0.628	0.62	59	252	248	51			79	79	4.0	0.24	13.59	16.697	99.0	34.786
C-3	28.8	00:28:48	852.260	0.06	0.628	0.62	59	252	249	51			79	79	4.0	0.24	13.59	17.709	98.9	34.057
C-4	31.2	00:31:12	853.310	0.06	0.628	0.62	59	255	249	50			79	79	4.0	0.24	13.59	18.731	99.0	33.448
C-5	33.6	00:33:36	854.370	0.11	1.152	1.10	59	253	251	50			79	79	4.0	0.33	18.40	20.029	98.6	33.381
D-1	36.0	00:36:00	855.715	0.08	0.838	0.83	59	252	250	50			78	78	4.0	0.28	15.69	21.212	98.7	33.144
D-2	38.4	00:38:24	856.940	0.09	0.943	0.93	59	254	249	51			79	79	4.0	0.30	16.65	22.476	98.8	33.053
D-3	40.8	00:40:48	858.250	0.09	0.943	0.93	60	251	248	50			79	79	4.0	0.30	16.66	23.749	98.9	32.985
D-4	43.2	00:43:12	859.570	0.08	0.838	0.83	60	254	249	50			79	79	4.0	0.28	15.71	24.945	99.0	32.822
D-5	45.6	00:45:36	860.810	0.10	1.047	1.05	60	254	248	50			79	79	4.0	0.32	17.56	26.270	99.1	32.837
E-1	48.0	00:48:00	862.183	0.15	1.571	1.60	60	252	248	51			78	78	4.0	0.39	21.51	27.941	99.3	33.263
E-2	50.4	00:50:24	863.910	0.15	1.571	1.60	60	247	249	51			79	79	4.0	0.39	21.51	29.593	99.5	33.629
E-3	52.8	00:52:48	865.620	0.12	1.257	1.20	60	251	249	51			79	79	4.0	0.35	19.24	31.138	99.8	33.845
E-4	55.2	00:55:12	867.220	0.09	0.943	0.93	60	249	250	51			79	79	4.0	0.30	16.66	32.411	99.9	33.761
E-5	57.6	00:57:36	868.540	0.08	0.838	0.83	60	249	249	50			79	79	4.0	0.28	15.71	33.607	99.9	33.607
Last Pt	60.0	01:00:00	869.781																	
Final Val	60.0	01:00:00	869.781											**Max Vac**	4.0	**Final Values**		33.607	99.9	
Average Values				0.11		1.09	59	251	249	49			79	79		0.32	17.84			
													79							

Notes:

EMISSION DATA RECORDS

Vent #3 Reference Method Data

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE

Source Information	
Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room

Test Information			
Project #		amee-19-mcalester.ok-perf#1	
Operator		JW	
Date for Preliminary Run	(mm/dd/yy)	12/19/19	
Standard Temperature		68	°F
Standard Pressure		29.92	in Hg
Required Sample Vol.	indust. spec.	30	scf
Run Duration	≥ 2 min/point	60	minutes
Unit Number		Vent #3	
Base Run Number		V3Pb	
Number of Ports Available		5	
Number of Ports Used		5	
Port Inside Diameter		3.00	in
Stack Shape		Rectangular	

Test Equipment Information					
Run		**1**	**2**	**3**	
Test Date	(mm/dd/yy)	12/19/19	12/19/19	12/19/19	
Production Rate		Max	Max	Max	ton/hr
Meter Box Number	from ACS	samp-cp-0029	samp-cp-0029	samp-cp-0029	
Meter Calibration Factor	(Y)	0.995	0.995	0.995	
Orifice Meter Coefficient	($\Delta H_{@}$)	1.882	1.882	1.882	in H_2O
Non-Console Manometer Used		Yes	Yes	Yes	
Pitot Identification	from ACS	A8877	2428	A8877	
Pitot Tube Coefficient	(C_p)	0.8290	0.8190	0.8290	
Nozzle Number	from ACS	G12	F14	G14	
Nozzle Diameter	(D_n)	0.386	0.433	0.436	in
Probe Number	from ACS	samp-hp-0067	samp-hp-0066	samp-hp-0067	
Probe Length		60.0	60.0	60.0	in
(SS, Glass ….) Liner Material	from list	glass	glass	glass	
Sample Case / Oven Number	from ACS	samp-bh-0038	samp-bh-0038	samp-bh-0038	
Impinger Case Number	from ACS	samp-bc-0015	samp-bc-0019	samp-bc-0015	

Testing Company Information	
Company Name	Air Hygiene International, Inc. (Tulsa, Oklahoma)
Address	1600 W Tacoma Street
City, State Zip	Broken Arrow, Oklahoma 74012
Project Manager	Paul Little
Phone Number	(918) 307-8865
Fax Number	(918) 307-9131

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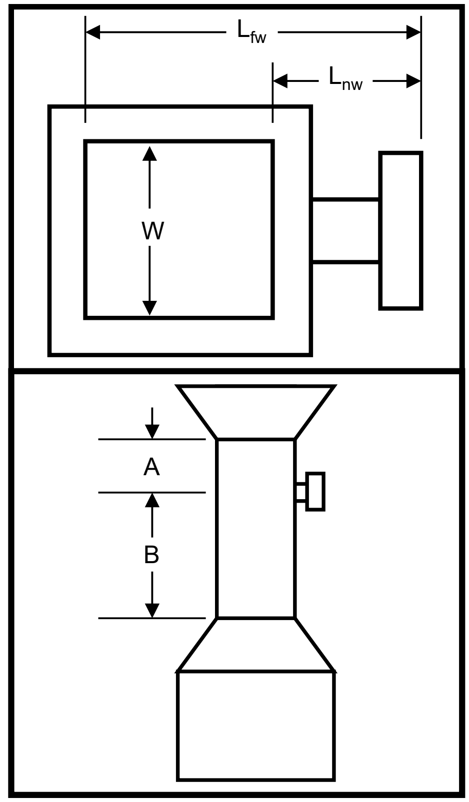
METHOD 1 - SAMPLE AND VELOCITY TRAVERSES FOR RECTANGULAR SOURCES

Plant Name	Choctaw Defense Facility	**Date**	12/19/19
Sampling Location	Centerfire Room	**Stack Type**	Rectangular
Operator	JW	**Ports Available**	5
Project #	amee-19-mcalester.ok-perf#1	**Ports Used**	5
Stack Size	Large (>24 inch diameter)	**Port ID (inches)**	3.00

Rectangular Stacks or Ducts			
Length to Far Wall of Stack	(L_{fw})	36.13	in
Length to Near Wall of Stack	(L_{nw})	0.13	in
Length of Stack	(L)	36.00	in
Width of Stack	(W)	36.00	in
Equivalent Stack Diam	(D_e)	36.00	in
Area of Stack	(A_s)	9.00	ft²



Distance from Port to Disturbances			
Distance Upstream	(A)	12.00	in
Diameters Upstream	(A_D)	0.33	diameters
Distance Downstream	(B)	44.00	in
Diameters Downstream	(B_D)	1.22	diameters

Number of Traverse Points Required			
Diameters to Flow Disturbance		**Minimum Number of Traverse Points**[1]	
Down Stream	**Up Stream**	**Particulate Points**	**Velocity Points**
2.00-4.99	0.50-1.24	25	16
5.00-5.99	1.25-1.49	20	16
6.00-6.99	1.50-1.74	16	12
7.00-7.99	1.75-1.99	12	12
>= 8.00	>=2.00	9 or 12[2]	9 or 12[2]
Upstream Spec		25	16
Downstream Spec		25	16
Traverse Pts Required		25	16

[1] Check Minimum Number of Points for the Upstream and Downstream conditions, then use the largest.

[2] 9 for Rectangular Stacks 12 to 24 inches
12 for All Stacks over 24 inches

- (●) *Method 1 Trav*
- ( ) 12 Point PM Trav (M201a ONLY)
- ( ) Velocity

Stack does NOT meet Method 1 criteria.			
Number of Traverse Points Used			
5	**Ports by**	5	**Across**
25	**Pts Used**	25	**Required**

LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS									
Traverse Point Number	Percent of Stack Diameter from Inside Wall to Traverse Point — Number of Traverse Points on a Diameter								
	1	2	3	4	5	6	7	8	9
1	0.500	0.250	0.167	0.125	0.100	0.083	0.071	0.063	0.056
2		0.750	0.500	0.375	0.300	0.250	0.214	0.188	0.167
3			0.833	0.625	0.500	0.417	0.357	0.313	0.278
4				0.875	0.700	0.583	0.500	0.438	0.389
5					0.900	0.750	0.643	0.563	0.500
6						0.917	0.786	0.688	0.611
7							0.929	0.813	0.722
8								0.938	0.833
9									0.944

Traverse Point Locations			
Traverse Point Number	**Fraction of Stack Dimension**	**Distance from Inside Wall**	**Distance Including Reference Length**
		in	in
1	0.100	3 5/8	3 6/8
2	0.300	10 6/8	10 7/8
3	0.500	18	18 1/8
4	0.700	25 2/8	25 3/8
5	0.900	32 3/8	32 4/8
6			
7			
8			
9			

METHOD 2 - DETERMINATION OF STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant Name	Choctaw Defense Facility			
Sampling Location	Centerfire Room			
Operator	JW			
Project #	amee-19-mcalester.ok-perf#1			
Pitot Leak Check	x	**PreTest**	x	**PostTest**

Preliminary Run Date	12/19/19		
Stack Type	Rectangular		
Ports Available	5		
Thermocouple ID	samp-hp-0067		
Pitot Coefficient	0.8290	**Pitot Identification**	A8877

Stack Dimensions			
Area of Stack	(A_s)	9.00	ft²
Length of Stack	(L)	36.00	in
Width of Stack	(W)	36.00	in

Pressures			
Barometric Pressure	(P_b)	29.53	in Hg
Static Pressure	(P_{static})	0.02	in H_2O
Absolute Stack Pressure	(P_s)	29.53	in Hg

Stack Gas Composition			
Composition Data:	**Estimated Composition**		
Carbon Dioxide Concentration	(%CO_2)	0.00	%vd
Oxygen Concentration	(%O_2)	20.90	%vd
Carbon Monoxide Concentration	(ppmCO)	0.00	ppmvd
Nitrogen Concentration	(%N_2)	79.10	%vd
Stack Moisture Content	(B_{ws})	1.00	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Stack Wet Molecular Weight	(M_w)	28.73	lb/lb-mole

Results			
Avg Stack Gas Velocity	(v_s)	5.40	ft/sec
Avg Stack Dry Std Flow Rate	(Q_{sd})	172,211	dscf/hr
Avg Stack Dry Std Flow Rate	(Q_{sd})	2,870	dscf/min
Avg Stack Wet Flow Rate	(Q_{aw})	2,915	acf/min
Avg Stack Wet Std Flow Rate	(Q_{sw})	173,951	ascf/hr

40 CFR 60, Method 2G, Section 8.11.1 (but applies to all Method 2 type static pressure measurements):
If a Type S probe is used for this measurement, position the probe at or between any traverse point(s) and rotate the probe until a null differential pressure reading is obtained. Disconnect the tubing from one of the pressure ports; read and record the ΔP. For pressure devices with one-directional scales, if a deflection in the positive direction is noted with the negative side disconnected, then the static pressure is positive. Likewise, if a deflection in the positive direction is noted with the positive side disconnected, then the static pressure is negative.

Stack Cross Section Schematic

Velocity Traverse Data					
Run Number	V3Pb-V1				
Run Time	11:09	**Start**	11:43	**End**	
Traverse Point	**Velocity Head** (Δp)	**Null Angle** (N_a)	**Zero Deg Pressure** ($0^o{}_a$)	**Stack Temp** (t_s)	**Local Velocity** ($v_{s(l)}$)
	in H_2O	deg	in H_2O	°F	ft/sec
A-1	0.010	0	0.00	64	5.57
A-2	0.015	0	0.00	64	6.82
A-3	0.010	0	0.00	64	5.57
A-4	0.015	0	0.00	64	6.82
A-5	0.015	0	0.00	64	6.82
B-1	0.015	0	0.00	64	6.82
B-2	0.015	0	0.00	64	6.82
B-3	0.015	0	0.00	64	6.82
B-4	0.015	0	0.00	64	6.82
B-5	0.010	0	0.00	64	5.57
C-1	0.010	0	0.00	64	5.57
C-2	0.010	0	0.00	64	5.57
C-3	0.010	0	0.00	64	5.57
C-4	0.005	0	0.00	64	3.94
C-5	0.005	0	0.00	64	3.94
D-1	0.010	0	0.00	64	5.57
D-2	0.010	0	0.00	64	5.57
D-3	0.010	0	0.00	64	5.57
D-4	0.010	0	0.00	64	5.57
D-5	0.005	0	0.00	64	3.94
E-1	0.005	0	0.00	64	3.94
E-2	0.005	0	0.00	64	3.94
E-3	0.005	0	0.00	64	3.94
E-4	0.005	0	0.00	64	3.94
E-5	0.005	0	0.00	64	3.94
Average	0.010			64	
	0.10	**= Square roots of Δp**			
Standard deviation of null angles =					

METHOD 3a - DETERMINATION OF DRY MOLECULAR WEIGHT BY ANALYZER

Plant Name	Choctaw Defense Facility	**Preliminary Run Date**	12/19/19
Sampling Location	Centerfire Room	**Operator**	JW

Gas Analysis Data

Run Number	V3Pb-1	**Date**	12/19/19	**Run Start Time**	12:01	**Run Stop Time**	13:08
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**		
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)		
hh:mm	%	%	ppm	%	lb/lb-mole		
01:07	0.0	20.9	0.0	79.1	28.84		

Gas Analysis Data

Run Number	V3Pb-2	**Date**	12/19/19	**Run Start Time**	13:47	**Run Stop Time**	14:54
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**		
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)		
hh:mm	%	%	ppm	%	lb/lb-mole		
01:07	0.0	20.9	0.0	79.1	28.84		

Gas Analysis Data

Run Number	V3Pb-3	**Date**	12/19/19	**Run Start Time**	15:11	**Run Stop Time**	16:18
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**		
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)		
hh:mm	%	%	ppm	%	lb/lb-mole		
01:07	0.0	20.9	0.0	79.1	28.84		

METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES

Plant Name	Choctaw Defense Facility	**Preliminary Run Date**	12/19/19
Sampling Location	Centerfire Room	**Operator**	JW
Project #	amee-19-mcalester.ok-perf#1	**Ports Used**	5

Scale Daily Calibration					
Scale Number	SAMP-SC-0035	**Standard**	**Result**	**Difference**	**Pass/Fail**
Date		(g)	(g)	(g)	(± 0.5 g)
Test Day 1	12/19/19	500	499.7	-0.3	Pass

Moisture Content Data								
Run Number		V3Pb-1		**Date**	12/19/19	**Start Time** 12:01	**Stop Time**	13:08
Meter Box Number		samp-cp-0029			**Meter Cal Factor**	(Y)	0.995	
Total Meter Volume		(V_m)	14.567	dcf	**Barometric Pressure**	(P_b)	29.53	in Hg
Average Stack Temp		$(t_s)_{avg}$	64	°F	**Stack Static Pressure**	(P_{static})	0.02	in H_2O
Average Meter Temp		$(t_m)_{avg}$	67	°F	**Avg Orifice Pressure**	$(\Delta H)_{avg}$	0.21	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	$(V_f),(W_f)$	706.40	667.00	614.20	889.60				
Initial Value	$(V_i),(W_i)$	706.00	666.20	614.00	886.90				
Net Value	$(V_n),(W_n)$	0.4	0.8	0.2	2.7				
Results									
Total Weight		(W_t)	4.10	g	**Water Vol Weighed**	$(V_{wsg(std)})$	0.193	scf
Std Meter Volume		$(V_{m(std)})$	14.348	dscf	**Sat. Moisture Content**	$(B_{ws(svp)})$	2.06	%
Calc Moisture Content		$(B_{ws(calc)})$	1.33	%	**Final Moisture Content**	(B_{ws})	1.33	%

Moisture Content Data								
Run Number		V3Pb-2		**Date**	12/19/19	**Start Time** 13:47	**Stop Time**	14:54
Meter Box Number		samp-cp-0029			**Meter Cal Factor**	(Y)	0.995	
Total Meter Volume		(V_m)	21.053	dcf	**Barometric Pressure**	(P_b)	29.45	in Hg
Average Stack Temp		$(t_s)_{avg}$	64	°F	**Stack Static Pressure**	(P_{static})	0.02	in H_2O
Average Meter Temp		$(t_m)_{avg}$	72	°F	**Avg Orifice Pressure**	$(\Delta H)_{avg}$	0.41	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	$(V_f),(W_f)$	698.40	693.70	562.20	887.30				
Initial Value	$(V_i),(W_i)$	699.20	692.20	562.00	883.80				
Net Value	$(V_n),(W_n)$	-0.8	1.5	0.2	3.5				
Results									
Total Weight		(W_t)	4.40	g	**Water Vol Weighed**	$(V_{wsg(std)})$	0.207	scf
Std Meter Volume		$(V_{m(std)})$	20.488	dscf	**Sat. Moisture Content**	$(B_{ws(svp)})$	2.01	%
Calc Moisture Content		$(B_{ws(calc)})$	1.00	%	**Final Moisture Content**	(B_{ws})	1.00	%

Moisture Content Data								
Run Number		V3Pb-3		**Date**	12/19/19	**Start Time** 15:11	**Stop Time**	16:18
Meter Box Number		samp-cp-0029			**Meter Cal Factor**	(Y)	0.995	
Total Meter Volume		(V_m)	19.976	dcf	**Barometric Pressure**	(P_b)	29.45	in Hg
Average Stack Temp		$(t_s)_{avg}$	63	°F	**Stack Static Pressure**	(P_{static})	0.02	in H_2O
Average Meter Temp		$(t_m)_{avg}$	73	°F	**Avg Orifice Pressure**	$(\Delta H)_{avg}$	0.38	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	$(V_f),(W_f)$	704.60	667.80	614.60	893.10				
Initial Value	$(V_i),(W_i)$	706.80	666.90	614.30	889.60				
Net Value	$(V_n),(W_n)$	-2.2	0.9	0.3	3.5				
Results									
Total Weight		(W_t)	2.50	g	**Water Vol Weighed**	$(V_{wsg(std)})$	0.118	scf
Std Meter Volume		$(V_{m(std)})$	19.399	dscf	**Sat. Moisture Content**	$(B_{ws(svp)})$	2.00	%
Calc Moisture Content		$(B_{ws(calc)})$	0.60	%	**Final Moisture Content**	(B_{ws})	0.60	%

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/19/19
Operator	JW
Run Number	V3Pb-1

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8290	A8877
Average Stack Temp	(t_s)	64.3	°F
Average Meter Temp	(t_m)	66.7	
Orifice Meter Coefficient	($\Delta H@$)	1.882	in H_2O
Square Root ΔP	($\Delta p^{1/2}_{avg}$)	0.09	in H_2O
Stack Moisture Content	(B_{ws})	1.33	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.75	acfm
ΔP to ΔH Isokinetic Factor	(K)	23.96	

Leak Checks		*[change]*		*[level]*		*[time]*	
Train	**Pre**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	**Post**	0.000	ft³/min@	9.0	in Hg for	65.0	sec [≥60]
Pitot	**Pre (+)**	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
<3.0in	**Post (+)**	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
	Post (-)	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	G12		
Average Nozzle Diameter	(D_{na})	0.3863	in
Suggested Nozzle Diameter	(D_{ni})	0.3692	in
Probe Number	samp-hp-0067		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0038		
Impinger Case Number	samp-bc-0015		

Nozzle Measurements			**ID: G12**	
Pre	0.387	0.387	0.385	**PASS**
Post	0.387	0.387	0.385	**PASS**

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Pressures			
Barometric Pressure	(P_b)	29.53	in Hg
Stack Static Pressure	(P_{static})	0.02	in H_2O
Absolute Stack Pressure	(P_s)	29.53	in Hg
Absolute Meter Pressure	(P_m)	29.67	in Hg

Run Time			
Start	12:01	**End**	13:08

Weights	**Imp 1**	**Imp 2**	**Imp 3**	**Imp 4**	**Imp 5**	**Imp 6**	**Imp 7**	**Imp 8**
Pre	706.0	666.2	614.0	886.9				
Post	706.4	667.0	614.2	889.6				

Wash Volumes					
					ml
					ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0067	samp-hp-0067	samp-bh-0038	samp-bc-0015			**samp-cp-0029**		samp-cp-0029					
Traverse Point #	**Sampling Time (Θ)**	**Timer Time**	**Dry Gas Meter Reading (V_m)**	**Velocity Head (Δp)**	**Desired Orifice ΔH (ΔH_d)**	**Actual Orifice ΔH (ΔH_a)**	**Stack Temp (t_s)**	**Probe Temp (248±25°F)**	**Filter Temp (248±25°F)**	**Impinger Exit Temp (≤68°F)**	**Cond. Temp (≤--°F)**	**CPM Filter Temp (--±--°F)**	**Meter Inlet Temp (t_{mi})**	**Meter Outlet Temp (t_{mo})**	**Pump Vacuum**	**Square Root ΔP ($\Delta p^{1/2}$)**	**Local Stack Velocity ($v_s)_i$**	**Cumul. Meter Volume ($V_m)_{std}$**	**Cumul. Percent IsoKinetic (I)**	**Est-Run Meter Volume ($V_m)_{std}$**
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	870.050	0.005	0.120	0.12	63	257	252	52			63	63	1.0	0.07	3.94	0.347	76.5	8.678
A-2	2.4	00:02:24	870.400	0.010	0.240	0.25	63	254	254	48			63	63	1.0	0.10	5.57	0.744	68.7	9.299
A-3	4.8	00:04:48	870.800	0.010	0.240	0.25	63	260	245	48			64	64	1.0	0.10	5.57	1.605	103.9	13.378
A-4	7.2	00:07:12	871.670	0.010	0.240	0.25	63	260	244	47			64	64	1.0	0.10	5.57	2.249	102.9	14.056
A-5	9.6	00:09:36	872.320	0.005	0.120	0.12	63	258	244	48			64	64	1.0	0.07	3.94	2.702	102.4	13.511
B-1	12.0	00:12:00	872.778	0.010	0.240	0.25	63	251	246	48			64	64	1.0	0.10	5.57	3.318	101.2	13.826
B-2	14.4	00:14:24	873.400	0.005	0.120	0.12	63	253	249	49			65	65	1.0	0.07	3.94	3.822	102.5	13.650
B-3	16.8	00:16:48	873.910	0.010	0.240	0.25	63	253	246	48			65	65	1.0	0.10	5.57	4.415	101.2	13.797
B-4	19.2	00:19:12	874.510	0.005	0.120	0.12	63	257	246	49			66	66	1.0	0.07	3.94	4.869	101.1	13.524
B-5	21.6	00:21:36	874.970	0.005	0.120	0.12	64	256	242	50			66	66	1.0	0.07	3.94	5.264	100.0	13.160
C-1	24.0	00:24:00	875.371	0.015	0.359	0.37	64	257	248	51			66	66	1.0	0.12	6.83	6.042	99.9	13.733
C-2	26.4	00:26:24	876.160	0.010	0.240	0.25	64	256	251	49			67	67	1.0	0.10	5.57	6.682	99.9	13.922
C-3	28.8	00:28:48	876.810	0.010	0.240	0.25	65	255	251	50			67	67	1.0	0.10	5.58	7.263	99.2	13.968
C-4	31.2	00:31:12	877.400	0.010	0.240	0.25	65	254	251	50			68	68	1.0	0.10	5.58	7.971	100.2	14.233
C-5	33.6	00:33:36	878.120	0.015	0.359	0.37	65	252	246	50			68	68	1.0	0.12	6.83	8.740	100.0	14.567
D-1	36.0	00:36:00	878.903	0.010	0.240	0.25	65	254	245	50			68	68	1.0	0.10	5.58	9.376	100.0	14.650
D-2	38.4	00:38:24	879.550	0.015	0.359	0.37	65	257	245	50			68	68	1.0	0.12	6.83	10.182	100.2	14.974
D-3	40.8	00:40:48	880.370	0.005	0.120	0.12	65	255	251	51			69	69	1.0	0.07	3.94	10.643	100.3	14.782
D-4	43.2	00:43:12	880.840	0.005	0.120	0.12	65	255	248	53			69	69	1.0	0.07	3.94	11.094	100.2	14.597
D-5	45.6	00:45:36	881.300	0.005	0.120	0.12	65	252	246	54			69	69	1.0	0.07	3.94	11.528	100.1	14.410
E-1	48.0	00:48:00	881.743	0.010	0.240	0.25	65	255	245	53			69	69	1.0	0.10	5.58	12.182	100.2	14.503
E-2	50.4	00:50:24	882.410	0.010	0.240	0.25	65	251	254	53			69	69	1.0	0.10	5.58	12.820	100.2	14.568
E-3	52.8	00:52:48	883.060	0.005	0.120	0.12	66	250	252	53			69	69	1.0	0.07	3.95	13.281	100.2	14.436
E-4	55.2	00:55:12	883.530	0.005	0.120	0.12	66	255	245	53			69	69	1.0	0.07	3.95	13.742	100.3	14.314
E-5	57.6	00:57:36	884.000	0.010	0.240	0.25	66	252	247	53			69	69	1.0	0.10	5.58	14.347	100.0	14.347
Last Pt	60.0	01:00:00	884.617																	
Final Val	60.0	01:00:00	884.617											**Max Vac**	1.0	**Final Values**		14.347	100.0	
Average Values				0.009		0.21	64	255	248	50			67	67		0.09	5.07			
													67							

Notes:

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/19/19
Operator	JW
Run Number	V3Pb-2

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8190	2428
Average Stack Temp	(t_s)	63.6	°F
Average Meter Temp	(t_m)	71.9	
Orifice Meter Coefficient	(ΔH@)	1.882	in H_2O
Square Root ΔP	($\Delta p^{1/2}{}_{avg}$)	0.10	in H_2O
Stack Moisture Content	(B_{ws})	1.00	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.24	acfm
ΔP to ΔH Isokinetic Factor	(K)	37.40	

Leak Checks		*[change]*		*[level]*		*[time]*	
Train	**Pre**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	**Post**	0.000	ft³/min@	8.0	in Hg for	65.0	sec [≥60]
Pitot	**Pre (+)**	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
<3.0in	**Post (+)**	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
	Post (-)	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	F14		
Average Nozzle Diameter	(D_{na})	0.4327	in
Suggested Nozzle Diameter	(D_{ni})	0.2023	in
Probe Number	samp-hp-0066		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0038		
Impinger Case Number	samp-bc-0019		

Pressures			
Barometric Pressure	(P_b)	29.45	in Hg
Stack Static Pressure	(P_{static})	0.02	in H_2O
Absolute Stack Pressure	(P_s)	29.45	in Hg
Absolute Meter Pressure	(P_m)	29.59	in Hg

Nozzle Measurements			**ID: F14**	
Pre	0.432	0.433	0.433	**PASS**
Post	0.432	0.433	0.433	**PASS**

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Run Time			
Start	13:47	**End**	14:54

Weights	**Imp 1**	**Imp 2**	**Imp 3**	**Imp 4**	**Imp 5**	**Imp 6**	**Imp 7**	**Imp 8**
Pre	699.2	692.2	562.0	883.8				
Post	698.4	693.7	562.2	887.3				

Wash Volumes					
					ml
					ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0066	samp-hp-0066	samp-bh-0038	samp-bc-0019			**samp-cp-0029**		samp-cp-0029					
Traverse Point #	**Sampling Time (Θ)**	**Timer Time**	**Dry Gas Meter Reading (V_m)**	**Velocity Head (Δp)**	**Desired Orifice ΔH (ΔH_d)**	**Actual Orifice ΔH (ΔH_a)**	**Stack Temp (t_s)**	**Probe Temp (248±25°F)**	**Filter Temp (248±25°F)**	**Impinger Exit Temp (≤68°F)**	**Cond. Temp (≤--°F)**	**CPM Filter Temp (--±--°F)**	**Meter Inlet Temp (t_{mi})**	**Meter Outlet Temp (t_{mo})**	**Pump Vacuum**	**Square Root ΔP ($\Delta p^{1/2}$)**	**Local Stack Velocity ($(v_s)_i$)**	**Cumul. Meter Volume ($(V_m)_{std}$)**	**Cumul. Percent IsoKinetic (I)**	**Est-Run Meter Volume ($(V_m)_{std}$)**
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	884.816	0.015	0.561	0.56	65	257	249	61			69	69	2.0	0.12	6.76	0.993	102.0	24.815
A-2	2.4	00:02:24	885.830	0.015	0.561	0.56	65	252	248	53			70	70	2.0	0.12	6.76	1.970	101.2	24.620
A-3	4.8	00:04:48	886.830	0.015	0.561	0.56	65	256	248	51			70	70	2.0	0.12	6.76	2.917	100.0	24.311
A-4	7.2	00:07:12	887.800	0.010	0.374	0.37	65	254	249	52			70	70	2.0	0.10	5.52	3.718	100.2	23.238
A-5	9.6	00:09:36	888.620	0.010	0.374	0.37	64	254	250	52			70	70	2.0	0.10	5.51	4.500	99.9	22.502
B-1	12.0	00:12:00	889.421	0.010	0.374	0.30	64	252	250	51			70	70	2.0	0.10	5.51	5.290	99.8	22.043
B-2	14.4	00:14:24	890.230	0.015	0.561	0.56	64	251	248	51			70	70	2.0	0.12	6.75	6.179	98.6	22.069
B-3	16.8	00:16:48	891.140	0.005	0.187	0.19	64	256	249	51			71	71	2.0	0.07	3.90	6.793	99.5	21.229
B-4	19.2	00:19:12	891.770	0.010	0.374	0.37	64	250	249	53			71	71	2.0	0.10	5.51	7.544	99.0	20.955
B-5	21.6	00:21:36	892.540	0.005	0.187	0.19	64	253	249	54			71	71	2.0	0.07	3.90	8.118	99.2	20.294
C-1	24.0	00:24:00	893.129	0.015	0.561	0.56	64	258	248	55			71	71	2.0	0.12	6.75	9.094	99.3	20.668
C-2	26.4	00:26:24	894.130	0.015	0.561	0.56	64	254	248	55			71	71	2.0	0.12	6.75	10.049	99.2	20.936
C-3	28.8	00:28:48	895.110	0.015	0.561	0.56	64	257	249	55			72	72	2.0	0.12	6.75	11.062	99.7	21.273
C-4	31.2	00:31:12	896.150	0.015	0.561	0.56	64	255	250	54			72	72	2.0	0.12	6.75	12.055	99.9	21.526
C-5	33.6	00:33:36	897.170	0.010	0.374	0.37	64	255	249	54			73	73	2.0	0.10	5.51	12.890	100.2	21.483
D-1	36.0	00:36:00	898.030	0.015	0.561	0.56	62	256	251	56			73	73	2.0	0.12	6.74	13.929	100.7	21.765
D-2	38.4	00:38:24	899.100	0.010	0.374	0.37	62	249	251	55			73	73	2.0	0.10	5.50	14.706	100.5	21.627
D-3	40.8	00:40:48	899.900	0.010	0.374	0.37	62	254	249	55			73	73	2.0	0.10	5.50	15.483	100.4	21.504
D-4	43.2	00:43:12	900.700	0.015	0.561	0.56	62	252	249	55			74	74	2.0	0.12	6.74	16.395	100.0	21.572
D-5	45.6	00:45:36	901.640	0.005	0.187	0.19	63	249	249	55			74	74	2.0	0.07	3.89	17.030	100.5	21.288
E-1	48.0	00:48:00	902.296	0.010	0.374	0.37	63	252	249	55			74	74	2.0	0.10	5.50	17.819	100.4	21.213
E-2	50.4	00:50:24	903.110	0.015	0.561	0.60	63	255	249	55			74	74	2.0	0.12	6.74	18.799	100.4	21.362
E-3	52.8	00:52:48	904.120	0.005	0.187	0.19	63	256	248	56			74	74	2.0	0.07	3.89	19.370	100.4	21.055
E-4	55.2	00:55:12	904.710	0.005	0.187	0.19	63	255	250	56			74	74	2.0	0.07	3.89	19.932	100.4	20.763
E-5	57.6	00:57:36	905.290	0.005	0.187	0.19	63	255	249	56			74	74	2.0	0.07	3.89	20.493	100.4	20.493
Last Pt	60.0	01:00:00	905.869																	
Final Val	60.0	01:00:00	905.869											**Max Vac**	2.0	**Final Values**		20.493	100.4	
Average Values				0.011		0.41	64	254	249	54			72	72		0.10	5.67			
													72							

Notes:

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/19/19
Operator	JW
Run Number	V3Pb-3

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8290	A8877
Average Stack Temp	(t_s)	63.4	°F
Average Meter Temp	(t_m)	73.0	
Orifice Meter Coefficient	$(\Delta H@)$	1.882	in H_2O
Square Root ΔP	$(\Delta p^{1/2}{}_{avg})$	0.10	in H_2O
Stack Moisture Content	(B_{ws})	0.60	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.34	acfm
ΔP to ΔH Isokinetic Factor	(K)	39.87	

Leak Checks		*[change]*		*[level]*		*[time]*	
Train	**Pre**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	**Post**	0.000	ft³/min@	7.0	in Hg for	65.0	sec [≥60]
Pitot	**Pre (+)**	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.000	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
<3.0in	**Post (+)**	0.000	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
	Post (-)	0.000	in H_2O	0.3	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	G14		
Average Nozzle Diameter	(D_{na})	0.4360	in
Suggested Nozzle Diameter	(D_{ni})	0.2439	in
Probe Number	samp-hp-0067		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0038		
Impinger Case Number	samp-bc-0015		

Pressures			
Barometric Pressure	(P_b)	29.45	in Hg
Stack Static Pressure	(P_{static})	0.02	in H_2O
Absolute Stack Pressure	(P_s)	29.45	in Hg
Absolute Meter Pressure	(P_m)	29.59	in Hg

Nozzle Measurements			**ID: G14**	
Pre	0.437	0.435	0.436	**PASS**
Post	0.437	0.435	0.436	**PASS**

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Run Time			
Start	15:11	**End**	16:18

Weights	**Imp 1**	**Imp 2**	**Imp 3**	**Imp 4**	**Imp 5**	**Imp 6**	**Imp 7**	**Imp 8**
Pre	706.8	666.9	614.3	889.6				
Post	704.6	667.8	614.6	893.1				

Wash Volumes						ml
						ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0067	samp-hp-0067	samp-bh-0038	samp-bc-0015			**samp-cp-0029**		samp-cp-0029					
Traverse Point #	**Sampling Time (Θ)**	**Timer Time**	**Dry Gas Meter Reading (V_m)**	**Velocity Head (Δp)**	**Desired Orifice ΔH (ΔH_d)**	**Actual Orifice ΔH (ΔH_a)**	**Stack Temp (t_s)**	**Probe Temp (248±25°F)**	**Filter Temp (248±25°F)**	**Impinger Exit Temp (≤68°F)**	**Cond. Temp (≤--°F)**	**CPM Filter Temp (--±--°F)**	**Meter Inlet Temp (t_{mi})**	**Meter Outlet Temp (t_{mo})**	**Pump Vacuum**	**Square Root ΔP $(\Delta p^{1/2})$**	**Local Stack Velocity $(v_s)_i$**	**Cumul. Meter Volume $(V_m)_{std}$**	**Cumul. Percent IsoKinetic (I)**	**Est-Run Meter Volume $(V_m)_{std}$**
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	906.315	0.015	0.598	0.59	64	258	252	58			72	72	2.0	0.12	6.83	1.027	102.3	25.674
A-2	2.4	00:02:24	907.370	0.015	0.598	0.59	64	256	250	55			73	73	2.0	0.12	6.83	1.999	99.6	24.982
A-3	4.8	00:04:48	908.370	0.015	0.598	0.59	64	256	249	55			73	73	2.0	0.12	6.83	3.019	100.3	25.157
A-4	7.2	00:07:12	909.420	0.010	0.399	0.40	63	254	248	52			73	73	2.0	0.10	5.57	3.854	100.6	24.087
A-5	9.6	00:09:36	910.280	0.010	0.399	0.40	63	255	248	50			73	73	2.0	0.10	5.57	4.695	100.9	23.475
B-1	12.0	00:12:00	911.146	0.010	0.399	0.40	63	252	249	51			73	73	2.0	0.10	5.57	5.524	101.0	23.018
B-2	14.4	00:14:24	912.000	0.010	0.399	0.40	63	255	249	50			73	73	2.0	0.10	5.57	6.311	100.3	22.539
B-3	16.8	00:16:48	912.810	0.010	0.399	0.40	63	254	250	49			73	73	2.0	0.10	5.57	7.127	100.2	22.271
B-4	19.2	00:19:12	913.650	0.010	0.399	0.40	63	255	250	49			73	73	2.0	0.10	5.57	7.923	99.9	22.009
B-5	21.6	00:21:36	914.470	0.010	0.399	0.40	63	256	247	48			73	73	2.0	0.10	5.57	8.730	99.8	21.825
C-1	24.0	00:24:00	915.301	0.010	0.399	0.40	63	251	250	51			73	73	2.0	0.10	5.57	9.535	99.6	21.671
C-2	26.4	00:26:24	916.130	0.005	0.199	0.20	63	255	249	50			73	73	2.0	0.07	3.94	10.118	99.7	21.078
C-3	28.8	00:28:48	916.730	0.010	0.399	0.40	63	252	249	50			73	73	2.0	0.10	5.57	10.914	99.5	20.988
C-4	31.2	00:31:12	917.550	0.010	0.399	0.40	63	253	259	49			73	73	2.0	0.10	5.57	11.720	99.4	20.929
C-5	33.6	00:33:36	918.380	0.015	0.598	0.60	63	254	249	49			73	73	2.0	0.12	6.82	12.582	98.4	20.970
D-1	36.0	00:36:00	919.267	0.005	0.199	0.20	63	252	248	51			73	73	2.0	0.07	3.94	12.711	97.7	19.861
D-2	38.4	00:38:24	919.400	0.010	0.399	0.40	63	253	250	50			73	73	2.0	0.10	5.57	13.886	101.5	20.421
D-3	40.8	00:40:48	920.610	0.005	0.199	0.20	63	255	247	49			73	73	2.0	0.07	3.94	14.439	101.3	20.055
D-4	43.2	00:43:12	921.180	0.010	0.399	0.40	63	252	247	49			73	73	2.0	0.10	5.57	15.245	101.1	20.060
D-5	45.6	00:45:36	922.010	0.010	0.399	0.40	64	252	248	49			74	74	2.0	0.10	5.57	16.050	101.0	20.062
E-1	48.0	00:48:00	922.840	0.010	0.399	0.40	64	255	249	51			73	73	2.0	0.10	5.57	16.788	100.5	19.986
E-2	50.4	00:50:24	923.600	0.005	0.199	0.20	64	252	248	50			73	73	2.0	0.07	3.94	17.467	101.1	19.849
E-3	52.8	00:52:48	924.300	0.005	0.199	0.20	64	251	252	49			73	73	2.0	0.07	3.94	18.050	101.1	19.619
E-4	55.2	00:55:12	924.900	0.005	0.199	0.20	64	252	252	49			73	73	2.0	0.07	3.94	18.535	100.7	19.308
E-5	57.6	00:57:36	925.400	0.010	0.399	0.40	64	253	247	49			73	73	2.0	0.10	5.57	19.400	100.9	19.400
Last Pt	60.0	01:00:00	926.291																	
Final Val	60.0	01:00:00	926.291											**Max Vac**	2.0	**Final Values**		19.400	100.9	
Average Values				0.010		0.38	63	254	249	50			73	73		0.10	5.38			
													73							

Notes:

APPENDIX C

LABORATORY ANALYSIS

Your Project #: AMEE-19-MCALESTER.OK-PERF#1

Attention: Data Reports

Air Hygiene International Inc
1600 West Tacoma Street
Broken Arrow, OK
USA 74012

Report Date: 2020/01/08
Report #: R6029908
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B9AE876
Received: 2019/12/24, 13:11

Sample Matrix: Stack Sampling Train
Samples Received: 11

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Lead in Filter by ICPMS (M12mod) (1)	11	2020/01/07	2020/01/07	BRL SOP-00103	EPA 12 m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) EPA Method 12 Modification - The analysis for the lead was completed using ICPMS instead of flame AA.

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Your Project #: AMEE-19-MCALESTER.OK-PERF#1

Attention: Data Reports

Air Hygiene International Inc
1600 West Tacoma Street
Broken Arrow, OK
USA 74012

Report Date: 2020/01/08
Report #: R6029908
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B9AE876
Received: 2019/12/24, 13:11

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
Email: Clayton.Johnson@bvlabs.com
Phone# (905)817-5769
==
This report has been generated and distributed using a secure automated process.
BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

BV Labs Job #: B9AE876
Report Date: 2020/01/08

Air Hygiene International Inc
Client Project #: AMEE-19-MCALESTER.OK-PERF#1

EPA M12 - LEAD DETERMINATION BY ICPMS (STACK SAMPLING TRAIN)

BV Labs ID		LRI790	LRI791		LRI792	LRI792	LRI793		
Sampling Date		2019/12/17	2019/12/17		2019/12/18	2019/12/18	2019/12/18		
	UNITS	**M12- FILTER BLANKS**	**M12- HNO3 BLANK**	**RDL**	**M12- V1- R1**	**M12- V1- R1 Lab-Dup**	**M12- V1- R2**	**RDL**	**QC Batch**
Metals									
Inorganic Lead (Pb)	ug	<0.2	0.6	0.2	3.2	3.4	2.8	0.5	6526725

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

BV Labs ID		LRI794	LRI795	LRI796	LRI797	LRI798	LRI799	LRI800		
Sampling Date		2019/12/18	2019/12/18	2019/12/19	2019/12/19	2019/12/19	2019/12/19	2019/12/19		
	UNITS	**M12- V1- R3**	**M12- V2- R1**	**M12- V2- R2**	**M12- V2- R3**	**M12- V3- R1**	**M12- V3- R2**	**M12- V3- R3**	**RDL**	**QC Batch**
Metals										
Inorganic Lead (Pb)	ug	2.1	1.4	2.3	2.0	1.4	1.1	1.2	0.5	6526725

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

BV Labs Job #: B9AE876
Report Date: 2020/01/08

Air Hygiene International Inc
Client Project #: AMEE-19-MCALESTER.OK-PERF#1

TEST SUMMARY

BV Labs ID: LRI790 **Collected:** 2019/12/17
Sample ID: M12- FILTER BLANKS **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI791 **Collected:** 2019/12/17
Sample ID: M12- HNO3 BLANK **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI792 **Collected:** 2019/12/18
Sample ID: M12- V1- R1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI792 Dup **Collected:** 2019/12/18
Sample ID: M12- V1- R1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI793 **Collected:** 2019/12/18
Sample ID: M12- V1- R2 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI794 **Collected:** 2019/12/18
Sample ID: M12- V1- R3 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI795 **Collected:** 2019/12/18
Sample ID: M12- V2- R1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

TEST SUMMARY

BV Labs ID: LRI796
Sample ID: M12- V2- R2
Matrix: Stack Sampling Train

Collected: 2019/12/19
Shipped:
Received: 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI797
Sample ID: M12- V2- R3
Matrix: Stack Sampling Train

Collected: 2019/12/19
Shipped:
Received: 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI798
Sample ID: M12- V3- R1
Matrix: Stack Sampling Train

Collected: 2019/12/19
Shipped:
Received: 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI799
Sample ID: M12- V3- R2
Matrix: Stack Sampling Train

Collected: 2019/12/19
Shipped:
Received: 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI800
Sample ID: M12- V3- R3
Matrix: Stack Sampling Train

Collected: 2019/12/19
Shipped:
Received: 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

GENERAL COMMENTS

EPA M12 - LEAD DETERMINATION BY ICPMS (STACK SAMPLING TRAIN)

Lead in Filter by ICPMS (M12mod): Post digestion duplicate and spike were done on sample LRI792.

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
6526725	N_R	Matrix Spike(LRI792)	Inorganic Lead (Pb)	2020/01/07		104	%	75 - 125
6526725	N_R	Matrix Spike DUP(LRI792)	Inorganic Lead (Pb)	2020/01/07		101	%	75 - 125
6526725	N_R	MS/MSD RPD	Inorganic Lead (Pb)	2020/01/07	3.0		%	20
6526725	N_R	Spiked Blank	Inorganic Lead (Pb)	2020/01/07		100	%	85 - 115
6526725	N_R	Spiked Blank DUP	Inorganic Lead (Pb)	2020/01/07		96	%	85 - 115
6526725	N_R	RPD	Inorganic Lead (Pb)	2020/01/07	3.5		%	20
6526725	N_R	Method Blank	Inorganic Lead (Pb)	2020/01/07	<0.5		ug	
6526725	N_R	RPD - Sample/Sample Dup	Inorganic Lead (Pb)	2020/01/07	4.9		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

John Bowman, Supervisor, Metals Group

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

1 of 3

B9AE876

SAMPLE DESCRIPTION AND CHAIN OF CUSTODY RECORD

Air Hygiene International, Inc.
1600 W Tacoma Street
Broken Arrow, Oklahoma 74012
(888) 461-8778
www.airhygiene.com

Project Number:	amee-19-mcalester.ok-perf#1			Laboratory Analysis Requested:			
Person Taking Samples:	Paul Little			EPA Method 12 - Lead			
Sample Number	Location	Date	Volume	Analysis Method			
				Method 12			
HNO3-Blank	Choctaw Defense Facility, Vent 1	12/17/19	As Marked	x			
Filter Blank	Choctaw Defense Facility, Vent 1	12/17/19	N/A	x			
V1-R1-Filter	Choctaw Defense Facility, Vent 1	12/18/19	N/A	x			
V1-R1-PW	Choctaw Defense Facility, Vent 1	12/18/19	As Marked	x			
V1-R1-IMPC	Choctaw Defense Facility, Vent 1	12/18/19	As Marked	x			
V1-R2-Filter	Choctaw Defense Facility, Vent 1	12/18/19	N/A	x			
V1-R2-PW	Choctaw Defense Facility, Vent 1	12/18/19	As Marked	x			
V1-R2-IMPC	Choctaw Defense Facility, Vent 1	12/18/19	As Marked	x			
V1-R3-Filter	Choctaw Defense Facility, Vent 1	12/18/19	N/A	x			
V1-R3-PW	Choctaw Defense Facility, Vent 1	12/18/19	As Marked	x			
V1-R3-IMPC	Choctaw Defense Facility, Vent 1	12/18/19	As Marked	x			

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
Paul L	12/20/19	08:45	Sa Baug	12/20/19	08:50
[signature]	12/20/19	13:50	FIDELE NTAMWEMEZI	2019/12/24	13:11

EE V1 COC

B9AE876

SAMPLE DESCRIPTION AND CHAIN OF CUSTODY RECORD

Air Hygiene International, Inc.
1600 W Tacoma Street
Broken Arrow, Oklahoma 74012
(888) 461-8778
www.airhygiene.com

Project Number:	amee-19-mcalester.ok-perf#1	Laboratory Analysis Requested:	
Person Taking Samples:	Paul Little	EPA Method 12 - Lead	

Sample Number	Location	Date	Volume	Analysis Method: Method 12			
V2-R1-Filter	Choctaw Defense Facility, Vent 2	12/18/19	N/A	x			
V2-R1-PW	Choctaw Defense Facility, Vent 2	12/18/19	As Marked	x			
V2-R1-IMPC	Choctaw Defense Facility, Vent 2	12/19/19	As Marked	x			
V2-R2-Filter	Choctaw Defense Facility, Vent 2	12/19/19	N/A	x			
V2-R2-PW	Choctaw Defense Facility, Vent 2	12/19/19	As Marked	x			
V2-R2-IMPC	Choctaw Defense Facility, Vent 2	12/19/19	As Marked	x			
V2-R3-Filter	Choctaw Defense Facility, Vent 2	12/19/19	N/A	x			
V2-R3-PW	Choctaw Defense Facility, Vent 2	12/19/19	As Marked	x			
V2-R3-IMPC	Choctaw Defense Facility, Vent 2	12/19/19	As Marked	x			

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
Paul [illegible]	12/20/19	08:45	[illegible]	12/24/19	08:50
[illegible]	12/24/19	13:50	FIDELE NTAMWEMEZI [illegible]	2019/12/24	13:11

EE V2 - COC

3 of 3

B9AE876

SAMPLE DESCRIPTION AND CHAIN OF CUSTODY RECORD

Air Hygiene International, Inc.
1600 W Tacoma Street
Broken Arrow, Oklahoma 74012
(888) 461-8778
www.airhygiene.com

Project Number:	amee-19-mcalester.ok-perf#1	Laboratory Analysis Requested:	
Person Taking Samples:	Paul Little	EPA Method 12 - Lead	

Sample Number	Location	Date	Volume	Analysis Method: Method 12			
V3-R1-Filter	Choctaw Defense Facility, Vent 3	12/19/19	N/A	x			
V3-R1-PW	Choctaw Defense Facility, Vent 3	12/19/19	As Marked	x			
V3-R1-IMPC	Choctaw Defense Facility, Vent 3	12/19/19	As Marked	x			
V3-R2-Filter	Choctaw Defense Facility, Vent 3	12/19/19	N/A	x			
V3-R2-PW	Choctaw Defense Facility, Vent 3	12/19/19	As Marked	x			
V3-R2-IMPC	Choctaw Defense Facility, Vent 3	12/19/19	As Marked	x			
V3-R3-Filter	Choctaw Defense Facility, Vent 3	12/19/19	N/A	x			
V3-R3-PW	Choctaw Defense Facility, Vent 3	12/19/19	As Marked	x			
V3-R3-IMPC	Choctaw Defense Facility, Vent 3	12/19/19	As Marked	x			

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Paul Little	12/20/19	08:45	[signature]	12/20/19	08:50
[signature]	12/24/19	13:50	FIDELE NTAMWEMEZI / Fidele Ntamwemezi	2019/12/24	13:11

EE V3 - COC

APPENDIX D

QUALITY ASSURANCE AND QUALITY CONTROL DATA

QA/QC PROGRAM

AIR HYGIENE ensures the quality and validity of its emission measurement and reporting procedures through a rigorous quality assurance (QA) program. The program is developed and administered by an internal QA team and encompasses six major areas:

1. Field Qualifications
2. QA reviews of reports, laboratory work, and field testing;
3. Equipment calibration and maintenance;
4. Chain-of-custody;
5. Training; and
6. Knowledge of current test methods

Field Qualifications

Air Hygiene personnel are required to gain and maintain competence with testing methods and techniques according to their job titles and the roles they play during field testing events. Qualifications for each job description include:

Staff Technician - An entry level position with responsibility to test on the stack by performing duties that include: keep trucks and trailers stocked and clean, travel to and from job site, be the "hands of the test" on the stack; stay on a stack during the sample test, set up and tear down equipment on-site, perform maintenance on equipment in the shop and on-site.

Test Technician or Specialist - Acts as the "hands of the test" on the stack by performing duties that include: stay on a stack during the sample test, migrate to the testing trailer and learn the different analyzers and testing methods used on site, set up and tear down testing equipment on site, learn the system for testing from Testing Managers and Project Managers, travel to and from job site; including driving responsibilities under DOT requirements, follow directions of Testing Managers and Project Managers, learn the proper way to conduct on-site test of stationary stacks

Test Manager or Engineer - Directs and coordinates all aspects of a successful test by performing the following duties personally or through subordinate supervisors including: operating analyzers and consoles during testing along with QA/QC procedures, supervise set up and tear down of equipment on site, writing, reviewing, and revising final test reports, working with the client or state personnel while on the job site, managing pre-test checklists and onsite testing procedures, diagnose and repair any problems that may arise with the equipment, safely operate a man lift and drive a truck with or without a trailer, act as crew leader in the field, write protocols and reports, maintain project log of services performed on the job, verify all equipment needed for a job was loaded on the trailer. Test Managers must hold at least one QSTI certificate.

Project Manager - Directs and coordinates all aspects of a successful test by performing the following duties personally or through subordinate supervisors including: operating analyzers and consoles during testing along with QA/QC procedures, supervise set up and tear down of equipment on site, writing, reviewing, and revising final test reports, working with the client or state personnel while on the job site, managing pre-test checklists and onsite testing procedures, diagnose and repair any problems that may arise with the equipment, safely operate a man lift and drive a truck with or without a trailer, act as crew leader in the field, write protocols and reports, maintain project log of services performed on the job, verify all equipment needed for a job was loaded on the trailer. Project Managers typically hold QSTI certificates in Groups 1 through 4.

QA Reviews

Air Hygiene's review procedure includes review of each source test report, along with laboratory and fieldwork, by the QA Team. The most important review is the one that takes place before a test program begins. The QA Team works closely with technical division personnel to prepare and review test protocols. Test protocol review includes selection of appropriate test procedures, evaluation of interferences or other restrictions that might preclude use of standard test procedures, and evaluation and/or development of alternate procedures.

Equipment Calibration and Maintenance

The equipment used to conduct the emission measurements is maintained according to the manufacturer's instructions to ensure proper operation. In addition to the maintenance program, calibrations are carried out on each measurement device according to the schedule outlined by the Environmental Protection Agency. Quality control checks are also conducted in the field for each test program. In conformance with ASTM D7036 Section 15.3.15, all metering and monitoring equipment meets or exceeds the uncertainty criteria contained in the method language that pertains to that equipment.

Chain-of-Custody

Air Hygiene maintains full chain-of-custody documentation on all samples and data sheets. In addition to normal documentation of changes between field sample custodians, laboratory personnel, and field test personnel, Air Hygiene documents every individual who handles any test component in the field (e.g., probe wash, impinger loading and recovery, filter loading and recovery, etc.). Samples are stored in a locked area to which only Air Hygiene personnel have access. Field data sheets are secured at Air Hygiene's offices upon return from the field.

Training

Personnel's training is essential to ensure quality testing. Air Hygiene has formal and informal training programs, which include:

1. Attendance at EPA-sponsored training courses
2. Enrollment in EPA correspondence courses
3 A requirement for all technicians to read and understand Air Hygiene's QA manual
4. In-house training and QA meetings on a regular basis
5. Maintenance of training records

Knowledge of Current Test Methods

With the constant updating of standard test methods and the wide variety of emerging test procedures, it is essential that any qualified source tester keep abreast of new developments. Air Hygiene subscribes to services, which provide updates on EPA reference methods, rules, and regulations. Additionally, source test personnel regularly attend and present papers at testing and emission-related seminars and conferences. Air Hygiene personnel maintain membership in the Air and Waste Management Association and the American Industrial Hygiene Association.

Reproduction and Distribution Policy

Reproducing portions of this test report may omit critical or substantial documentation or be taken out of context and due care must be exercised in this regard. Furthermore, this test report and its associated data shall not be reproduced in full or in part without the written consent of the customer.

Data Provided by Client

Data provided by the Client is clearly identified in the report. Air Hygiene accepts data provided by the Client as accurate.

COMBUSTION TESTING QUALITY ASSURANCE ACTIVITIES

In conformance with ASTM D7036 Section 15.3.11 and 13, all testing was performed without any real or apparent errors, with the exception of those that would be listed in Section 2.0 of this report. In addition, all testing was conducted according to the approved testing protocol, test methods, Air Hygiene Quality Manual, or ASTM D7036, with the exception of specifics noted in Section 2.0 of this report. A number of quality assurance activities were undertaken before, during, and after this testing project. This section of the report combined with the documentation in Appendix C describes each of those activities.

Air Hygiene collected and reported the enclosed test data in accordance with the procedures and quality assurance activities described in this test report. Air Hygiene makes no warranty as to the suitability of the test methods. Air Hygiene also assumes no liability relating to the interpretation and use of the test data.

INSTRUMENTAL ANALYSIS
QUALITY ASSURANCE DATA

Date: December 18-19, 2019
Company: Choctaw Defense Facility
Location: McAlester, Oklahoma
Techs: PL / JW / IHM

Sample System Leak Check

Date	Sample System	Leak Rate (l/min)
December 18-19, 2019	1	0

amee-19-mcalester-ok-perf#1-rpt

Accredited Laboratory

A2LA has accredited

AIR HYGIENE INTERNATIONAL, INC.

Broken Arrow, OK

for technical competence in the field of

Environmental Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the A2LA *R219 – Specific Requirements – TNI Field Sampling and Measurement Organization Accreditation Program*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 18th day of December 2019

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3796.01
Valid to August 31, 2021

For the tests to which this accreditation applies, please refer to the laboratory's Envrionmental Scope of Accreditation.

STAC
STACK TESTING ACCREDITATION COUNCIL

American Association for Laboratory Accreditation

Accredited Air Emission Testing Body

A2LA has accredited

AIR HYGIENE INTERNATIONAL, INC.

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

Presented this 18th day of December 2019.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3796.02
Valid to August 31, 2021

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

SOURCE EVALUATION SOCIETY

SES

Qualified Source Testing Individual

LET IT BE KNOWN THAT

PAUL R. LITTLE

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

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 2ND DAY OF SEPTEMBER 2016 AND EFFECTIVE UNTIL SEPTEMBER 1ST, 2021

Peter R. Westlin
Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

P. Pakalnis
Peter S. Pakalnis, QSTI/QSTO Review Board

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

Theresa M. Lowe
Theresa Lowe, QSTI/QSTO Review Board

Bruce Randall QSTI/QSTO Review Board

CERTIFICATE NO. 2010-458

SOURCE EVALUATION SOCIETY CORPORATE SEAL 1995 NORTH CAROLINA

Daily Observations - December 18, 2019
McAlester Regional Airport Station 34.92 °N, 95.76 °W

Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precip.	Condition
12:53 AM	22 °F	19 °F	89 %	CALM	0 mph	0 mph	29.53 in	0.0 in	Fair
1:53 AM	22 °F	19 °F	89 %	CALM	0 mph	0 mph	29.52 in	0.0 in	Partly Cloudy
2:53 AM	22 °F	18 °F	85 %	SW	3 mph	0 mph	29.53 in	0.0 in	Fair
3:53 AM	23 °F	19 °F	85 %	SW	5 mph	0 mph	29.52 in	0.0 in	Fair
4:53 AM	24 °F	20 °F	84 %	SW	3 mph	0 mph	29.52 in	0.0 in	Fair
5:53 AM	24 °F	19 °F	81 %	CALM	0 mph	0 mph	29.52 in	0.0 in	Fair
6:53 AM	21 °F	18 °F	88 %	CALM	0 mph	0 mph	29.54 in	0.0 in	Fair
7:53 AM	21 °F	17 °F	85 %	CALM	0 mph	0 mph	29.55 in	0.0 in	Fair
8:53 AM	30 °F	26 °F	85 %	CALM	0 mph	0 mph	29.56 in	0.0 in	Fair
9:53 AM	38 °F	26 °F	62 %	CALM	0 mph	0 mph	29.57 in	0.0 in	Fair
10:53 AM	44 °F	25 °F	47 %	CALM	0 mph	0 mph	29.57 in	0.0 in	Fair
11:53 AM	50 °F	24 °F	36 %	VAR	3 mph	0 mph	29.55 in	0.0 in	Fair
12:53 PM	54 °F	17 °F	23 %	VAR	3 mph	0 mph	29.53 in	0.0 in	Fair
1:53 PM	57 °F	15 °F	19 %	WNW	8 mph	0 mph	29.51 in	0.0 in	Fair
2:53 PM	57 °F	15 °F	19 %	W	7 mph	0 mph	29.49 in	0.0 in	Fair
3:53 PM	57 °F	16 °F	20 %	WSW	7 mph	0 mph	29.49 in	0.0 in	Fair
4:53 PM	53 °F	18 °F	25 %	S	5 mph	0 mph	29.49 in	0.0 in	Partly Cloudy
5:53 PM	46 °F	19 °F	34 %	S	3 mph	0 mph	29.49 in	0.0 in	Fair
6:53 PM	40 °F	23 °F	51 %	CALM	0 mph	0 mph	29.50 in	0.0 in	Fair
7:53 PM	39 °F	22 °F	50 %	CALM	0 mph	0 mph	29.50 in	0.0 in	Fair
8:53 PM	38 °F	22 °F	53 %	CALM	0 mph	0 mph	29.50 in	0.0 in	Fair
9:53 PM	31 °F	23 °F	72 %	CALM	0 mph	0 mph	29.50 in	0.0 in	Fair
10:53 PM	29 °F	22 °F	75 %	SW	3 mph	0 mph	29.51 in	0.0 in	Fair
11:53 PM	36 °F	21 °F	55 %	CALM	0 mph	0 mph	29.50 in	0.0 in	Fair

Daily Observations - December 19, 2019
McAlester Regional Airport Station 34.92 °N, 95.76 °W

Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precip.	Condition
12:53 AM	36 °F	20 °F	52 %	SW	5 mph	0 mph	29.49 in	0.0 in	Fair
1:53 AM	37 °F	20 °F	50 %	SSW	6 mph	0 mph	29.50 in	0.0 in	Fair
2:53 AM	38 °F	19 °F	47 %	S	5 mph	0 mph	29.51 in	0.0 in	Fair
3:53 AM	37 °F	19 °F	48 %	S	5 mph	0 mph	29.51 in	0.0 in	Fair
4:53 AM	38 °F	19 °F	47 %	S	5 mph	0 mph	29.50 in	0.0 in	Fair
5:53 AM	39 °F	20 °F	46 %	S	3 mph	0 mph	29.50 in	0.0 in	Fair
6:53 AM	38 °F	20 °F	48 %	S	5 mph	0 mph	29.51 in	0.0 in	Fair
7:53 AM	38 °F	21 °F	51 %	S	5 mph	0 mph	29.52 in	0.0 in	Fair
8:53 AM	42 °F	23 °F	47 %	SSW	7 mph	0 mph	29.53 in	0.0 in	Fair
9:53 AM	48 °F	23 °F	37 %	SSW	8 mph	0 mph	29.53 in	0.0 in	Fair
10:53 AM	53 °F	22 °F	30 %	S	8 mph	0 mph	29.53 in	0.0 in	Partly Cloudy
11:53 AM	54 °F	20 °F	26 %	SSW	14 mph	0 mph	29.50 in	0.0 in	Fair
12:53 PM	56 °F	19 °F	24 %	SSW	16 mph	22 mph	29.47 in	0.0 in	Fair
1:53 PM	57 °F	20 °F	24 %	SSW	10 mph	17 mph	29.45 in	0.0 in	Mostly Cloudy
2:53 PM	58 °F	20 °F	23 %	S	12 mph	20 mph	29.44 in	0.0 in	Fair
3:53 PM	58 °F	19 °F	22 %	SSE	12 mph	17 mph	29.44 in	0.0 in	Fair
4:53 PM	55 °F	18 °F	23 %	VAR	6 mph	0 mph	29.44 in	0.0 in	Fair
5:53 PM	51 °F	20 °F	29 %	SSE	6 mph	0 mph	29.45 in	0.0 in	Partly Cloudy
6:53 PM	44 °F	21 °F	40 %	ESE	6 mph	0 mph	29.45 in	0.0 in	Fair
7:53 PM	44 °F	22 °F	42 %	SE	6 mph	0 mph	29.46 in	0.0 in	Fair
8:53 PM	43 °F	22 °F	43 %	SE	6 mph	0 mph	29.46 in	0.0 in	Fair
9:53 PM	41 °F	22 °F	47 %	SE	6 mph	0 mph	29.46 in	0.0 in	Fair
10:53 PM	43 °F	23 °F	45 %	SSE	6 mph	0 mph	29.47 in	0.0 in	Fair
11:53 PM	39 °F	23 °F	53 %	SSE	5 mph	0 mph	29.47 in	0.0 in	Fair

APPENDIX E

EQUIPMENT CALIBRATION RECORDS

APEX SOURCE TESTING EQUIPMENT INSTRUMENTS

Apex Instruments, Inc.
204 Technology Park Lane
Fuquay-Varina, NC 27526

S-TYPE PITOT TUBE CALIBRATION SHEET

Reference USEPA Reference Method 2 (40CFR60, App. A, Meth. 2)

PITOT SERIAL#	2428	**CALIBRATION DATE:**	20-Mar-09	
PITOT TYPE:	MPT-6-181	**BAROMETRIC PRESSURE:**	29.50	in Hg
STD. PITOT TYPE:	Ellipsoidal	**STATIC PRESSURE**	-1.6	in H_20
Cp(std):	0.990	**BLOCKAGE %:**	N/A	
CALIBRATED BY:	BC & JP	**CORRECTION FACTOR:**	1.00	

RUN NO.	**SIDE "A" CALIBRATION** Pstd in H_2O	P(s) in H2O	Cp(s)	**DEVIATION** Cp(s) - avg.Cp(s)
1	0.549	0.800	0.820	0.001
2	0.546	0.799	0.818	-0.001
3	0.548	0.800	0.819	0.000
		AVERAGE	0.819	

RUN NO.	**SIDE "B" CALIBRATION** Pstd in H_2O	P(s) in H_2O	Cp(s)	**DEVIATION** Cp(s) - avg.Cp(s)
1	0.547	0.801	0.818	-0.001
2	0.548	0.798	0.820	0.001
3	0.547	0.799	0.819	0.000
		AVERAGE	0.819	

OVERALL AVERAGE 0.819

ACCEPTANCE CRITERIA

AVG. ICp (A) - AVG. Cp (B)I	0.0001	**must be less than or equal to 0.01**
Standard Deviation A =	0.0009	**must be less than or equal to 0.01**
Standard Deviation B =	0.0011	**must be less than or equal to 0.01**

If each of the above criteria are met the overall avg. Cp (Side A or Side B) may be used.

I certify that the above pitot tube was tested in accordance with the US EPA Method 2 standards.
See the Code of Federal Regulations, Title 40, Pat 60, Appendix A, Method 2, Item 4.

Signature Bob Christ[illegible] Date 3-20-09

Title Welding Sup.

APEX INSTRUMENTS SOURCE TESTING EQUIPMENT

Certificate of Calibration

S-Type Pitot Tube Calibration

See the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 2, Item 4.

Pitot Information

Pitot Type:	S
Pitot Serial #:	A8877
Jig ID:	APEX-WT-CAL
Blockage %:	< 2
Correction Factor:	1.00

Calibration Conditions

Bar. Pressure (in Hg):	29.93
Elevation (ft):	407
Adj. Bar. Pressure (in Hg):	29.52
Static Pressure (in H20):	-0.6
Tunnel Velocity (ft/s):	50
Tunnel Temperature (°F):	79
Humidity (%):	40

Reference Pitot Information

Std. Pitot Type	Ellipsoidal
Cp(std):	0.990
Serial #:	APEX-RP1

Side "A" Calibration

Run No.	Δ Pstd in H20	Δ Ps in H20	Cp(s)	Deviation Cp(s) - avg.Cp(s)
1	0.558	0.800	0.827	-0.001
2	0.560	0.799	0.829	0.001
3	0.560	0.803	0.827	-0.001
		"A" Average	0.827	0.001

(must be ≤ 0.01)

Side "B" Calibration

Run No.	Δ Pstd in H20	Δ Ps in H20	Cp(s)	Deviation Cp(s) - avg.Cp(s)
1	0.560	0.796	0.830	0.000
2	0.557	0.794	0.829	-0.001
3	0.558	0.792	0.831	0.001
		"B" Average	0.830	0.001

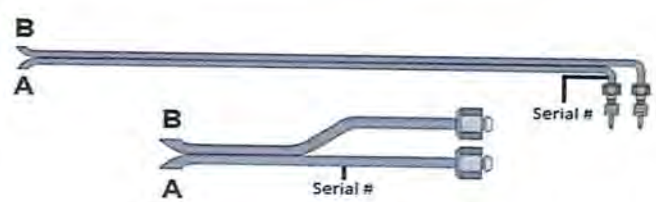
(must be ≤ 0.01)

Average	Acceptance Criteria	Overall Avg
-0.003		0.829

AVG. Cp(A) - AVG. Cp(B) must be ≤ 0.01

If the Average and both Deviation Averages "A" & "B" are ≤ 0.01, then the OVERALL AVERAGE above may be used.

*** If NOT, use the "A" Average OR "B" Average.**



$$C_{p(s)} = C_{p(std)} \sqrt{\frac{\Delta p_{std}}{\Delta p_s}}$$

$$\text{Deviation} = C_{p(s)} - C_p(A)$$

$$\text{Avg Dev} = \sigma(A) = \frac{\sum_{1}^{3} [C_{p(s)} - C_p(A)]}{3}$$

Technician: Bo Pritchard **Signature:** Bo P **Date:** 8/23/2019

I certify that the above pitot tube was tested in accordance with the US EPA Method 2 standards.

P:\APEX PRODUCTS NEW\P PRODUCTS\Pitot Tubes Calibration Data\~Pitot Calibration 2019\[1601 AIR HYGIENE #3.xlsx]Method 2 (A & B)

METERING SYSTEM DRY GAS METER CALIBRATION SHEET
EPA Reference Method
Metering System Pre-Test Calibration
Air Hygiene Assett ID: samp-cp-0029

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current\[SAMP-CP-0029 Calibration 4-30-19.xls]Original (5 point)

Make: apex
Model #: 522
Serial #: 1706009

Date: 04/30/19
Barometric Pressure: 29.07 (in. Hg)
Theoretical Critical Vacuum: 13.71 (in. Hg)

DRY GAS METER READINGS

ΔH (in. H2O)	Time (min)	Volume Initial (ft³)	Volume Final (ft³)	Volume Total (ft³)	Initial Temperature Inlet (°F)	Initial Temperature Outlet (°F)
0.34	17.00	91.550	96.880	5.330	73.0	73.0
0.68	12.00	96.880	102.320	5.440	74.0	74.0
1.10	10.00	102.320	108.350	6.030	76.0	76.0
1.90	10.00	108.350	116.170	7.820	78.0	78.0
3.50	10.00	116.170	126.920	10.750	80.0	80.0

Final Temperature Inlet (°F)	Final Temperature Outlet (°F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in. Hg)	Ambient Temperature Initial (°F)	Ambient Temperature Final (°F)	Ambient Temperature Average (°F)
74.0	74.0	140	0.2395	16.0	73.4	73.3	73.4
76.0	76.0	148	0.3446	16.0	73.3	73.4	73.4
78.0	78.0	155	0.4561	16.0	73.5	73.6	73.6
80.0	80.0	163	0.5897	16.0	73.6	73.5	73.6
82.0	82.0	173	0.8096	16.0	73.5	73.4	73.5

RESULTS

DRY GAS METER VOLUME CORRECTED Vm(std) (ft³)	DRY GAS METER VOLUME CORRECTED Vm(std) (liters)	ORIFICE VOLUME CORRECTED Vcr(std) (ft³)	ORIFICE VOLUME CORRECTED Vcr(std) (liters)	ORIFICE VOLUME NOMINAL Vcr (ft³)
5.128	145.21	5.125	145.1	5.330
5.223	147.92	5.205	147.4	5.414
5.774	163.53	5.740	162.6	5.972
7.476	211.71	7.421	210.2	7.722
10.280	291.12	10.190	288.6	10.600

DRY GAS METER CALIBRATION FACTOR Y Variation (number)	DRY GAS METER CALIBRATION FACTOR Y Value (number)	ORIFICE CALIBRATION FACTOR ΔH@ Value (in. H2O)	ORIFICE CALIBRATION FACTOR ΔH@ Value (mm H2O)	ORIFICE CALIBRATION FACTOR ΔH@ Variation (in. H2O)
0.005	1.000	2.023	51.40	0.141
0.002	0.997	1.949	49.51	0.067
-0.001	0.994	1.794	45.57	-0.088
-0.002	0.993	1.847	46.91	-0.035
-0.004	0.991	1.798	45.67	-0.084
AVERAGE:	**0.995**	**1.882**	47.81	**PASSED**

Notes:

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter,acceptable tolerance of individual values from the average is +/- 0.02. For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H_20 that equates to 0.75 cfm of air at 68 ^oF and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/- 0.2. For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above. The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

SIGNATURE: Craig McCarty

DATE: 04/30/19 04/30/19

METERING SYSTEM THERMOCOUPLE CALIBRATION SHEET
EPA Reference Method
Metering System Pre-Test Calibration
Air Hygiene Assett ID: samp-cp-0029

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current\[SAMP-CP-0029 Calibration 4-30-19.xls]Original (5 point)

Make: apex
Model #: 522
Serial #: 1706009

Date: 04/30/19
Barometric Pressure: 29.06 (in. Hg)
Temperature (ASTM cal): 73.10 (°F)

Thermocouple	**100 (°F)**		**600 (°F)**		**1200 (°F)**	
	Reading	**% Error**	**Reading**	**% Error**	**Reading**	**% Error**
Stack	100.00	0.00	601.00	0.17	1203.00	0.25
Probe	100.00	0.00	601.00	0.17	1203.00	0.25
Filter	100.00	0.00	601.00	0.17	1203.00	0.25
Dryer	100.00	0.00	601.00	0.17	1203.00	0.25
Aux.	100.00	0.00	601.00	0.17	1203.00	0.25

Note: Calibrated against an ALTEK Thermocouple Source Series 22, ID: samp-tc-0003
Direct temperature output calibrated to ASTM and IPTS standards as outlined in ALTEK Data Sheet 22.

Thermocouple	**73.10 (°F)**		**Responded to heating/cooling with the anticipated outcome?**
	Reading	**(±°F)**	
DGM In	73.0	0.10	yes
DGM Out	73.0	0.10	yes

Note: Calibrated against Reference Thermometer ID: a070717

SIGNATURE: Craig McCarty

DATE: 04/30/19 04/30/19

Standard for Calibration of Console Thermocouple Systems

40 CFR, Part 60
Appendix A, Method 5
10.3.2 The temperature data recorded in the field shall be considered valid. If, during calibration, the absolute temperature measured with the sensor being calibrated and the reference sensor **agree within 1.5 percent**, the temperature data taken in the field shall be considered valid.

Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

Check the continuity of the thermocouple by subjecting it to a change in the temperature (e.g.., removing it from the stack or touching an ice cube). This step will also check for loose connections and reversed connections (noted by a wrong change in the temperature).

PROBE (STACK), HOTBOX (FILTER), AND GOOSENECK (EXIT) THERMOCOUPLE CALIBRATION SHEET
EPA Reference Method
Metering System Pre-Test Calibration

Air Hygiene Assett ID(s): **Probe:** samp-hp-0086 **Hotbox:** samp-bh-0012 **Gooseneck:** samp-ad-0028

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current\[SAMP-CP-0029 Calibration 4-30-19.xls]Original (5 point)

Barometric Pressure: 29.06

Thermo-couples		Temps (°F)	Signature		Date	
Stack	Ref	73.10	Craig McCarty		04/30/19	04/30/19
	Read	73.00				
	±°F	0.10				
Probe	Ref	73.10	Craig McCarty		04/30/19	04/30/19
	Read	73.00				
	±°F	0.10				
Filter	Ref	73.10	Craig McCarty		04/30/19	04/30/19
	Read	73.00				
	±°F	0.10				
Cond.	Ref	73.10	Craig McCarty		04/30/19	04/30/19
	Read	73.00				
	±°F	0.10				
CPM	Ref	73.10	Craig McCarty		04/30/19	04/30/19
	Read	73.00				
	±°F	0.10				
Exit	Ref	73.10	Craig McCarty		04/30/19	04/30/19
	Read	73.00				
	±°F	0.10				

Note: Calibrated against Reference Thermometer ID: a070717

Thermocouple	Responded to heating/cooling with the anticipated outcome?
Stack	yes
Probe	yes
Filter	yes
Cond.	yes
CPM	yes
Exit	yes

Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

Check the continuity of the thermocouple by subjecting it to a change in the temperature (e.g.., removing it from the stack or touching an ice cube). This step will also check for loose connections and reversed connections (noted by a wrong change in the temperature).

Alternative Post-Test Metering System Calibration

RM 5, Section 16.3.1.3

$$\gamma_{qa} = \frac{\theta}{V_m}\sqrt{\frac{0.0319T_m}{\Delta H@\left(P_{bar} + \frac{\Delta H_{avg}}{13.6}\right)}\frac{29}{M_d}}\left(\sqrt{\Delta H}\right)_{avg}$$

Parameters	Variable	Run 1	Run 2	Run 3	Units
Run Time	Θ	60.00	60.00	60.00	minutes
Actual Meter Volume	V_m	14.567	21.053	19.976	dcf
Meter Temperature	T_m	526.72	531.92	533.00	°R
Meter Pressure at 0.75 cfm	ΔH@	1.882	1.882	1.882	in. H_2O
Barometric Pressure	P_{bar}	29.53	29.45	29.45	in. Hg
Average Meter Pressure	ΔH_{avg}	0.21	0.41	0.38	in. H_2O
Dry Molecular Weight	M_d	28.84	28.84	28.84	lb/lb-mol
Average √Meter Pressure	$(\Delta H)^{1/2}_{avg}$	0.45	0.63	0.61	(in. $H_2O)^{1/2}$
Run Specific Gamma	Y_{aq}	1.0253	0.9913	1.0171	

Constants:

0.0319 = (29.92/528) $(0.75)^2$(in. Hg/°R) cfm^2

29 = Dry molecular weight of air, lb/lb-mole

13.6 = conversion from inches of water to inches of mercury

$Y_{aq\ (avg)}$	1.0112
Y_i	0.9950
%Diff	1.63%
Criteria	%Diff <5%
Result	**PASS**

Example Calculation (Run 1)

$$Y_{aq} = \frac{60.00}{14.567} \times \sqrt{\frac{0.0319 \times 526.72}{1.882 \times \left(29.53 + \frac{0.21}{13.6}\right)} \times \frac{29}{28.84}} \times 0.4516 = 1.0253$$

Field Balance Weight Verfication
Annual 500g Field Balance Stock Weight vs. 500g ISO 17025 Traceable Weight
Air Hygiene Asset ID: samp-sc-0035

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\Field Balance Weights\2019\[samp-sc-0035-219.xlsm]Balance

Make:	Ohaus	ISO 17025 Weight ID	LABS-WT-0005
Model #:	ScoutPro SP2001	ISO S/N	1000128090
Serial #:	B432902768	ISO Cal Due	1/15/2019
Field Weight #:	sc--35		
Trailer #:	219		

ISO 17025 Certfified Weight (g)	Field Balance Weight (g)	± g
500.00	499.80	0.20

must be within ±0.5g

Pranay Uc. (signature) 01/15/19 (date)

ISO 17025 Certfified Weight (g)	Field Balance Weight (g)	± g
500.00	499.80	0.20

must be within ±0.5g

Pranay Uc. (signature) 01/15/19 (date)

ISO 17025 Certfified Weight (g)	Field Balance Weight (g)	± g
500.00	499.80	0.20

must be within ±0.5g

Pranay Uc. (signature) 01/15/19 (date)

Note: Calibrated against ISO 17025 Certified weight LABS-WT-0005

EPA Method 4 - Section 10.3, EPA Method 5 - Section 10.7, EPA Method 202 - Section 10.3: Field Balance Calibration Check. Check the calibration of the balance used to weigh impingers with a weight that is at least 500g or within 50g of a loaded impinger. The weight must be ASTM E617-13 "Standard Specification for Laboratory Weights and Precision Mass Standards" Class 6 (or better). Daily before used, the field balance must meausure within ±0.5g of the certified mass. If the daily balance calibration check fails, perform corrective measures and repeat the check before using balance.

ISO 17025 Certified 500g Weight is certified annually. Certified weight is used to verify Class 6 or better weight that accompanies each field balance on the balance it will be used. Acceptance critieria is certified weight must be within ±0.5g of Class 6 or better weight.

WEATHER STATION CALIBRATION SHEET
Temperature, Barometric Pressure, and Relative Humidity Periodic Calibration
Air Hygiene Asset ID: SAMP-we-0031

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\Weather Stations\2019\[SAMP-we-0031_219.xlsm]112013
Make: Kestrel — ISO 17025 Weather Station ID SAMP-WE-0033
Model #: 4000 — ISO 17025 S/N A026334
Serial #: 552037 — ISO 17025 Cal Due 8/3/2019

ASTM Temp (deg F) (±1.5°)	Thermo. (deg F)	± deg F	ASTM Barometer (in. Hg) (±0.1 in Hg)	Barometric (in. Hg)	± in. Hg	Time
70.10	70.00	0.10	29.34	29.31	0.03	07:50

Sean Barnes (signature) — 05/10/19 (date)

ASTM Temp (deg F) (±1.5°)	Thermo. (deg F)	± deg F	ASTM Barometer (in. Hg) (±0.1 in Hg)	Barometric (in. Hg)	± in. Hg	Time
69.90	69.70	0.20	29.34	29.33	0.01	08:07

Sean Barnes (signature) — 05/10/19 (date)

ASTM Temp (deg F) (±1.5°)	Thermo. (deg F)	± deg F	ASTM Barometer (in. Hg) (±0.1 in Hg)	Barometric (in. Hg)	± in. Hg	Time
69.50	69.60	0.10	29.35	29.33	0.02	08:39

Sean Barnes (signature) — 05/10/19 (date)

ASTM Temp (deg F) (±1.5°)	Thermo. (deg F)	± deg F	ASTM Barometer (in. Hg) (±0.1 in Hg)	Barometric (in. Hg)	± in. Hg	Time
69.50	69.30	0.20	29.35	29.33	0.02	09:06

Sean Barnes (signature) — 05/10/19 (date)

Note: Verified against ISO 17025 Traceable Barometer and Thermometer (SAMP-WE-0033).

ATTACHMENT L

EMISSION TESTING

AIR HYGIENE, INC.

Testing Solutions for a Better World

EMISSION COMPLIANCE TEST
FOR THE
CENTERFIRE ROOM, VENTS #1, 2, AND 3
PREPARED FOR
CHOCTAW DEFENSE FACILITY
AT THE
MCALESTER FACILITY
MCALESTER, OKLAHOMA
DECEMBER 18-19, 2019

Report Date: January 11, 2020

Corporate Headquarters
1600 W Tacoma Street
Broken Arrow, Oklahoma 74012

AIR HYGIENE, INC.

(918) 307-8865 or (888) 461-8778
www.airhygiene.com

Remote Testing Offices
Las Vegas, NV 89156
Ft. Worth, TX 76028
Humble, TX 77338
Shreveport, LA 71115
Miami, FL 33101
Pittsburgh, PA 15205

EMISSION COMPLIANCE TEST
FOR THE
CENTERFIRE ROOM, VENTS #1, 2, AND 3
PREPARED FOR
CHOCTAW DEFENSE FACILITY
AT THE
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MCALESTER, OKLAHOMA
DECEMBER 18-19, 2019

Prepared and Reviewed by:

Logan K. Tsotsoros

Logan Tsotsoros
AHU Support Staff

Thomas K Graham

Thomas K. Graham, PE, QSTI
Director of AHU

I, Paul R Little

Paul Little, QSTI
Director of Customer Service
certify that this testing was conducted and this report was created in conformance with the requirements of ASTM D7036

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CERTIFICATION OF INFORMATION

I certify under penalty of law that I believe the information provided in this document is true, accurate and complete. I am aware that there are significant civil and criminal penalties, including the possibility of fine or imprisonment or both, for submitting false, inaccurate or incomplete information.

Paul R Little

Paul Little, QSTI
Director of Customer Service
Air Hygiene International, Inc.

December 29, 2019
Date

FACILITY CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attached documents and, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil and criminal penalties, including the possibility of fine or imprisonment or both, for submitting false, inaccurate or incomplete information.

I am the responsible official with direct knowledge and overall responsibility for the information contained in this report.

____
Name

____
Title

____
Signature

____
Date

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Table of Contents

Emissions Compliance Test
Centerfire Room, Vents #1, 2, and 3
Choctaw Defense Facility
McAlester Facility
McAlester, Oklahoma
December 18-19, 2019

1.0 INTRODUCTION

Air Hygiene International, Inc. (Air Hygiene) has completed the Emissions Compliance Test for lead (Pb) from the exhaust of the Centerfire Room, Vents #1, 2, and 3 for Choctaw Defense Facility at the McAlester Facility in McAlester, Oklahoma. This report details the background, results, process description, and the sampling/analysis methodology of the stack sampling survey conducted on December 18-19, 2019.

1.1 TEST PURPOSE AND OBJECTIVES

The purpose of the test was to conduct an emission test to document levels of selected pollutants. The information will be used to demonstrate emissions as part of an air permit application and to determine what emission factors are for the operation. The specific objective was to determine the emission concentration of Pb from the exhaust of Choctaw Defense Facility's Centerfire Room, Vents #1, 2, and 3 with all production equipment in the Centerfire Room operating at maximum production.

1.2 SUMMARY OF TEST PROGRAM

The following list details pertinent information related to this specific project:

1.2.1 Participating Organizations
- Choctaw Defense Facility
- A & M Engineering and Environmental Services, Inc.
- Air Hygiene

1.2.2 Industry
- Small Arms Ammunition Manufacturing

1.2.3 Plant Location
- McAlester Facility in McAlester, Oklahoma
  - GPS Coordinates [Latitude 34.891594, Longitude -95.778621]
  - Physical Address: 3 Skyway Drive, McAlester, Oklahoma 74501
  - Federal Registry System / Facility Registry Service (FRS) No. – 110070242795
  - Source Classification Code (SCC) – 39999994

1.2.4 Equipment Tested
- Centerfire Room, Vents #1, 2, and 3

1.2.5 Emission Points
- Exhaust from the Centerfire Room, Vents #1, 2, and 3
- For all Pb testing, 25 sampling points in the exhaust duct from the Centerfire Room, Vents #1, 2, and 3

1.2.6 Emission Parameters Measured
- Pb
- Flow
- H_2O

1.2.7 Dates of Emission Test
- December 18-19, 2019

1.2.8 Federal Certifications
- Stack Testing Accreditation Council AETB Certificate No. 3796.02
- International Standard ISO/IEC 17025:2005 Certificate No. 3796.01

1.3 KEY PERSONNEL

Choctaw Defense Facility:	Jacob Williams (jawilliams@choctawdefense.com)	918-426-2871
A&M Eng and Env Services:	Jeff Jenkins (JJenkins@aandmengineering.com)	918-665-6575
Air Hygiene:	Paul Little (plittle@airhygiene.com)	918-307-8865
Air Hygiene:	Jeff Wollrab	918-307-8865
Air Hygiene:	Isaac Hernandez	918-307-8865

2.0 SUMMARY OF TEST RESULTS

Results from the sampling conducted on Choctaw Defense Facility's Centerfire Room, Vents #1, 2, and 3 located at the McAlester Facility on December 18-19, 2019 are summarized in the following tables and relate only to the items tested.

TABLE 2.1
CHOCTAW DEFENSE FACILITY CENTERFIRE ROOM VENT #1
EMISSION DATA SUMMARY

Parameters	**V1Pb-1**	**V1Pb-2**	**V1Pb-3**	**Average**	**Units**
Run Start Time	07:55	12:47	14:26		hh:mm
Run Stop Time	11:00	13:59	15:35		hh:mm
Test Date	12/18/19	12/18/19	12/18/19		mm/dd/yy
Production Rate	Max	Max	Max		ton/hr
Total Sampling Time	60.00	60.00	60.00	60.00	min
Dry Standard Stack Flow Rate	793,601	782,625	792,993	789,740	dscfh
Emission Rate Data	**V1Pb-1**	**V1Pb-2**	**V1Pb-3**	**Average**	**Units**
Lead Mass	0.0026	0.0022	0.0015	0.0021	mg
Lead Concentration	8.15E-08	6.94E-08	4.74E-08	6.61E-08	g/dscf
	1.26E-06	1.07E-06	7.32E-07	1.02E-06	gr/dscf
Lead Emission Rate	6.47E-05	5.43E-05	3.76E-05	5.22E-05	kg/hr
	1.43E-04	1.20E-04	8.29E-05	1.15E-04	lb/hr
	6.24E-04	5.25E-04	3.63E-04	5.04E-04	tpy

TABLE 2.2

CHOCTAW DEFENSE FACILITY CENTERFIRE ROOM VENT #2

EMISSION DATA SUMMARY

Parameters	V2Pb-1	V2Pb-2	V2Pb-3	Average	Units
Run Start Time	16:42	07:08	08:45		hh:mm
Run Stop Time	17:52	08:14	09:50		hh:mm
Test Date	12/18/19	12/19/19	12/19/19		mm/dd/yy
Production Rate	Max	Max	Max		ton/hr
Total Sampling Time	60.00	60.00	60.00	60.00	min
Dry Standard Stack Flow Rate	843,962	860,200	833,474	845,879	dscfh
Emission Rate Data	**V2Pb-1**	**V2Pb-2**	**V2Pb-3**	**Average**	**Units**
Lead Mass	0.0008	0.0017	0.0014	0.0013	mg
Lead Concentration	2.33E-08	4.85E-08	4.17E-08	3.78E-08	g/dscf
	3.59E-07	7.48E-07	6.43E-07	5.83E-07	gr/dscf
Lead Emission Rate	1.96E-05	4.17E-05	3.47E-05	3.20E-05	kg/hr
	4.33E-05	9.19E-05	7.66E-05	7.06E-05	lb/hr
	1.90E-04	4.03E-04	3.35E-04	3.09E-04	tpy

TABLE 2.3

CHOCTAW DEFENSE FACILITY CENTERFIRE ROOM VENT #3

EMISSION DATA SUMMARY

Parameters	V3Pb-1	V3Pb-2	V3Pb-3	Average	Units
Run Start Time	12:01	13:47	15:11		hh:mm
Run Stop Time	13:08	14:54	16:18		hh:mm
Test Date	12/19/19	12/19/19	12/19/19		mm/dd/yy
Production Rate	Max	Max	Max		ton/hr
Total Sampling Time	60.00	60.00	60.00	60.00	min
Dry Standard Stack Flow Rate	161,180	180,386	172,013	171,193	dscfh
Emission Rate Data	**V3Pb-1**	**V3Pb-2**	**V3Pb-3**	**Average**	**Units**
Lead Mass	0.0008	0.0005	0.0006	0.0006	mg
Lead Concentration	5.58E-08	2.44E-08	3.09E-08	3.70E-08	g/dscf
	8.60E-07	3.77E-07	4.77E-07	5.71E-07	gr/dscf
Lead Emission Rate	8.99E-06	4.40E-06	5.32E-06	6.24E-06	kg/hr
	1.98E-05	9.71E-06	1.17E-05	1.37E-05	lb/hr
	8.68E-05	4.25E-05	5.14E-05	6.02E-05	tpy

All testing was performed without any real or apparent errors with the exception that Run 1 on Vent #1 began, but shortly thereafter the process experienced production slowdowns. During this time the test train was halted in place with no sampling occurring until the situation was remedied. Testing resumed when production levels were re-established. All testing was conducted according to the approved testing protocol with the exception that Method 3A was not performed. All sources were ambient vents and diluent concentrations were assumed as ambient. Also, the Vent #3 shroud did not meet the EPA Method 1 minimum design distances between the sample ports and the upstream and downstream disturbances. However, the average null angle of zero degrees is a good indicator of a lack of cyclonic flow.

3.0 SOURCE OPERATION

3.1 PROCESS DESCRIPTION

The Choctaw Defense Facility located at 3 Skyway Drive in McAlester, Oklahoma. Located on this facility are three process vents discharging emissions from an isolated process room utilized to produce ammunitions. The process vents are designated, for the purposes of this protocol, as Vent #1, Vent #2, and Vent #3.

The Centerfire Room is enclosed from other areas of the facility by hard walls and overhead doors which are kept closed at all times, except for brief moments while receiving material then immediately closed. Walk through doors are only opened as an employee is entering or existing the room. The Centerfire Room has three exhaust fans that were operational during the testing. Since the room is a fully enclosed environment, all exhaust is controlled by the three exhaust fans. This is the normal operating conditions for the Centerfire Room; thus, no increase in employee exposure was anticipated.

Each exhaust fan was tested with a minimum of three, one-hour runs with the other two exhaust fans operating. The exhaust fans were not equipped with variable speed controls, so fans were either on or off. Revolutions per minute (RPM) data was taken from manufacturers specifications. The other exhaust fans from the facility are in areas away from, and not associated with, the Centerfire Room. Each exhaust fan had a temporary shroud (duct) fabricated to snugly slip over the fan housing. Insulation was placed between the shroud and the fan housing and screwed in place with sheet metal screws. The seam where the fan housing and shroud met was taped with duct tape to make the connection leak proof.

3.2 SAMPLING LOCATION

The Vent #1 and Vent #2 stacks are horizontal, square and measure 3.58 feet (ft) (43 inches) wide and 3.67 ft (44 inches) deep at the five test ports. The test ports are located approximately 8.42 ft (101 inches) downstream and approximately 3.83 ft (46 inches) upstream from the nearest disturbances.

The Vent #3 stack is vertical, square and measures 3.0 feet (ft) (36 inches) deep and 3.0 feet (ft) (36 inches) wide at the test ports. The test ports are located approximately 3.67 ft (44 inches) downstream and approximately 1.0 ft (12 inches) upstream from the nearest disturbances. This stack did not meet the EPA Method 1 minimum design distances between the sample ports and the upstream and downstream disturbances. However, the average null angle of zero degrees is a good indicator of a lack of cyclonic flow.

Air Hygiene has field verified the measurable dimensions. Non-field verified dimensions are provided by Choctaw Defense Facility. For Pb testing, an initial velocity traverse was performed across the from 25 total points. All Pb sampling occurred from the same points by leaving the probe at each for an equal amount of time in order to draw an isokinetic sample through the sample train.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 TEST METHODS

The emission test on the Centerfire Room, Vents #1, 2, and 3 at the McAlester Facility was performed following United States Environmental Protection Agency (EPA) methods described by the Code of Federal Regulations (CFR). Table 4.1 outlines the specific methods performed on December 18-19, 2019.

TABLE 4.1
SUMMARY OF SAMPLING METHODS

Pollutant or Parameter	Sampling Method	Analysis Method
Sample Point Location	EPA Method 1	Equal Area Method
Stack Flow Rate	EPA Method 2	S-Type Pitot Tube
Stack Moisture Content	EPA Method 4	Gravimetric Analysis
Lead	EPA Method 12	Digestion

4.2 INSTRUMENT CONFIGURATION AND OPERATIONS FOR ANALYSIS

The sampling and analysis procedures used during these tests conform with the methods outlined in the Code of Federal Regulations (CFR), Title 40, Part 60, Appendix A, Methods 1, 2, 4, and 12.

Figure 4.1 represents the sample system used for the wet chemistry tests (Pb). A heated stainless-steel probe with a glass liner and nozzle was inserted into the sample ports of the stack to extract gas measurements from the emission stream through a filter and glass impinger train. Flow rates are monitored with oil filled manometers and total sample volumes are measured with a dry gas meter.

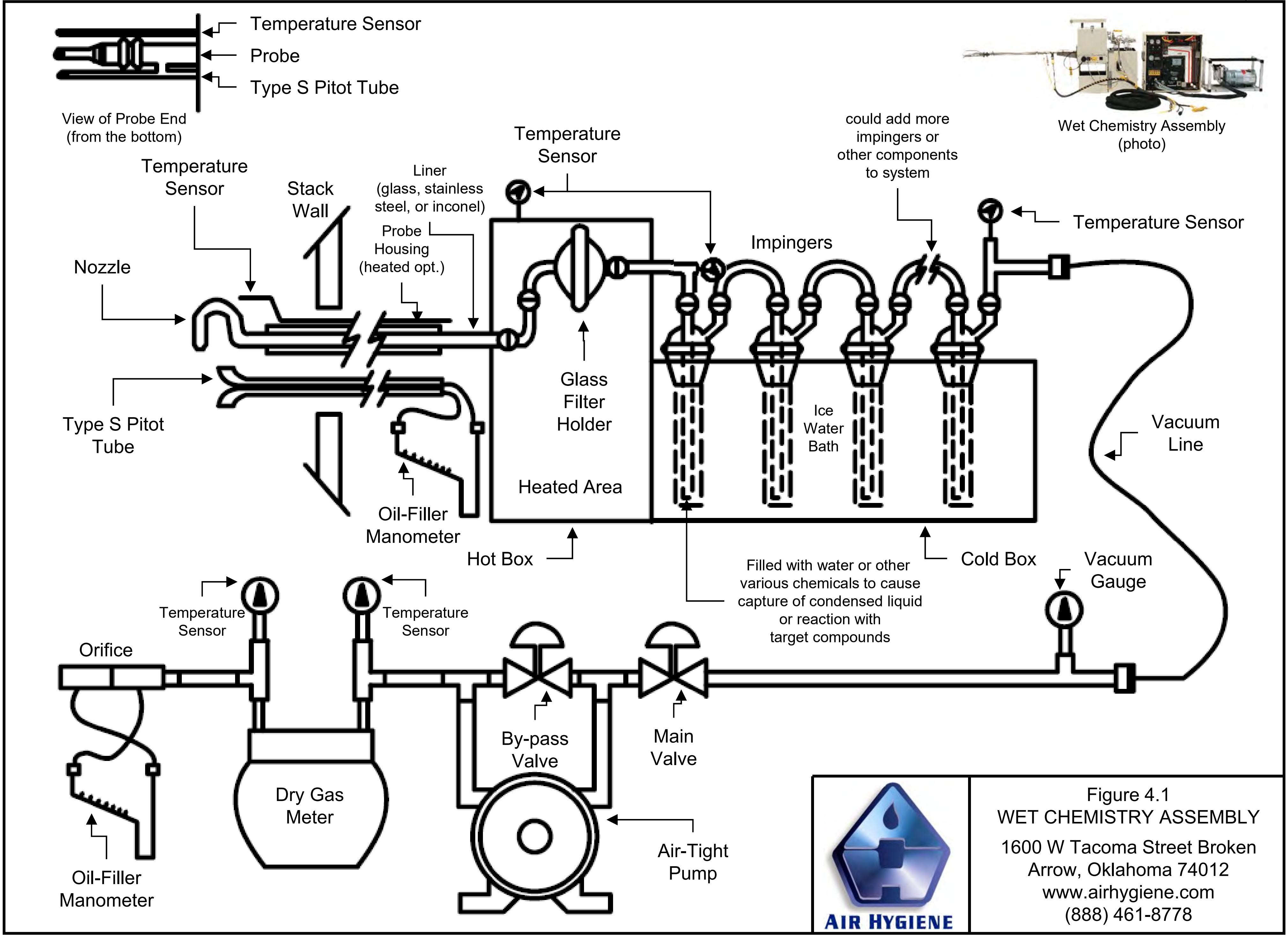

Figure 4.1
WET CHEMISTRY ASSEMBLY

1600 W Tacoma Street Broken Arrow, Oklahoma 74012
www.airhygiene.com
(888) 461-8778

APPENDIX A

TEST RESULTS AND CALCULATIONS

TABLE A.1: EMISSIONS TESTING SCHEDULE

Unit	Load	Component	Run	Date	Start	Stop	Time Sync	Duration
Vent #1	Max	Preliminaries	V1Pb-V1	12/17/19	08:08	08:48	DAHS	00:40
Vent #1	Max	Lead	V1Pb-1	12/18/19	07:55	11:00	DAHS	03:05
Vent #1	Max	Lead	V1Pb-2	12/18/19	12:47	13:59	DAHS	01:12
Vent #1	Max	Lead	V1Pb-3	12/18/19	14:26	15:35	DAHS	01:09
Vent #2	Max	Preliminaries	V2Pb-V1	12/18/19	15:58	16:18	DAHS	00:20
Vent #2	Max	Lead	V2Pb-1	12/18/19	16:42	17:52	DAHS	01:10
Vent #2	Max	Lead	V2Pb-2	12/19/19	07:08	08:14	DAHS	01:06
Vent #2	Max	Lead	V2Pb-3	12/19/19	08:45	09:50	DAHS	01:05
Vent #3	Max	Preliminaries	V3Pb-V1	12/19/19	11:09	11:43	DAHS	00:34
Vent #3	Max	Lead	V3Pb-1	12/19/19	12:01	13:08	DAHS	01:07
Vent #3	Max	Lead	V3Pb-2	12/19/19	13:47	14:54	DAHS	01:07
Vent #3	Max	Lead	V3Pb-3	12/19/19	15:11	16:18	DAHS	01:07

Note: Vent #1, Run 1 started at 07:55, but process experienced three lengthy delays because of site equipment issues. Test train was paused in place until production was re-established.

TEST RESULTS AND CALCULATIONS

Vent #1 Emissions Data

METHOD 12 (LEAD) - RESULTS

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Historical Data	**V1Pb-1**	**V1Pb-2**	**V1Pb-3**	**Average**	**Units**
Run Start Time	07:55	12:47	14:26		hh:mm
Run Stop Time	11:00	13:59	15:35		hh:mm
Test Date	12/18/19	12/18/19	12/18/19		mm/dd/yy
Production Rate	Max	Max	Max		ton/hr
Meter Calibration Factor	0.995	0.995	0.995		
Pitot Tube Coefficient	0.8290	0.8190	0.8290		
Average Nozzle Diameter	0.312	0.314	0.312		in
Stack Test Data	**V1Pb-1**	**V1Pb-2**	**V1Pb-3**	**Average**	**Units**
Initial Meter Volume	663.978	697.000	729.733		ft³
Final Meter Volume	696.754	729.421	762.455		ft³
Total Meter Volume	32.776	32.421	32.722	32.640	ft³
Total Sampling Time	60.00	60.00	60.00	60.00	min
Average Meter Temperature	74.08	72.32	78.08	74.83	°F
Average Stack Temperature	60.44	68.68	70.80	66.64	°F
Barometric Pressure	29.54	29.56	29.54	29.55	in Hg
Stack Static Pressure	0.01	0.01	0.01	0.01	in H_2O
Absolute Stack Pressure	29.54	29.56	29.54	29.55	in Hg
Average Orifice Pressure Drop	1.02	1.05	0.96	1.01	in H_2O
Absolute Meter Pressure	29.68	29.70	29.68	29.69	in Hg
Avg Square Root Pitot Pressure	0.30	0.31	0.31	0.31	$\sqrt{(in\ H_2O)}$
Moisture Content Data	**V1Pb-1**	**V1Pb-2**	**V1Pb-3**	**Average**	**Units**
Impinger Water Weight Gain	-2.80	5.50	-2.80	-0.03	g
Silica Gel Weight Gain	6.20	10.10	7.40	7.90	g
Total Water Volume Collected	3.41	15.63	4.61	7.88	ml
Standard Water Vapor Volume	0.16	0.74	0.22	0.37	scf
Standard Meter Volume	31.9	31.7	31.6	31.7	dscf
Standard Metric Meter Volume	0.9	0.9	0.9	0.9	dscm
Calculated Stack Moisture	0.50	2.27	0.68	1.15	%
Saturated Stack Moisture	1.79	2.39	2.57	2.25	%
Reported Stack Moisture Content	0.50	2.27	0.68	1.15	%
Gas Analysis Data	**V1Pb-1**	**V1Pb-2**	**V1Pb-3**	**Average**	**Units**
Carbon Dioxide Content	0.0	0.0	0.0	0.0	%
Oxygen Content	20.9	20.9	20.9	20.9	%
Carbon Monoxide Content	0.0	0.0	0.0	0.0	ppm
Nitrogen Content	79.1	79.1	79.1	79.1	%
Stack Dry Molecular Weight	28.84	28.84	28.84	28.84	lb/lb-mole
Stack Wet Molecular Weight	28.78	28.59	28.76	28.71	lb/lb-mole

METHOD 12 (LEAD) - RESULTS

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Volumetric Flow Rate Data	**V1Pb-1**	**V1Pb-2**	**V1Pb-3**	**Average**	**Units**
Average Stack Gas Velocity	16.83	17.16	17.19	17.06	ft/sec
Stack Cross-Sectional Area	13.14	13.14	13.14	13.14	ft²
Actual Stack Flow Rate	13,271	13,526	13,550	13,449	acfm
Wet Standard Stack Flow Rate	798	801	798	799	wkscfh
Dry Standard Stack Flow Rate	793,601	782,625	792,993	789,740	dscfh
Percent of Isokinetic Rate	101.8	105.1	99.2	102.0	%
Emission Rate Data	**V1Pb-1**	**V1Pb-2**	**V1Pb-3**	**Average**	**Units**
Lead Mass	0.0026	0.0022	0.0015	0.0021	mg
Lead Concentration	8.15E-08	6.94E-08	4.74E-08	6.61E-08	g/dscf
	1.26E-06	1.07E-06	7.32E-07	1.02E-06	gr/dscf
Lead Emission Rate	6.47E-05	5.43E-05	3.76E-05	5.22E-05	kg/hr
	1.43E-04	1.20E-04	8.29E-05	1.15E-04	lb/hr
	6.24E-04	5.25E-04	3.63E-04	5.04E-04	tpy

Note: HNO_3 blank concentration of 0.6 µg subtracted from each result

Nomenclature

- $\%CO$ = carbon monoxide concentration (%)
- $\%CO_2$ = carbon dioxide concentration (%)
- $\%N_2$ = nitrogen concentration (%)
- $\%O_2$ = oxygen concentration (%)
- $\%O_{2,wet}$ = Oxygen content of gas stream, % by volume of wet gas. (Note: The oxygen percentage used in Method 201A, Equation 3 is on a wet gas basis. That means that since oxygen is typically measured on a dry gas basis, the measured percent O2 must be multiplied by the quantity (1 - B_{ws}) to convert to the actual volume fraction. Therefore, $\%O_{2,wet} = (1 - B_{ws}) * \%O_{2, dry}$)
- $(\%EA)_{avg}$ = average excess air (%)
- $(F_o)_{avg}$ = average calculated fuel factor
- $[(\Delta p)^{0.5}]_{avg}$ = Average of square roots of the velocity pressures measured during the preliminary traverse, inches W.C.
- μ = Gas viscosity, micropoise
- 12.0 = Constant calculated as 60 percent of 20.5 square inch cross-sectional area of combined cyclone head, square inches
- 17.03 = mg/milliequivalents for ammonium ion
- 22.4 = liters of ideal gas per lb-mol of substance at 0^oC and 1 atm (ref. Civil Engineering Reference Manual, 7th ed. - Michael R. Lindeburg)
- 24.04 = liters of ideal gas per lb-mol of substance at 20^oC and 1 atm (ref. Civil Engineering Reference Manual, 7th ed. - Michael R. Lindeburg)
- 5.02×10^4 = constant derived from the molecular weight and correcting standard temperature and pressure (ref. Bay Area Air Quality Management District, Source Test Procedure ST-1B, Ammonia Integrated Sampling, Adopted January 20, 1982, Regulation 7-303)
- A = distance upstream (in.)
- A_D = stack diameters upstream (dia.)
- An = Area of nozzle, square feet
- A_s = area of stack (ft^2)
- B = distance downstream (in.)
- B_D = stack diameters downstream (dia.)
- b_f = Average blockage factor calculated in Equation 26, dimensionless
- B_{wm} = meter moisture content (%)
- B_{ws} = stack moisture content (%)
- C = Cunningham correction factor for particle diameter, Dp, and calculated using the actual stack gas temperature, dimensionless
- C_1 = -150.3162 (micropoise)
- C_2 = 18.0614 (micropoise/$K^{0.5}$) = 13.4622 (micropoise/$R^{0.5}$)
- $C_3 = 1.19183 \times 10^6$ (micropoise/K^2) = 3.86153×10^6 (micropoise/R^2)
- C_4 = 0.591123 (micropoise)
- C_5 = 91.9723 (micropoise)
- $C_6 = 4.91705 \times 10^{-5}$ (micropoise/K^2) = 1.51761×10^{-5} (micropoise/R^2)
- C_a = Acetone blank concentration, mg/mg
- C_b = Concentration of NH3 ion in the back half of train (breakthrough)
- C_f = Concentration of NH3 ion in the front half of train (main catch)
- C_{fPM10} = Conc. of filterable PM_{10}, gr/dscf
- $C_{fPM2.5}$ = Conc. of filterable $PM_{2.5}$, gr/dscf
- C_k = K Factor Constant, 849.8

Nomenclature

- C_n = nozzle diameter constant, 0.03575
- C_p' = Coefficient for the pitot used in the preliminary traverse, dimensionless
- C_p = Pitot coefficient for the combined cyclone pitot, dimensionless
- C_{cpm} = Concentration of the condensable PM in the stack gas, dry basis, corrected to standard conditions, milligrams/dry standard cubic foot.
- C_r = Re-estimated Cunningham correction factor for particle diameter equivalent to the actual cut size diameter and calculated using the actual stack gas temperature, dimensionless
- D_{50} = Particle cut diameter, micrometers
- $D_{50(N+1)}$ = D_{50} value for cyclone IV calculated during the N+1 iterative step, micrometers
- D_{50-1} = Re-calculated particle cut diameters based on re-estimated C_r, micrometers
- D_{50LL} = Cut diameter for cyclone I corresponding to the 2.25 micrometer cut diameter for cyclone IV, micrometer
- D_{50N} = D_{50} value for cyclone IV calculated during the Nth iterative step, micrometers
- D_{50T} = Cyclone I cut diameter corresponding to the middle of the overlap zone shown in Method 201A, Figure 10 of Section 17, micrometers
- D_e = equivalent stack diameter (in.)
- ΔH@ = ΔH @ 0.75 scfm (in. H2O)
- ΔH_{avg} = average orifice pressure (in. H_2O)
- D_n = Inner diameter of sampling nozzle mounted on Cyclone I, inches
- D_{na} = actual nozzle diameter (in.)
- D_p = Physical particle size, micrometers
- Δp = velocity head (in. H_2O)
- Δp_1 = velocity head at first current traverse point (in. H_2O)
- $\Delta p'_1$ = velocity head at first preliminary traverse point (in. H_2O)
- Δp_{avg} = average pitot tube differential pressure (in. H_2O)
- Δp_n = velocity head at subsequent current traverse point (in. H_2O)
- Δp_{RM2} = method 2 velocity head (in. H_2O)
- D_s = diameter of stack (in.)
- F_d = fuel f-factor (dscf/MMBtu)
- f_{O2} = stack gas fraction of O_2, by volume, dry basis
- I = Percent isokinetic sampling, dimensionless
- K_1 = standard volume correction, 17.65^{o}R/in. Hg
- K_4 = isokinetic conversion constant, 0.0945min•in.Hg/sec•^{o}R
- K_5 = water mass to std water vapor, 0.04715 ft^3/g
- K_p = 85.49, ((ft/sec)/(pounds/mole -^{o}R))
- L = length of stack (in.)
- L_{fw} = distance to far wall of stack (in.)
- L_{nw} = distance to near wall of stack (in.) [reference]
- $m_{\#x}$ = weight measurements (g)
- M_1 = Milligrams of PM collected on the filter, less than or equal to 2.5 micrometers
- M_2 = Milligrams of PM recovered from Container #2 (acetone blank corrected), greater than 10 micrometers
- M_3 = Milligrams of PM recovered from Container #3 (acetone blank corrected), less than or equal to 10 and greater than 2.5 micrometers
- M_4 = Milligrams of PM recovered from Container #4 (acetone blank corrected), less than or equal to 2.5 micrometers

Nomenclature

- m_a = Mass of residue of acetone after evaporation, mg
- m_c = Mass of the NH4+ added to sample to form ammonium sulfate, mg
- m_{cpm} = Mass of the total condensable PM, mg
- M_d = Molecular weight of dry gas, pounds/pound mole
- m_{fb} = Mass of total CPM in field train recovery blank, mg
- m_{fx} = final weight, avg of last two measurements (g)
- mg = Milligram
- mg/L = Milligram per liter
- m_i = Mass of inorganic CPM, mg
- m_{ib} = Mass of inorganic CPM in field train recovery blank, mg
- M_n = total particulates (mg)
- m_o = Mass of organic CPM, mg
- m_{ob} = Mass of organic CPM in field train blank, mg
- m_r = Mass of dried sample from inorganic fraction, mg
- m_{tx} = tare weight (g)
- MW = molecular weight (lb/lb-mole)
- M_w = Molecular weight of wet gas, pounds/pound mole
- N = Normality of ammonium hydroxide titrant
- N_a = null angle (deg.)
- N_{re} = Reynolds number, dimensionless
- N_{tp} = Number of iterative steps or total traverse points
- P_b = P_{bar} = barometric pressure (in. Hg)
- P_{bar} = barometric pressure (in. Hg)
- ppmCO = carbon monoxide concentration (ppm)
- ppmv = Parts per million by volume
- ppmw = Parts per million by weight
- P_s = absolute stack pressure (in. Hg)
- P_{static} = static pressure (in. H_2O)
- P_{std} = standard pressure, 29.92 in. Hg
- Θ = total sampling time (min)
- Q_{aw} = average stack wet flow rate (ascf/min)
- Q_I = Sampling rate for cyclone I to achieve specified D_{50}
- Q_m = estimated orifice flow rate, 0.750 acfm, else Vm/Q from previous run
- Q_s = Sampling rate for cyclone I to achieve specified D_{50}
- $Q_{s(std)}$ = total cyclone flow rate at standard conditions (dscf/min)
- Q_{sd} = dry standard stack flow rate (dscfm)
- Q_{sST} = Dry gas sampling rate through the sampling assembly, dscfm
- Q_{sw} = wet standard stack flow rate (ascfm)
- R_{max} = Nozzle/stack velocity ratio parameter, dimensionless
- R_{min} = Nozzle/stack velocity ratio parameter, dimensionless
- t_1 = Sampling time at point 1, min
- t_m = average gas meter temperature (^oF)
- t_m = average meter temperature (^oF)
- T_m = Meter box and orifice gas temperature, ^oR
- t_n = Sampling time at point n, min

Nomenclature

- t_r = Total projected run time, min
- T_s = Absolute stack gas temperature, ^oR
- T_{std} = standard temperature, 68^{o}F, 528^{o}R
- T_u = absolute temperature offset, 460^{o}R
- V_a = Volume of acetone blank, ml
- V_{aw} = Volume of acetone used in sample recovery wash, ml
- V_b = Volume of aliquot taken for IC analysis, ml
- V_c = Quantity of water captured in impingers and silica gel, ml
- V_f = final impinger volume (ml)
- V_i = initial impinger volume (ml)
- V_{ic} = Volume of impinger contents sample, ml
- V_m = Dry gas meter volume sampled, acf
- $V_{m(std)}$ = standard meter volume (dscf)
- v_{max} = Maximum gas velocity calculated from Equations 18 or 19, ft/sec
- v_{max} = maximum nozzle velocity (ft/sec)
- V_{mf} = final dry gas meter reading (dcf)
- V_{mi} = initial dry gas meter reading (dcf)
- v_{min} = Minimum gas velocity calculated from Method 201A, Equations 16 or 17, ft/sec
- V_{ms} = Dry gas meter volume sampled, corrected to standard conditions, dscf
- v_n = Sample gas velocity in the nozzle, ft/sec
- v_{org} = organics wash volume (ml)
- V_p = Volume of water added during train purge
- v_s = average stack gas velocity (ft/sec)
- v_{sl} = local velocity (ft/sec)
- V_t = total impinger volume (ml) = ;(V_f-V_i)
- V_t = Volume of NH4OH titrant, ml
- $V_{w(std)}$ = volume of water vapor in gas sample at standard conditions (scf)
- v_x = blank volume (ml)
- W = width of stack (in.)
- $W_{2,3,4}$ = Weight of PM recovered from Containers #2, #3, and #4, mg
- W_a = Weight of blank residue in acetone used to recover samples, mg
- W_f = final impinger weight (g)
- W_i = initial impinger weight (g)
- W_t = total impinger weight (g) = ;(W_f-W_i)
- w_x = blank weight of solids (g)
- Y = meter calibration factor (a.k.a gamma)
- Z = Ratio between estimated cyclone IV D_{50} values, dimensionless
- γ = Dry gas meter gamma value, dimensionless
- ΔH = Meter box orifice pressure drop, inches W.C.
- $\Delta H@$ = Pressure drop across orifice at flow rate of 0.75 scfm at standard conditions, inches W.C. (Note: Specific to each orifice and meter box.)
- Δp_1 = Velocity pressure measured at point 1, inches W.C.
- Δp_{avg} = Average velocity pressure, inches W.C.
- Δp_m = Observed velocity pressure using S-type pitot tube in preliminary traverse, inches W.C.
- Δp_{max} = Maximum velocity pressure, inches W.C.

Nomenclature

- Δp_{min} = Minimum velocity pressure, inches W.C.
- Δp_n = Velocity pressure measured at point n during the test run, inches W.C.
- Δp_s = Velocity pressure calculated in Method 201a, Equation 25, inches W.C.
- Δp_{s1} = Velocity pressure adjusted for combined cyclone pitot tube, inches W.C.
- Δp_{s2} = Velocity pressure corrected for blockage, inches W.C.
- θ = Total run time, min
- ρ_a = Density of acetone, mg/ml (see label on bottle)
- Σ_n = total number of sampling points

EXAMPLE CALCULATIONS (Reference Method 1 - Rectangular Stack)

Length of Stack (in.)

$$L(in.) = L_{fw} - L_{nw}$$

L (in.) = 44.13 in. - 0.13 in. = 44.00 in.

Equivalent Diameter of Stack (in.)

$$D_e(in.) = \frac{2 \times L \times W}{L + W}$$

$$D_e \text{ (in.)} = \frac{2 \times 44.00 \text{ in.} \times 43.00 \text{ in.}}{44.00 \text{ in.} + 43.00 \text{ in.}} = 43.49 \text{ in.}$$

Area of Stack (ft²)

$$A_s(ft^2) = w \times l$$

$$A_s \text{ (ft}^2\text{)} = \frac{43.00}{12} \text{ ft} \times \frac{44.00}{12} \text{ ft} = 13.14 \text{ ft}^2$$

Stack Diameters Downstream

$$B_D(dia.) = \frac{B}{D_e}$$

$$B_D \text{ (dia.)} = \frac{101.00 \text{ in.}}{43.49 \text{ in.}} = 2.32 \text{ diameters}$$

Stack Diameters Upstream

$$A_D(dia.) = \frac{A}{D_e}$$

$$A_D \text{ (dia.)} = \frac{46.00 \text{ in.}}{43.49 \text{ in.}} = 1.06 \text{ diameters}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 3a) [Values from Run 1 test]

Carbon Monoxide Concentration (%)

$$\%CO = \frac{ppmCO}{10{,}000}$$

$$\%CO\ (\%) = \frac{0.00\ \text{ppm}}{10{,}000\ \text{ppm}/\%} = 0.0000\ \%$$

Nitrogen Concentration (%)

$$\%N_2 = 100 - \%CO_2 - \%O_2 - \%CO$$

$\%N_2$ (%) = 100 - 0.00 % - 20.90 % - 0.00 / 10,000 % = 79.1 %

Stack Dry Molecular Weight (lb/lb-mole)

$$M_d\,(lb/lb-mol) = \sum\left(\frac{MW_{comp}}{100} \times \%component\right)$$

$$M_d\ (\text{lb/lb-mol}) = \left(\frac{44\ \text{lb/lb-mol}}{100} \times 0.00\ \%\right) + \left(\frac{32\ \text{lb/lb-mol}}{100} \times 20.90\ \%\right) + \left(\frac{28\ \text{lb/lb-mol}}{100} \times \left[\frac{0.00}{10{,}000} + 79.10\right]\right) = \frac{28.84\ \text{lb}}{\text{lb-mol}}$$

Stack Wet Molecular Weight (lb/lb-mole)

$$M_S\,(lb/lb-mol) = \left[M_d \times \left(1 - \frac{B_{WS}}{100}\right)\right] + \left[MW_{H_2O} \times \frac{B_{WS}}{100}\right]$$

$$M_S\ (\text{lb/lb-mol}) = \left\{\frac{28.84\ \text{lb}}{\text{lb-mol}} \times \left(1 - \frac{0.50\ \%}{100}\right)\right\} + \left\{\frac{18\ \text{lb}}{\text{lb-mol}} \times \frac{0.50\ \%}{100}\right\} = \frac{28.78\ \text{lb}}{\text{lb-mol}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 2) [Values from Run 1 test]

Absolute Stack Pressure (in. Hg)

$$P_S(in.Hg) = P_b + \frac{P_{static}}{13.6}$$

$$P_s \text{ (in. Hg)} = 29.54 \text{ in. Hg} + \frac{0.01 \text{ in. } H_2O}{13.6 \text{ in. } H_2O\text{/in. Hg}} = 29.54 \text{ in. Hg}$$

Average Stack Gas Velocity (ft/sec)

$$v_s\,(ft/\sec) = K_p \times C_p \times \left(\sqrt{\Delta p}\right)_{avg} \times \sqrt{\frac{(t_s)_{avg} + T_u}{P_s \times M_s}}$$

v_{sl} (ft/sec) =

$$\left(\frac{85.49 \text{ ft} \quad \text{(lb/lb-mol)(in. Hg)}}{\text{sec} \quad (^oR)(\text{in. } H_2O)}\right)^{1/2} \times 0.83 \times 0.30 \text{ in.} H_2O^{1/2} \times \sqrt{\frac{60.44 + 460\ ^oR}{29.54 \text{ in. Hg} \times 28.78 \text{ lb/lb-mol}}} = \frac{16.8 \text{ ft}}{\text{sec}}$$

Average Stack Dry Standard Flow Rate (dscfh)

$$Q_{sd}(dscfh) = \frac{60 \times 60 \times \left(1 - \frac{B_{ws}}{100}\right) \times v_s \times A_s \times T_{std} \times P_s}{(t_s + T_u) \times P_{std}}$$

$$Q_{sd} \text{ (dscf/hr)} = \frac{3600 \text{ sec}}{\text{hr}} \times \left(1 - \frac{0.50 \%}{100}\right) \times \frac{16.83 \text{ ft}}{\text{sec}} \times 13.14 \text{ ft}^2 \times \frac{68.00 + 460\ ^oR}{60.44 + 460\ ^oR} \times \frac{29.54 \text{ in. Hg}}{29.92 \text{ in. Hg}} = \frac{793{,}600.92 \text{ dscf}}{\text{hr}}$$

Average Stack Wet Flow Rate (acfm)

$$Q_{aw}(acfm) = 60 \times v_s \times A_s$$

$$Q_{aw} \text{ (acf/min)} = \frac{60 \text{ sec}}{\text{min}} \times \frac{16.83 \text{ ft}}{\text{sec}} \times 13.14 \text{ ft}^2 = \frac{13{,}271.02 \text{ acf}}{\text{min}}$$

Average Stack Wet Standard Flow Rate (ascfh)

$$Q_{sw}(ascfh) = \frac{60 \times Q_{aw} \times T_{std} \times P_s}{(t_s + T_u) \times P_{std}}$$

$$Q_{sw} \text{ (ascf/hr)} = \frac{60 \text{ min}}{\text{hr}} \times \frac{13{,}271.02 \text{ acf}}{\text{min}} \times \frac{68.00 + 460\ ^oR}{60.44 + 460\ ^oR} \times \frac{29.54 \text{ in. Hg}}{29.92 \text{ in. Hg}} = \frac{797{,}587.57 \text{ ascf}}{\text{hr}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 4) [Values from Run 1 test]

Water Volume Weighed (scf)

$$V_{wsg\,(std)}(scf) = W_t \times K_5$$

$V_{wsg(std)}$ = 3.40 g x 0.04715 ft^3/g = 0.160 scf

Standard Meter Volume (dscf)

$$V_{m(std)}(dscf) = \frac{K_1 \times Y \times V_m \times \left(P_b + \frac{\Delta H_{avg}}{13.6}\right)}{(t_m)_{avg} + T_u}$$

$$V_{m(std)} = \frac{\frac{17.65\ ^{o}R}{in.\ Hg} \times 1.00 \times 32.78\ dcf \times \left(29.54\ in.\ Hg + \frac{1.02\ in.\ H_2O}{13.6\ in.\ H_2O\ /\ in.\ Hg}\right)}{74.08\ ^{o}F + 460\ ^{o}R} = 31.91\ dscf$$

Calculated Moisture Content (%)

$$B_{ws(calc)}(\%) = 100 \times \frac{V_{wsg(std)}}{V_{wsg(std)} + V_{m(std)}}$$

$$B_{ws(calc)} = 100 \times \frac{0.16\ dscf}{0.16\ dscf + 31.91\ dscf} = 0.50\ \%$$

Saturated Moisture Content (%)

$$B_{ws(svp)}(\%) = 100 \times \frac{10^{6.691 - \frac{3144}{t_{s(avg)} + 390.86}}}{P_b + \frac{P_{static}}{13.6}} \leq 100$$

$$B_{ws(svp)} = 100 \times \frac{10^{\left(6.691 - \frac{3144}{60.44\ ^{o}F + 390.86}\right)}}{29.54\ in.\ Hg + \frac{0.01\ in.\ H_2O}{13.6\ in.\ H_2O\ /\ in.\ Hg}} \leq 100 = 1.79\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Isokinetic Sampling) [Values from Run 1 test]

Desired Orifice (in. H_2O) (first point)

$$\Delta H_d (in.H_2O) = K \times \Delta p$$

ΔH_d (in. H_2O) = 10.55 x 0.14 in. H_2O = 1.48 in. H_2O

Absolute Meter Pressure (in. Hg)

$$P_m (in.Hg) = P_b + \frac{\Delta H @}{13.6}$$

$$P_m \text{ (in. Hg)} = 29.54 \text{ in. Hg} + \frac{1.88 \text{ in. } H_2O}{13.6 \text{ in. } H_2O/\text{in. Hg}} = 29.68 \text{ in. Hg}$$

Recommended Nozzle Diameter (in.)

$$D_{ni} (in.) = \sqrt{\frac{C_n \times Q_m \times P_m}{(t_m + T_u) \times C_p} \times \left(\frac{1 - \frac{B_{wm}}{100}}{1 - \frac{B_{ws}}{100}}\right) \times \sqrt{(t_s + T_u) \times \left[\frac{M_d \times \left(1 - \frac{B_{ws}}{100}\right) + \left(18 \times \frac{B_{ws}}{100}\right)}{P_s \times \Delta p_{avg}}\right]}}$$

$$D_{ni} \text{ (in.)} = \sqrt{\frac{\frac{0.03575 \text{ (lb-mole}\cdot{}^oR\cdot\text{in. } H_2O)^{1/2}\cdot\text{min}\cdot\text{in.}^2}{\text{acf}\cdot\text{in. Hg}^{3/4}\cdot\text{lb}^{1/2}} \times 0.75 \text{ acf} \times 29.68 \text{ in. Hg}}{(74.08 \ {}^oF + 460^oR) \times 0.83} \times \left(\frac{1 - \frac{0.00 \ \%}{100}}{1 - \frac{0.50 \ \%}{100}}\right) \times \sqrt{(60.44 \ {}^oF + 460^oR) \times \frac{\frac{28.84 \text{ lb}}{\text{lb-mole}} \times \left(1 - \frac{0.50 \ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{0.50 \ \%}{100}\right)}{29.54 \text{ in. Hg} \times 0.30 \text{ in. } H_2O}}} = 0.271 \text{ in.}$$

ΔP to ΔH Isokinetic Factor

$$K = C_k \times C_p^2 \times \Delta H @ \times D_{na}^4 \times \left[\frac{M_d \times \left(1 - \frac{B_{wm}}{100}\right) + \left(18 \times \frac{B_{wm}}{100}\right)}{M_d \times \left(1 - \frac{B_{ws}}{100}\right) + \left(18 \times \frac{B_{ws}}{100}\right)}\right] \times \left(\frac{1 - \frac{B_{ws}}{100}}{1 - \frac{B_{wm}}{100}}\right)^2 \times \left(\frac{t_m + T_u}{ts + T_u}\right) \times \frac{P_s}{P_m}$$

$$K = \frac{849.8}{\text{in. } H_2O\cdot\text{in.}^4} \times 0.83^2 \times 1.88 \text{ in. } H_2O \times 0.31^4 \times \left(\frac{1 - \frac{0.50 \ \%}{100}}{1 - \frac{0.00 \ \%}{100}}\right)^2 \times \left(\frac{74.08 \ {}^oF + 460^oR}{60.44 \ {}^oF + 460^oR}\right) \times \left(\frac{\frac{28.84 \text{ lb}}{\text{lb/mole}} \times \left(1 - \frac{0.00 \ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{0.00 \ \%}{100}\right)}{\frac{28.84 \text{ lb}}{\text{lb/mole}} \times \left(1 - \frac{0.50 \ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{0.50 \ \%}{100}\right)}\right) \times \frac{29.54 \text{ in. Hg}}{29.68 \text{ in. Hg}} = 10.55$$

Percent Isokinetic (%) (first point)

$$I(\%) = \frac{K_4 \times ((t_s)_{avg} + T_u) \times V_{m(std)}}{\left(\Theta \times (v_{s(I)})_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right) \times \left(1 - \frac{B_{ws}}{100}\right)}$$

$$I (\%) = \frac{\frac{0.0945 \text{ min}\cdot\text{in. Hg}}{\text{sec}\cdot{}^oR} \times (56.00 \ {}^oF + 460 \ {}^oR) \times 1.63 \text{ dscf}}{2.40 \text{ min} \times \frac{20.66 \text{ ft}}{\text{sec}} \times 29.54 \text{ in. Hg} \times 3.14 \times \left(\frac{0.31 \text{ in.}}{2} \times \frac{\text{ft.}}{12 \text{ in.}}\right)^2 \times \left(1 - \frac{0.50 \ \%}{100}\right)} = 102.98 \ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Isokinetic Sampling) [Values from Run 1 test]

Cumulative Percent Isokinetic (%) (weighted average of all points)

$$I(\%) = \sum_{1-n} \frac{\lfloor I(\%) \times V_{m(std)} \rfloor_{1-n}}{V_{m(std)_{1-n}}}$$

Using Method 5, Eq 5-8 to determine intermediate isokinetics at each point, weighted averaging of the cumulative isokinetics is necessary since all points are not equal, and determined by using the dry standard meter volume collected at each point to weight the cumulative average. Intermediate isokinetics and dry standard meter volumes are found at each point. At each point the cumulative sum is found of each value and the quotient of the two used to determine the cumulative isokinetics for each residual point (n).

Pt	In (%)	x	Vm(std)n	=	I (%)n	∑(I (%)n)	/	∑(Vm(std)n)	=	I (%)
A-1	102.98	x	1.634	=	168.26	168.26	/	1.63	=	103.0
A-2	106.71	x	1.632	=	174.10	342.36	/	3.27	=	104.8
A-3	91.95	x	1.560	=	143.40	485.76	/	4.83	=	100.7
A-4	100.05	x	1.588	=	158.83	644.59	/	6.41	=	100.5
A-5	94.52	x	1.552	=	146.74	791.33	/	7.97	=	99.3
B-1	97.05	x	1.426	=	138.36	929.68	/	9.39	=	99.0
B-2	100.25	x	1.410	=	141.35	1071.03	/	10.80	=	99.2
B-3	129.98	x	1.457	=	189.38	1260.42	/	12.26	=	102.8
B-4	72.79	x	0.816	=	59.39	1319.81	/	13.07	=	101.0
B-5	96.24	x	1.467	=	141.22	1461.02	/	14.54	=	100.5
C-1	101.44	x	1.484	=	150.58	1611.60	/	16.03	=	100.6
C-2	100.97	x	1.045	=	105.50	1717.10	/	17.07	=	100.6
C-3	99.20	x	1.025	=	101.73	1818.83	/	18.10	=	100.5
C-4	101.56	x	0.958	=	97.25	1916.07	/	19.05	=	100.6
C-5	95.79	x	1.141	=	109.31	2025.39	/	20.19	=	100.3
D-1	98.39	x	1.172	=	115.33	2140.71	/	21.37	=	100.2
D-2	98.99	x	1.103	=	109.20	2249.92	/	22.47	=	100.1
D-3	100.82	x	1.123	=	113.18	2363.09	/	23.59	=	100.2
D-4	99.21	x	1.181	=	117.16	2480.25	/	24.77	=	100.1
D-5	101.25	x	1.205	=	122.01	2602.26	/	25.98	=	100.2
E-1	60.66	x	0.807	=	48.97	2651.23	/	26.79	=	99.0
E-2	146.22	x	1.846	=	269.93	2921.16	/	28.63	=	102.0
E-3	99.03	x	1.179	=	116.72	3037.89	/	29.81	=	101.9
E-4	99.86	x	1.111	=	110.93	3148.81	/	30.92	=	101.8
E-5	100.71	x	1.037	=	104.44	3253.26	/	31.96	=>	101.8
Last Pt										

Percent Isokinetic (%) (intermediate equation, all points)
[equivalent to taking an average of point-by-point isokinetics without weighting the average (e.g. all points equal)]

$$I(\%) = \frac{K_4 \times \left((t_s)_{avg} + T_u\right) \times V_{m(std)}}{\left(\Theta \times (v_{s(l)})_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right) \times \left(1 - \frac{B_{ws}}{100}\right)}$$

$$I(\%) = \frac{\frac{0.0945\ \text{min•in. Hg}}{\text{sec•}^{o}\text{R}} \times (60.44\ ^{o}\text{F} + 460\ ^{o}\text{R}) \times 31.91\ \text{dscf}}{60.00\ \text{min} \times \frac{16.83\ \text{ft}}{\text{sec}} \times 29.54\ \text{in. Hg} \times 3.14 \times \left(\frac{0.31\ \text{in.}}{2} \times \frac{\text{ft.}}{12\ \text{in.}}\right)^2 \times \left(1 - \frac{0.50\ \%}{100}\right)} = 99.57\ \%$$

Raw Data Percent Isokinetic (%)
[utilizes the raw data equation for isokinetics from Method 5]

$$I(\%) = \frac{100\left((t_s)_{avg} + T_u\right)\left[K_4 V_{1c} + \frac{V_m Y}{(t_m)_{avg} + T_u}\left(P_{bar} + \frac{\Delta H}{13.6}\right)\right]}{60\left(\Theta \times (v_{s(l)})_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right)}$$

$$I(\%) = \frac{100 \times (60.44\ ^{o}\text{F} + 460\ ^{o}\text{R}) \times \left[\frac{0.002669\ \text{ft}^3\text{•in. Hg}}{\text{ml•}^{o}\text{R}} \times 3.406\ \text{ml} + \frac{32.78\ \text{dcf} \times 0.995}{74.08\ ^{o}\text{F} + 460\ ^{o}\text{R}}\left(29.54\ \text{in Hg} + \frac{0.304}{13.6}\right)\right]}{60 \times 60.00\ \text{min} \times \frac{16.83\ \text{ft}}{\text{sec}} \times 29.54\ \text{in. Hg} \times 3.14 \times \left(\frac{0.31\ \text{in.}}{2} \times \frac{\text{ft.}}{12\ \text{in.}}\right)^2} = 99.34\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Analysis) [Values from Run 1 test - Lead Mass]

Stack Lead Concentration (g/dscf)

$$c_s(g/dscf) = 0.001 \times \frac{M_n}{V_{m(std)}}$$

$$c_s \text{ (g/dscf)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{\text{0.00 mg}}{\text{31.91 dscf}} = \frac{\text{8.00E-08 g}}{\text{dscf}}$$

Stack Lead Concentration (gr/dscf)

$$c'_s(gr/dscf) = 0.001 \times \frac{M_n}{V_{m(std)}} \times \frac{7000}{453.592}$$

$$c'_s \text{ (gr/dscf)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{\text{0.00 mg}}{\text{31.91 dscf}} \times \frac{\text{7000 gr}}{\text{lb}} \times \frac{\text{lb}}{\text{453.592 g}} = \frac{\text{1.26E-06 gr}}{\text{dscf}}$$

Lead Emissions Rate (kg/hr)

$$E(kg/hr) = c_s \times Q_{sd} \times \frac{kg}{1000\ g}$$

$$E \text{ (kg/hr)} = \frac{\text{kg}}{\text{1000 g}} \times \frac{\text{8.15E-08 g}}{\text{dscf}} \times \frac{\text{793,601 dscf}}{\text{hr}} = \frac{\text{6.47E-05 kg}}{\text{hr}}$$

Lead Emissions Rate (lb/hr)

$$E'(lb/hr) = \frac{M_n \times Q_{sd}}{V_{m(std)}} \times \frac{lb \times g}{453.592g \times 1000mg}$$

$$E' \text{ (lb/hr)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{\text{lb}}{\text{453.592 g}} \times \frac{\text{0.00 mg}}{\text{31.91 dscf}} \times \frac{\text{793,601 dscf}}{\text{hr}} = \frac{\text{1.43E-04 lb}}{\text{hr}}$$

Lead Emissions Rate (tpy)

$$E''(ton/yr) = E' \times \frac{8760}{2000}$$

$$E'' \text{ (tpy)} = \frac{\text{ton}}{\text{2000 lb}} \times \frac{\text{8,760 hr}}{\text{yr}} \times \frac{\text{0.00 lb}}{\text{hr}} = \frac{\text{6.24E-04 ton}}{\text{yr}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

TEST RESULTS AND CALCULATIONS

Vent #2 Emissions Data

METHOD 12 (LEAD) - RESULTS

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Historical Data	**V2Pb-1**	**V2Pb-2**	**V2Pb-3**	**Average**	**Units**
Run Start Time	16:42	07:08	08:45		hh:mm
Run Stop Time	17:52	08:14	09:50		hh:mm
Test Date	12/18/19	12/19/19	12/19/19		mm/dd/yy
Production Rate	Max	Max	Max		ton/hr
Meter Calibration Factor	0.995	0.995	0.995		
Pitot Tube Coefficient	0.8290	0.8190	0.8290		
Average Nozzle Diameter	0.312	0.314	0.312		in
Stack Test Data	**V2Pb-1**	**V2Pb-2**	**V2Pb-3**	**Average**	**Units**
Initial Meter Volume	763.058	798.888	834.988		ft^3
Final Meter Volume	798.585	834.659	869.781		ft^3
Total Meter Volume	35.527	35.771	34.793	35.364	ft^3
Total Sampling Time	60.00	60.00	60.00	60.00	min
Average Meter Temperature	77.32	70.20	78.56	75.36	°F
Average Stack Temperature	65.48	58.20	59.32	61.00	°F
Barometric Pressure	29.54	29.51	29.54	29.53	in Hg
Stack Static Pressure	0.01	0.01	0.01	0.01	in H_2O
Absolute Stack Pressure	29.54	29.51	29.54	29.53	in Hg
Average Orifice Pressure Drop	1.16	1.20	1.09	1.15	in H_2O
Absolute Meter Pressure	29.68	29.65	29.68	29.67	in Hg
Avg Square Root Pitot Pressure	0.33	0.33	0.32	0.33	$\sqrt{(\text{in } H_2O)}$
Moisture Content Data	**V2Pb-1**	**V2Pb-2**	**V2Pb-3**	**Average**	**Units**
Impinger Water Weight Gain	-1.10	-3.20	-0.10	-1.47	g
Silica Gel Weight Gain	7.90	6.10	11.70	8.57	g
Total Water Volume Collected	6.81	2.91	11.62	7.11	ml
Standard Water Vapor Volume	0.32	0.14	0.55	0.33	scf
Standard Meter Volume	34.4	35.1	33.6	34.4	dscf
Standard Metric Meter Volume	1.0	1.0	1.0	1.0	dscm
Calculated Stack Moisture	0.92	0.39	1.60	0.97	%
Saturated Stack Moisture	2.14	1.66	1.72	1.84	%
Reported Stack Moisture Content	0.92	0.39	1.60	0.97	%
Gas Analysis Data	**V2Pb-1**	**V2Pb-2**	**V2Pb-3**	**Average**	**Units**
Carbon Dioxide Content	0.0	0.0	0.0	0.0	%
Oxygen Content	20.9	20.9	20.9	20.9	%
Carbon Monoxide Content	0.0	0.0	0.0	0.0	ppm
Nitrogen Content	79.1	79.1	79.1	79.1	%
Stack Dry Molecular Weight	28.84	28.84	28.84	28.84	lb/lb-mole
Stack Wet Molecular Weight	28.74	28.79	28.66	28.73	lb/lb-mole

METHOD 12 (LEAD) - RESULTS

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Volumetric Flow Rate Data	**V2Pb-1**	**V2Pb-2**	**V2Pb-3**	**Average**	**Units**
Average Stack Gas Velocity	18.15	18.17	17.84	18.05	ft/sec
Stack Cross-Sectional Area	13.14	13.14	13.14	13.14	ft²
Actual Stack Flow Rate	14,311	14,321	14,064	14,232	acfm
Wet Standard Stack Flow Rate	852	864	847	854	wkscfh
Dry Standard Stack Flow Rate	843,962	860,200	833,474	845,879	dscfh
Percent of Isokinetic Rate	101.2	100.3	99.9	100.5	%
Emission Rate Data	**V2Pb-1**	**V2Pb-2**	**V2Pb-3**	**Average**	**Units**
Lead Mass	0.0008	0.0017	0.0014	0.0013	mg
Lead Concentration	2.33E-08	4.85E-08	4.17E-08	3.78E-08	g/dscf
	3.59E-07	7.48E-07	6.43E-07	5.83E-07	gr/dscf
Lead Emission Rate	1.96E-05	4.17E-05	3.47E-05	3.20E-05	kg/hr
	4.33E-05	9.19E-05	7.66E-05	7.06E-05	lb/hr
	1.90E-04	4.03E-04	3.35E-04	3.09E-04	tpy

Note: HNO_3 blank concentration of 0.6 µg subtracted from each result

EXAMPLE CALCULATIONS (Reference Method 1 - Rectangular Stack)

Length of Stack (in.)

$$L(in.) = L_{fw} - L_{nw}$$

L (in.) = 44.13 in. - 0.13 in. = 44.00 in.

Area of Stack (ft^2)

$$A_s(ft^2) = w \times l$$

$$A_s\,(ft^2) = \frac{43.00}{12}\,ft \times \frac{44.00}{12}\,ft = 13.14\ ft^2$$

Equivalent Diameter of Stack (in.)

$$D_e(in.) = \frac{2 \times L \times W}{L + W}$$

$$D_e\,(in.) = \frac{2 \times 44.00\ in. \times 43.00\ in.}{44.00\ in. + 43.00\ in.} = 43.49\ in.$$

Stack Diameters Downstream

$$B_D(dia.) = \frac{B}{D_e}$$

$$B_D\,(dia.) = \frac{101.00\ in.}{43.49\ in.} = 2.32\ \text{diameters}$$

Stack Diameters Upstream

$$A_D(dia.) = \frac{A}{D_e}$$

$$A_D\,(dia.) = \frac{46.00\ in.}{43.49\ in.} = 1.06\ \text{diameters}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 3a) [Values from Run 1 test]

Carbon Monoxide Concentration (%)

$$\%CO = \frac{ppmCO}{10{,}000}$$

$\%CO\ (\%) = \dfrac{0.00\ \text{ppm}}{10{,}000\ \text{ppm/\%}} = 0.0000\ \%$

Nitrogen Concentration (%)

$$\%N_2 = 100 - \%CO_2 - \%O_2 - \%CO$$

$\%N_2\ (\%) =$ 100 - 0.00 % - 20.90 % - 0.00 / 10,000 % = 79.1 %

Stack Dry Molecular Weight (lb/lb-mole)

$$M_d\,(lb/lb-mol) = \sum\left(\frac{MW_{comp}}{100} \times \%component\right)$$

M_d (lb/lb-mol) = $\left(\dfrac{44\ \text{lb/lb-mol}}{100} \times 0.00\ \%\right) + \left(\dfrac{32\ \text{lb/lb-mol}}{100} \times 20.90\ \%\right) + \left(\dfrac{28\ \text{lb/lb-mol}}{100} \times \left[\dfrac{0.00}{10{,}000} + 79.10\right]\right) = \dfrac{28.84\ \text{lb}}{\text{lb-mol}}$

Stack Wet Molecular Weight (lb/lb-mole)

$$M_S\,(lb/lb-mol) = \left[M_d \times \left(1 - \frac{B_{WS}}{100}\right)\right] + \left[MW_{H_2O} \times \frac{B_{WS}}{100}\right]$$

M_S (lb/lb-mol) = $\left\{\dfrac{28.84\ \text{lb}}{\text{lb-mol}} \times \left(1 - \dfrac{0.92\ \%}{100}\right)\right\} + \left\{\dfrac{18\ \text{lb}}{\text{lb-mol}} \times \dfrac{0.92\ \%}{100}\right\} = \dfrac{28.74\ \text{lb}}{\text{lb-mol}}$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 2) [Values from Run 1 test]

Absolute Stack Pressure (in. Hg)

$$P_S\,(in.Hg) = P_b + \frac{P_{static}}{13.6}$$

$$P_s\text{ (in. Hg)} = 29.54\text{ in. Hg} + \frac{0.01\text{ in. }H_2O}{13.6\text{ in. }H_2O\text{/in. Hg}} = 29.54\text{ in. Hg}$$

Average Stack Gas Velocity (ft/sec)

$$v_s\,(ft/\sec) = K_p \times C_p \times \left(\sqrt{\Delta p}\right)_{avg} \times \sqrt{\frac{(t_s)_{avg} + T_u}{P_s \times M_s}}$$

v_{sl} (ft/sec) =

$$\left(\frac{85.49\text{ ft}\quad\text{(lb/lb-mol)(in. Hg)}}{\text{sec}\quad(^{o}\text{R})(\text{in. }H_2O)}\right)^{1/2} \times 0.83 \times 0.33\text{ in.}H_2O^{1/2} \times \sqrt{\frac{65.48 + 460\ ^{o}R}{29.54\text{ in. Hg} \times 28.74\text{ lb/lb-mol}}} = \frac{18.1\text{ ft}}{\text{sec}}$$

Average Stack Dry Standard Flow Rate (dscfh)

$$Q_{sd}(dscfh) = \frac{60\times 60\times\left(1-\frac{B_{ws}}{100}\right)\times v_s \times A_s \times T_{std} \times P_s}{(t_s + T_u)\times P_{std}}$$

$$Q_{sd}\text{ (dscf/hr)} = \frac{3600\text{ sec}}{\text{hr}} \times \left(1 - \frac{0.92\ \%}{100}\right) \times \frac{18.15\text{ ft}}{\text{sec}} \times 13.14\text{ ft}^2 \times$$

$$\frac{68.00 + 460\ ^{o}R}{65.48 + 460\ ^{o}R} \times \frac{29.54\text{ in. Hg}}{29.92\text{ in. Hg}} = \frac{843{,}961.71\text{ dscf}}{\text{hr}}$$

Average Stack Wet Flow Rate (acfm)

$$Q_{aw}(acfm) = 60 \times v_s \times A_s$$

$$Q_{aw}\text{ (acf/min)} = \frac{60\text{ sec}}{\text{min}} \times \frac{18.15\text{ ft}}{\text{sec}} \times 13.14\text{ ft}^2 = \frac{14{,}310.80\text{ acf}}{\text{min}}$$

Average Stack Wet Standard Flow Rate (ascfh)

$$Q_{sw}(ascfh) = \frac{60 \times Q_{aw} \times T_{std} \times P_s}{(t_s + T_u)\times P_{std}}$$

$$Q_{sw}\text{ (ascf/hr)} = \frac{60\text{ min}}{\text{hr}} \times \frac{14{,}310.80\text{ acf}}{\text{min}} \times$$

$$\frac{68.00 + 460\ ^{o}R}{65.48 + 460\ ^{o}R} \times \frac{29.54\text{ in. Hg}}{29.92\text{ in. Hg}} = \frac{851{,}829.08\text{ ascf}}{\text{hr}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 4) [Values from Run 1 test]

Water Volume Weighed (scf)

$$V_{wsg\,(std)}(scf) = W_t \times K_5$$

$V_{wsg(std)}$ = 6.80 g x 0.04715 ft^3/g = 0.321 scf

Standard Meter Volume (dscf)

$$V_{m(std)}(dscf) = \frac{K_1 \times Y \times V_m \times \left(P_b + \frac{\Delta H_{avg}}{13.6} \right)}{(t_m)_{avg} + T_u}$$

$$V_{m(std)} = \frac{\frac{17.65\ ^{o}R}{in.\ Hg} \times 1.00 \times 35.53\ dcf \times \left(29.54\ in.\ Hg + \frac{1.16\ in.\ H_2O}{13.6\ in.\ H_2O\ /\ in.\ Hg} \right)}{77.32\ ^{o}F + 460\ ^{o}R} = 34.39\ dscf$$

Calculated Moisture Content (%)

$$B_{ws(calc)}(\%) = 100 \times \frac{V_{wsg(std)}}{V_{wsg(std)} + V_{m(std)}}$$

$$B_{ws(calc)} = 100 \times \frac{0.32\ dscf}{0.32\ dscf + 34.39\ dscf} = 0.92\ \%$$

Saturated Moisture Content (%)

$$B_{ws(svp)}(\%) = 100 \times \frac{10^{6.691 - \frac{3144}{t_{s\,(avg)} + 390.86}}}{P_b + \frac{P_{static}}{13.6}} \leq 100$$

$$B_{ws(svp)} = 100 \times \frac{10^{\left(6.691 - \frac{3144}{65.48\ ^{o}F + 390.86}\right)}}{29.54\ in.\ Hg + \frac{0.01\ in.\ H_2O}{13.6\ in.\ H_2O\ /\ in.\ Hg}} \leq 100 = 2.14\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Isokinetic Sampling) [Values from Run 1 test]

Desired Orifice (in. H_2O) (first point)

$$\Delta H_d\,(in.H_2O) = K \times \Delta p$$

ΔH_d (in. H_2O) = 10.44 x 0.11 in. H_2O = 1.15 in. H_2O

Absolute Meter Pressure (in. Hg)

$$P_m\,(in.Hg) = P_b + \frac{\Delta H\,@}{13.6}$$

$$P_m\ (\text{in. Hg}) = 29.54\ \text{in. Hg} + \frac{1.88\ \text{in. } H_2O}{13.6\ \text{in. } H_2O/\text{in. Hg}} = 29.68\ \text{in. Hg}$$

Recommended Nozzle Diameter (in.)

$$D_{ni}\,(in.) = \sqrt{\frac{C_n \times Q_m \times P_m}{(t_m + T_u) \times C_p} \times \left(\frac{1-\frac{B_{wm}}{100}}{1-\frac{B_{ws}}{100}}\right)} \times \sqrt{(t_s + T_u) \times \left[\frac{M_d \times \left(1-\frac{B_{ws}}{100}\right) + \left(18 \times \frac{B_{ws}}{100}\right)}{P_s \times \Delta p_{avg}}\right]}$$

$$D_{ni}\ (\text{in.}) = \sqrt{\frac{\frac{0.03575\ (\text{lb-mole}\cdot{}^oR\cdot\text{in. } H_2O)^{1/2}\cdot\text{min}\cdot\text{in.}^2}{\text{acf}\cdot\text{in. Hg}^{3/4}\cdot\text{lb}^{1/2}} \times 0.75\ \text{acf} \times 29.68\ \text{in. Hg}}{(77.32\ {}^oF + 460{}^oR) \times 0.83} \times \left(\frac{1-\frac{0.00\ \%}{100}}{1-\frac{0.92\ \%}{100}}\right)} \times \sqrt{(65.48\ {}^oF + 460{}^oR) \times \frac{\frac{28.84\ \text{lb}}{\text{lb-mole}} \times \left(1-\frac{0.92\ \%}{100}\right) + \left(\frac{18\ \text{lb}}{\text{lb-mol}} \times \frac{0.92\ \%}{100}\right)}{29.54\ \text{in. Hg} \times 0.33\ \text{in. } H_2O}} = 0.266\ \text{in.}$$

ΔP to ΔH Isokinetic Factor

$$K = C_k \times C_p^2 \times \Delta H\,@ \times D_{na}^4 \times \left[\frac{M_d \times \left(1-\frac{B_{wm}}{100}\right) + \left(18 \times \frac{B_{wm}}{100}\right)}{M_d \times \left(1-\frac{B_{ws}}{100}\right) + \left(18 \times \frac{B_{ws}}{100}\right)}\right] \times \left(\frac{1-\frac{B_{ws}}{100}}{1-\frac{B_{wm}}{100}}\right)^2 \times \left(\frac{t_m + T_u}{ts + T_u}\right) \times \frac{P_s}{P_m}$$

$$K = \frac{849.8}{\text{in. } H_2O\cdot\text{in.}^4} \times 0.83^2 \times 1.88\ \text{in. } H_2O \times 0.31^4 \times \left(\frac{1-\frac{0.92\ \%}{100}}{1-\frac{0.00\ \%}{100}}\right)^2 \times \left(\frac{77.32\ {}^oF + 460{}^oR}{65.48\ {}^oF + 460{}^oR}\right) \times \left(\frac{\frac{28.84\ \text{lb}}{\text{lb/mole}} \times \left(1-\frac{0.00\ \%}{100}\right) + \left(\frac{18\ \text{lb}}{\text{lb-mol}} \times \frac{0.00\ \%}{100}\right)}{\frac{28.84\ \text{lb}}{\text{lb/mole}} \times \left(1-\frac{0.92\ \%}{100}\right) + \left(\frac{18\ \text{lb}}{\text{lb-mol}} \times \frac{0.92\ \%}{100}\right)}\right) \times \frac{29.54\ \text{in. Hg}}{29.68\ \text{in. Hg}} = 10.44$$

Percent Isokinetic (%) (first point)

$$I(\%) = \frac{K_4 \times \left((t_s)_{avg} + T_u\right) \times V_{m(std)}}{\left(\Theta \times (v_{s(l)})_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right) \times \left(1-\frac{B_{ws}}{100}\right)}$$

$$I\ (\%) = \frac{\frac{0.0945\ \text{min}\cdot\text{in. Hg}}{\text{sec}\cdot{}^oR} \times (70.00\ {}^oF + 460\ {}^oR) \times 1.47\ \text{dscf}}{2.40\ \text{min} \times \frac{18.57\ \text{ft}}{\text{sec}} \times 29.54\ \text{in. Hg} \times 3.14 \times \left(\frac{0.31\ \text{in.}}{2} \times \frac{\text{ft.}}{12\ \text{in.}}\right)^2 \times \left(1-\frac{0.92\ \%}{100}\right)} = 106.51\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Isokinetic Sampling) [Values from Run 1 test]

Cumulative Percent Isokinetic (%) (weighted average of all points)

$$I(\%) = \sum_{1-n} \frac{\left\lfloor I(\%) \times V_{m(std)} \right\rfloor_{1-n}}{V_{m(std)_{1-n}}}$$

Using Method 5, Eq 5-8 to determine intermediate isokinetics at each point, weighted averaging of the cumulative isokinetics is necessary since all points are not equal, and determined by using the dry standard meter volume collected at each point to weight the cumulative average. Intermediate isokinetics and dry standard meter volumes are found at each point. At each point the cumulative sum is found of each value and the quotient of the two used to determine the cumulative isokinetics for each residual point (n).

Pt	In (%)	x	Vm(std)n	=	I (%)n	∑(I (%)n)	/	∑(Vm(std)n)	=	I (%)
A-1	106.51	x	1.473	=	156.90	156.90	/	1.47	=	106.5
A-2	102.66	x	1.420	=	145.74	302.64	/	2.89	=	104.6
A-3	108.17	x	1.429	=	154.59	457.23	/	4.32	=	105.8
A-4	103.02	x	1.361	=	140.22	597.44	/	5.68	=	105.1
A-5	95.28	x	1.128	=	107.47	704.92	/	6.81	=	103.5
B-1	102.57	x	1.289	=	132.22	837.14	/	8.10	=	103.4
B-2	99.67	x	1.447	=	144.18	981.32	/	9.55	=	102.8
B-3	101.46	x	1.125	=	114.10	1095.42	/	10.67	=	102.7
B-4	99.52	x	1.103	=	109.79	1205.21	/	11.77	=	102.4
B-5	110.54	x	1.389	=	153.58	1358.79	/	13.16	=	103.2
C-1	88.97	x	1.118	=	99.50	1458.29	/	14.28	=	102.1
C-2	118.52	x	1.647	=	195.20	1653.49	/	15.93	=	103.8
C-3	109.13	x	1.210	=	132.00	1785.49	/	17.14	=	104.2
C-4	97.83	x	1.230	=	120.30	1905.79	/	18.37	=	103.8
C-5	101.18	x	1.406	=	142.26	2048.05	/	19.77	=	103.6
D-1	98.54	x	1.369	=	134.93	2182.98	/	21.14	=	103.2
D-2	99.97	x	1.324	=	132.40	2315.38	/	22.47	=	103.1
D-3	95.16	x	1.322	=	125.83	2441.21	/	23.79	=	102.6
D-4	99.78	x	1.322	=	131.91	2573.12	/	25.11	=	102.5
D-5	96.75	x	1.216	=	117.65	2690.77	/	26.33	=	102.2

Pt	In (%)	x	Vm(std)n	=	I (%)n	∑(I (%)n)	/	∑(Vm(std)n)	=	I (%)
E-1	98.92	x	1.659	=	164.13	2854.91	/	27.99	=	102.0
E-2	101.97	x	1.711	=	174.42	3029.33	/	29.70	=	102.0
E-3	97.36	x	1.633	=	159.01	3188.34	/	31.33	=	101.8
E-4	97.08	x	1.523	=	147.88	3336.22	/	32.85	=	101.5
E-5	94.70	x	1.538	=	145.67	3481.89	/	34.39	=>	101.2
Last Pt										

Percent Isokinetic (%) (intermediate equation, all points)
[equivalent to taking an average of point-by-point isokinetics without weighting the average (e.g. all points equal)]

$$I(\%) = \frac{K_4 \times \left((t_s)_{avg} + T_u\right) \times V_{m(std)}}{\left(\Theta \times \left(v_{s(l)}\right)_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right) \times \left(1 - \frac{B_{ws}}{100}\right)}$$

$$I(\%) = \frac{\frac{0.0945 \text{ min}\cdot\text{in. Hg}}{\text{sec}\cdot{}^{o}\text{R}} \times (65.48\ {}^{o}\text{F} + 460\ {}^{o}\text{R}) \times 34.39 \text{ dscf}}{60.00 \text{ min} \times \frac{18.15 \text{ ft}}{\text{sec}} \times 29.54 \text{ in. Hg} \times 3.14 \times \left(\frac{0.31 \text{ in.}}{2} \times \frac{\text{ft.}}{12 \text{ in.}}\right)^2 \times \left(1 - \frac{0.92\ \%}{100}\right)} = 100.91\ \%$$

Raw Data Percent Isokinetic (%)
[utilizes the raw data equation for isokinetics from Method 5]

$$I(\%) = \frac{100\left((t_s)_{avg} + T_u\right)\left[K_4 V_{1c} + \frac{V_m Y}{(t_m)_{avg} + T_u}\left(P_{bar} + \frac{\Delta H}{13.6}\right)\right]}{60\left(\Theta \times \left(v_{s(l)}\right)_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right)}$$

I (%) =

$$\frac{100 \times (65.48\ {}^{o}\text{F} + 460\ {}^{o}\text{R}) \times \left[\frac{0.002669 \text{ ft}^3\cdot\text{in. Hg}}{\text{ml}\cdot{}^{o}\text{R}} \times 6.812 \text{ ml} + \frac{35.53 \text{ dcf} \times 0.995}{77.32\ {}^{o}\text{F} + 460\ {}^{o}\text{R}}\left(29.54 \text{ in Hg} + \frac{0.326}{13.6}\right)\right]}{60 \times 60.00 \text{ min} \times \frac{18.15 \text{ ft}}{\text{sec}} \times 29.54 \text{ in. Hg} \times 3.14 \times \left(\frac{0.31 \text{ in.}}{2} \times \frac{\text{ft.}}{12 \text{ in.}}\right)^2} = 100.65\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Analysis) [Values from Run 1 test - Lead Mass]

Stack Lead Concentration (g/dscf)

$$c_s(g/dscf) = 0.001 \times \frac{M_n}{V_{m(std)}}$$

$$c_s\text{ (g/dscf)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{0.00 \text{ mg}}{34.39 \text{ dscf}} = \frac{2.00\text{E-08 g}}{\text{dscf}}$$

Stack Lead Concentration (gr/dscf)

$$c'_s(gr/dscf) = 0.001 \times \frac{M_n}{V_{m(std)}} \times \frac{7000}{453.592}$$

$$c'_s\text{ (gr/dscf)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{0.00 \text{ mg}}{34.39 \text{ dscf}} \times \frac{\text{7000 gr}}{\text{lb}} \times \frac{\text{lb}}{\text{453.592 g}} = \frac{3.60\text{E-07 gr}}{\text{dscf}}$$

Lead Emissions Rate (kg/hr)

$$E(kg/hr) = c_s \times Q_{sd} \times \frac{kg}{1000\ g}$$

$$E\text{ (kg/hr)} = \frac{\text{kg}}{\text{1000 g}} \times \frac{2.33\text{E-08 g}}{\text{dscf}} \times \frac{843{,}962 \text{ dscf}}{\text{hr}} = \frac{1.96\text{E-05 kg}}{\text{hr}}$$

Lead Emissions Rate (lb/hr)

$$E'(lb/hr) = \frac{M_n \times Q_{sd}}{V_{m(std)}} \times \frac{lb \times g}{453.592g \times 1000mg}$$

$$E'\text{ (lb/hr)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{\text{lb}}{\text{453.592 g}} \times \frac{0.00 \text{ mg}}{34.39 \text{ dscf}} \times \frac{843{,}962 \text{ dscf}}{\text{hr}} = \frac{4.33\text{E-05 lb}}{\text{hr}}$$

Lead Emissions Rate (tpy)

$$E''(ton/yr) = E' \times \frac{8760}{2000}$$

$$E''\text{ (tpy)} = \frac{\text{ton}}{\text{2000 lb}} \times \frac{8{,}760 \text{ hr}}{\text{yr}} \times \frac{0.00 \text{ lb}}{\text{hr}} = \frac{1.90\text{E-04 ton}}{\text{yr}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

TEST RESULTS AND CALCULATIONS

Vent #3 Emissions Data

METHOD 12 (LEAD) - RESULTS

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Historical Data	**V3Pb-1**	**V3Pb-2**	**V3Pb-3**	**Average**	**Units**
Run Start Time	12:01	13:47	15:11		hh:mm
Run Stop Time	13:08	14:54	16:18		hh:mm
Test Date	12/19/19	12/19/19	12/19/19		mm/dd/yy
Production Rate	Max	Max	Max		ton/hr
Meter Calibration Factor	0.995	0.995	0.995		
Pitot Tube Coefficient	0.8290	0.8190	0.8290		
Average Nozzle Diameter	0.386	0.433	0.436		in
Stack Test Data	**V3Pb-1**	**V3Pb-2**	**V3Pb-3**	**Average**	**Units**
Initial Meter Volume	870.050	884.816	906.315		ft^3
Final Meter Volume	884.617	905.869	926.291		ft^3
Total Meter Volume	14.567	21.053	19.976	18.532	ft^3
Total Sampling Time	60.00	60.00	60.00	60.00	min
Average Meter Temperature	66.72	71.92	73.00	70.55	°F
Average Stack Temperature	64.28	63.60	63.36	63.75	°F
Barometric Pressure	29.53	29.45	29.45	29.48	in Hg
Stack Static Pressure	0.02	0.02	0.02	0.02	in H_2O
Absolute Stack Pressure	29.53	29.45	29.45	29.48	in Hg
Average Orifice Pressure Drop	0.21	0.41	0.38	0.33	in H_2O
Absolute Meter Pressure	29.67	29.59	29.59	29.62	in Hg
Avg Square Root Pitot Pressure	0.09	0.10	0.10	0.10	$\sqrt{(in\ H_2O)}$
Moisture Content Data	**V3Pb-1**	**V3Pb-2**	**V3Pb-3**	**Average**	**Units**
Impinger Water Weight Gain	1.40	0.90	-1.00	0.43	g
Silica Gel Weight Gain	2.70	3.50	3.50	3.23	g
Total Water Volume Collected	4.11	4.41	2.50	3.67	ml
Standard Water Vapor Volume	0.19	0.21	0.12	0.17	scf
Standard Meter Volume	14.3	20.5	19.4	18.1	dscf
Standard Metric Meter Volume	0.4	0.6	0.5	0.5	dscm
Calculated Stack Moisture	1.33	1.00	0.60	0.98	%
Saturated Stack Moisture	2.06	2.01	2.00	2.02	%
Reported Stack Moisture Content	1.33	1.00	0.60	0.98	%
Gas Analysis Data	**V3Pb-1**	**V3Pb-2**	**V3Pb-3**	**Average**	**Units**
Carbon Dioxide Content	0.0	0.0	0.0	0.0	%
Oxygen Content	20.9	20.9	20.9	20.9	%
Carbon Monoxide Content	0.0	0.0	0.0	0.0	ppm
Nitrogen Content	79.1	79.1	79.1	79.1	%
Stack Dry Molecular Weight	28.84	28.84	28.84	28.84	lb/lb-mole
Stack Wet Molecular Weight	28.69	28.73	28.77	28.73	lb/lb-mole

METHOD 12 (LEAD) - RESULTS

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Volumetric Flow Rate Data	**V3Pb-1**	**V3Pb-2**	**V3Pb-3**	**Average**	**Units**
Average Stack Gas Velocity	5.07	5.67	5.38	5.37	ft/sec
Stack Cross-Sectional Area	9.00	9.00	9.00	9.00	ft²
Actual Stack Flow Rate	2,739	3,060	2,904	2,901	acfm
Wet Standard Stack Flow Rate	163	182	173	173	wkscfh
Dry Standard Stack Flow Rate	161,180	180,386	172,013	171,193	dscfh
Percent of Isokinetic Rate	100.0	100.4	100.9	100.4	%
Emission Rate Data	**V3Pb-1**	**V3Pb-2**	**V3Pb-3**	**Average**	**Units**
Lead Mass	0.0008	0.0005	0.0006	0.0006	mg
Lead Concentration	5.58E-08	2.44E-08	3.09E-08	3.70E-08	g/dscf
	8.60E-07	3.77E-07	4.77E-07	5.71E-07	gr/dscf
Lead Emission Rate	8.99E-06	4.40E-06	5.32E-06	6.24E-06	kg/hr
	1.98E-05	9.71E-06	1.17E-05	1.37E-05	lb/hr
	8.68E-05	4.25E-05	5.14E-05	6.02E-05	tpy

Note: HNO_3 blank concentration of 0.6 µg subtracted from each result

EXAMPLE CALCULATIONS (Reference Method 1 - Rectangular Stack)

Length of Stack (in.)

$$L(in.) = L_{fw} - L_{nw}$$

L (in.) = 36.13 in. - 0.13 in. = 36.00 in.

Area of Stack (ft^2)

$$A_s(ft^2) = w \times l$$

$$A_s\,(ft^2) = \frac{36.00}{12}\,ft \times \frac{36.00}{12}\,ft = 9.00\ ft^2$$

Equivalent Diameter of Stack (in.)

$$D_e(in.) = \frac{2 \times L \times W}{L + W}$$

$$D_e\,(in.) = \frac{2 \times 36.00\ in. \times 36.00\ in.}{36.00\ in. + 36.00\ in.} = 36.00\ in.$$

Stack Diameters Downstream

$$B_D(dia.) = \frac{B}{D_e}$$

$$B_D\,(dia.) = \frac{44.00\ in.}{36.00\ in.} = 1.22\ diameters$$

Stack Diameters Upstream

$$A_D(dia.) = \frac{A}{D_e}$$

$$A_D\,(dia.) = \frac{12.00\ in.}{36.00\ in.} = 0.33\ diameters$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 3a) [Values from Run 1 test]

Carbon Monoxide Concentration (%)

$$\%CO = \frac{ppmCO}{10{,}000}$$

%CO (%) = $\frac{0.00 \text{ ppm}}{10{,}000 \text{ ppm/\%}}$ = 0.0000 %

Nitrogen Concentration (%)

$$\%N_2 = 100 - \%CO_2 - \%O_2 - \%CO$$

$\%N_2$ (%) = 100 - 0.00 % - 20.90 % - 0.00 / 10,000 % = 79.1 %

Stack Dry Molecular Weight (lb/lb-mole)

$$M_d\,(lb/lb-mol) = \sum\left(\frac{MW_{comp}}{100} \times \%component\right)$$

M_d (lb/lb-mol) = ($\frac{44 \text{ lb/lb-mol}}{100}$ x 0.00 %) + ($\frac{32 \text{ lb/lb-mol}}{100}$ x 20.90 %) + ($\frac{28 \text{ lb/lb-mol}}{100}$ x [$\frac{0.00}{10{,}000}$ + 79.10]) = $\frac{28.84 \text{ lb}}{\text{lb-mol}}$

Stack Wet Molecular Weight (lb/lb-mole)

$$M_S\,(lb/lb-mol) = \left[M_d \times \left(1 - \frac{B_{WS}}{100}\right)\right] + \left[MW_{H_2O} \times \frac{B_{WS}}{100}\right]$$

M_S (lb/lb-mol) = { $\frac{28.84 \text{ lb}}{\text{lb-mol}}$ x (1 - $\frac{1.33 \text{ \%}}{100}$) } + { $\frac{18 \text{ lb}}{\text{lb-mol}}$ x $\frac{1.33 \text{ \%}}{100}$ } = $\frac{28.69 \text{ lb}}{\text{lb-mol}}$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 2) [Values from Run 1 test]

Absolute Stack Pressure (in. Hg)

$$P_S\,(in.Hg) = P_b + \frac{P_{static}}{13.6}$$

$$P_s \text{ (in. Hg)} = 29.53 \text{ in. Hg} + \frac{0.02 \text{ in. } H_2O}{13.6 \text{ in. } H_2O\text{/in. Hg}} = 29.53 \text{ in. Hg}$$

Average Stack Gas Velocity (ft/sec)

$$v_s\,(ft/\sec) = K_p \times C_p \times \left(\sqrt{\Delta p}\right)_{avg} \times \sqrt{\frac{(t_s)_{avg} + T_u}{P_s \times M_s}}$$

v_{sl} (ft/sec) =

$$\left(\frac{85.49 \text{ ft} \quad \text{(lb/lb-mol)(in. Hg)}}{\text{sec} \quad (^oR)(\text{in. } H_2O)}\right)^{1/2} \times 0.83 \times 0.09 \text{ in.} H_2O^{1/2} \times \sqrt{\frac{64.28 + 460\ ^oR}{29.53 \text{ in. Hg} \times 28.69 \text{ lb/lb-mol}}} = \frac{5.0 \text{ ft}}{\text{sec}}$$

Average Stack Dry Standard Flow Rate (dscfh)

$$Q_{sd}(dscfh) = \frac{60 \times 60 \times \left(1 - \frac{B_{ws}}{100}\right) \times v_s \times A_s \times T_{std} \times P_s}{(t_s + T_u) \times P_{std}}$$

$$Q_{sd} \text{ (dscf/hr)} = \frac{3600 \text{ sec}}{\text{hr}} \times \left(1 - \frac{1.33\ \%}{100}\right) \times \frac{5.07 \text{ ft}}{\text{sec}} \times 9.00 \text{ ft}^2 \times \frac{68.00 + 460\ ^oR}{64.28 + 460\ ^oR} \times \frac{29.53 \text{ in. Hg}}{29.92 \text{ in. Hg}} = \frac{161{,}179.87 \text{ dscf}}{\text{hr}}$$

Average Stack Wet Flow Rate (acfm)

$$Q_{aw}\,(acfm) = 60 \times v_s \times A_s$$

$$Q_{aw} \text{ (acf/min)} = \frac{60 \text{ sec}}{\text{min}} \times \frac{5.07 \text{ ft}}{\text{sec}} \times 9.00 \text{ ft}^2 = \frac{2{,}738.91 \text{ acf}}{\text{min}}$$

Average Stack Wet Standard Flow Rate (ascfh)

$$Q_{sw}\,(ascfh) = \frac{60 \times Q_{aw} \times T_{std} \times P_s}{(t_s + T_u) \times P_{std}}$$

$$Q_{sw} \text{ (ascf/hr)} = \frac{60 \text{ min}}{\text{hr}} \times \frac{2{,}738.91 \text{ acf}}{\text{min}} \times \frac{68.00 + 460\ ^oR}{64.28 + 460\ ^oR} \times \frac{29.53 \text{ in. Hg}}{29.92 \text{ in. Hg}} = \frac{163{,}351.56 \text{ ascf}}{\text{hr}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 4) [Values from Run 1 test]

Water Volume Weighed (scf)

$$V_{wsg(std)}(scf) = W_t \times K_5$$

$V_{wsg(std)}$ = 4.10 g x 0.04715 ft^3/g = 0.193 scf

Standard Meter Volume (dscf)

$$V_{m(std)}(dscf) = \frac{K_1 \times Y \times V_m \times \left(P_b + \frac{\Delta H_{avg}}{13.6}\right)}{(t_m)_{avg} + T_u}$$

$$V_{m(std)} = \frac{\frac{17.65\ ^{o}R}{in.\ Hg} \times 1.00 \times 14.57\ dcf \times \left(29.53\ in.\ Hg + \frac{0.21\ in.\ H_2O}{13.6\ in.\ H_2O / in.\ Hg}\right)}{66.72\ ^{o}F + 460\ ^{o}R} = 14.35\ dscf$$

Calculated Moisture Content (%)

$$B_{ws(calc)}(\%) = 100 \times \frac{V_{wsg(std)}}{V_{wsg(std)} + V_{m(std)}}$$

$$B_{ws(calc)} = 100 \times \frac{0.19\ dscf}{0.19\ dscf + 14.35\ dscf} = 1.33\ \%$$

Saturated Moisture Content (%)

$$B_{ws(svp)}(\%) = 100 \times \frac{10^{6.691 - \frac{3144}{t_{s(avg)} + 390.86}}}{P_b + \frac{P_{static}}{13.6}} \leq 100$$

$$B_{ws(svp)} = 100 \times \frac{10^{\left(6.691 - \frac{3144}{64.28\ ^{o}F + 390.86}\right)}}{29.53\ in.\ Hg + \frac{0.02\ in.\ H_2O}{13.6\ in.\ H_2O / in.\ Hg}} \leq 100 = 2.06\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Isokinetic Sampling) [Values from Run 1 test]

Desired Orifice (in. H_2O) (first point)

$$\Delta H_d (in. H_2O) = K \times \Delta p$$

ΔH_d (in. H_2O) = 23.96 x 0.01 in. H_2O = 0.12 in. H_2O

Absolute Meter Pressure (in. Hg)

$$P_m (in.Hg) = P_b + \frac{\Delta H @}{13.6}$$

$$P_m \text{ (in. Hg)} = 29.53 \text{ in. Hg} + \frac{1.88 \text{ in. } H_2O}{13.6 \text{ in. } H_2O\text{/in. Hg}} = 29.67 \text{ in. Hg}$$

Recommended Nozzle Diameter (in.)

$$D_{ni}(in.) = \sqrt{\frac{C_n \times Q_m \times P_m}{(t_m + T_u) \times C_p} \times \left(\frac{1 - \frac{B_{wm}}{100}}{1 - \frac{B_{ws}}{100}}\right) \times \sqrt{(t_s + T_u) \times \left[\frac{M_d \times \left(1 - \frac{B_{ws}}{100}\right) + \left(18 \times \frac{B_{ws}}{100}\right)}{P_s \times \Delta p_{avg}}\right]}}$$

$$D_{ni} \text{ (in.)} = \sqrt{\frac{\frac{0.03575 \text{ (lb-mole} \cdot {}^{o}\text{R} \cdot \text{in. } H_2O)^{1/2} \cdot \text{min} \cdot \text{in.}^2}{\text{acf} \cdot \text{in. Hg}^{3/4} \cdot \text{lb}^{1/2}} \times 0.75 \text{ acf} \times 29.67 \text{ in. Hg}}{\left(66.72\ {}^{o}\text{F} + 460{}^{o}\text{R}\right) \times 0.83} \times \left(\frac{1 - \frac{0.00\ \%}{100}}{1 - \frac{1.33\ \%}{100}}\right) \times \sqrt{\left(64.28\ {}^{o}\text{F} + 460{}^{o}\text{R}\right) \times \frac{\frac{28.84 \text{ lb}}{\text{lb-mole}} \times \left(1 - \frac{1.33\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{1.33\ \%}{100}\right)}{29.53 \text{ in. Hg} \times 0.09 \text{ in. } H_2O}}} = 0.369 \text{ in.}$$

ΔP to ΔH Isokinetic Factor

$$K = C_k \times C_p^2 \times \Delta H @ \times D_{na}^4 \times \left[\frac{M_d \times \left(1 - \frac{B_{wm}}{100}\right) + \left(18 \times \frac{B_{wm}}{100}\right)}{M_d \times \left(1 - \frac{B_{ws}}{100}\right) + \left(18 \times \frac{B_{ws}}{100}\right)}\right] \times \left(\frac{1 - \frac{B_{ws}}{100}}{1 - \frac{B_{wm}}{100}}\right)^2 \times \left(\frac{t_m + T_u}{ts + T_u}\right) \times \frac{P_s}{P_m}$$

$$K = \frac{849.8}{\text{in. } H_2O \cdot \text{in.}^4} \times 0.83^2 \times 1.88 \text{ in. } H_2O \times 0.39^4 \times \left(\frac{1 - \frac{1.33\ \%}{100}}{1 - \frac{0.00\ \%}{100}}\right)^2 \times \frac{66.72\ {}^{o}\text{F} + 460{}^{o}\text{R}}{64.28\ {}^{o}\text{F} + 460{}^{o}\text{R}} \times \left(\frac{\frac{28.84 \text{ lb}}{\text{lb/mole}} \times \left(1 - \frac{0.00\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{0.00\ \%}{100}\right)}{\frac{28.84 \text{ lb}}{\text{lb/mole}} \times \left(1 - \frac{1.33\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{1.33\ \%}{100}\right)}\right) \times \frac{29.53 \text{ in. Hg}}{29.67 \text{ in. Hg}} = 23.96$$

Percent Isokinetic (%) (first point)

$$I(\%) = \frac{K_4 \times \left((t_s)_{avg} + T_u\right) \times V_{m(std)}}{\left(\Theta \times \left(v_{s(l)}\right)_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right) \times \left(1 - \frac{B_{ws}}{100}\right)}$$

$$I(\%) = \frac{\frac{0.0945 \text{ min} \cdot \text{in. Hg}}{\text{sec} \cdot {}^{o}\text{R}} \times \left(63.00\ {}^{o}\text{F} + 460\ {}^{o}\text{R}\right) \times 0.35 \text{ dscf}}{2.40 \text{ min} \times \frac{3.94 \text{ ft}}{\text{sec}} \times 29.53 \text{ in. Hg} \times 3.14 \times \left(\frac{0.39 \text{ in.}}{2} \times \frac{\text{ft.}}{12 \text{ in.}}\right)^2 \times \left(1 - \frac{1.33\ \%}{100}\right)} = 76.54\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Isokinetic Sampling) [Values from Run 1 test]

Cumulative Percent Isokinetic (%) (weighted average of all points)

$$I(\%) = \sum_{1-n} \frac{\lfloor I(\%) \times V_{m(std)} \rfloor_{1-n}}{V_{m(std)\,1-n}}$$

Using Method 5, Eq 5-8 to determine intermediate isokinetics at each point, weighted averaging of the cumulative isokinetics is necessary since all points are not equal, and determined by using the dry standard meter volume collected at each point to weight the cumulative average. Intermediate isokinetics and dry standard meter volumes are found at each point. At each point the cumulative sum is found of each value and the quotient of the two used to determine the cumulative isokinetics for each residual point (n).

Pt	In (%)	x	Vm(std)n	=	I (%)n	∑(I (%)n)	/	∑(Vm(std)n)	=	I (%)
A-1	76.54	x	0.347	=	26.57	26.57	/	0.35	=	76.5
A-2	61.87	x	0.397	=	24.55	51.12	/	0.74	=	68.7
A-3	134.31	x	0.861	=	115.70	166.82	/	1.61	=	103.9
A-4	100.35	x	0.644	=	64.58	231.40	/	2.25	=	102.9
A-5	99.96	x	0.453	=	45.32	276.72	/	2.70	=	102.4
B-1	96.03	x	0.616	=	59.14	335.86	/	3.32	=	101.2
B-2	111.10	x	0.504	=	55.98	391.83	/	3.82	=	102.5
B-3	92.45	x	0.593	=	54.82	446.66	/	4.41	=	101.2
B-4	100.02	x	0.454	=	45.37	492.02	/	4.87	=	101.1
B-5	87.27	x	0.395	=	34.51	526.53	/	5.26	=	100.0
C-1	99.20	x	0.778	=	77.23	603.76	/	6.04	=	99.9
C-2	99.87	x	0.640	=	63.91	667.67	/	6.68	=	99.9
C-3	90.74	x	0.581	=	52.71	720.38	/	7.26	=	99.2
C-4	110.52	x	0.708	=	78.20	798.57	/	7.97	=	100.2
C-5	98.17	x	0.770	=	75.55	874.13	/	8.74	=	100.0
D-1	99.32	x	0.636	=	63.14	937.27	/	9.38	=	100.0
D-2	102.81	x	0.806	=	82.86	1020.13	/	10.18	=	100.2
D-3	101.81	x	0.461	=	46.91	1067.05	/	10.64	=	100.3
D-4	99.64	x	0.451	=	44.94	1111.98	/	11.09	=	100.2
D-5	95.96	x	0.434	=	41.68	1153.66	/	11.53	=	100.1

Pt	In (%)	x	Vm(std)n	=	I (%)n	∑(I (%)n)	/	∑(Vm(std)n)	=	I (%)
E-1	102.19	x	0.654	=	66.85	1220.52	/	12.18	=	100.2
E-2	99.59	x	0.638	=	63.49	1284.01	/	12.82	=	100.2
E-3	101.90	x	0.461	=	46.96	1330.97	/	13.28	=	100.2
E-4	101.90	x	0.461	=	46.96	1377.93	/	13.74	=	100.3
E-5	94.62	x	0.605	=	57.26	1435.19	/	14.35	=>	100.0
Last Pt										

Percent Isokinetic (%) (intermediate equation, all points)

[equivalent to taking an average of point-by-point isokinetics without weighting the average (e.g. all points equal)]

$$I(\%) = \frac{K_4 \times \left((t_s)_{avg} + T_u\right) \times V_{m(std)}}{\left(\Theta \times \left(v_{s(l)}\right)_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right) \times \left(1 - \frac{B_{ws}}{100}\right)}$$

$$I(\%) = \frac{\frac{0.0945 \text{ min•in. Hg}}{\text{sec•}^{o}\text{R}} \times (64.28\ ^{o}\text{F} + 460\ ^{o}\text{R}) \times 14.35 \text{ dscf}}{60.00 \text{ min} \times \frac{5.07 \text{ ft}}{\text{sec}} \times 29.53 \text{ in. Hg} \times 3.14 \times \left(\frac{0.39 \text{ in.}}{2} \times \frac{\text{ft.}}{12 \text{ in.}}\right)^2 \times \left(1 - \frac{1.33\ \%}{100}\right)} = 98.47\ \%$$

Raw Data Percent Isokinetic (%)

[utilizes the raw data equation for isokinetics from Method 5]

$$I(\%) = \frac{100\left((t_s)_{avg} + T_u\right)\left[K_4 V_{1c} + \frac{V_m Y}{(t_m)_{avg} + T_u}\left(P_{bar} + \frac{\Delta H}{13.6}\right)\right]}{60\left(\Theta \times \left(v_{s(l)}\right)_{avg} \times P_s \times \pi \times \left(\frac{D_{na}}{2} \times \frac{1}{12}\right)^2\right)}$$

I (%) =

$$\frac{100 \times (64.28\ ^{o}\text{F} + 460\ ^{o}\text{R}) \times \left[\frac{0.002669 \text{ ft}^3\text{•in. Hg}}{\text{ml•}^{o}\text{R}} \times 4.107 \text{ ml} + \frac{14.57 \text{ dcf} \times 0.995}{66.72\ ^{o}\text{F} + 460\ ^{o}\text{R}}\left(29.53 \text{ in Hg} + \frac{0.091}{13.6}\right)\right]}{60 \times 60.00 \text{ min} \times \frac{5.07 \text{ ft}}{\text{sec}} \times 29.53 \text{ in. Hg} \times 3.14 \times \left(\frac{0.39 \text{ in.}}{2} \times \frac{\text{ft.}}{12 \text{ in.}}\right)^2} = 98.39\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Analysis) [Values from Run 1 test - Lead Mass]

Stack Lead Concentration (g/dscf)

$$c_s(g/dscf) = 0.001 \times \frac{M_n}{V_{m(std)}}$$

$$c_s \text{ (g/dscf)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{\text{0.00 mg}}{\text{14.35 dscf}} = \frac{\text{6.00E-08 g}}{\text{dscf}}$$

Stack Lead Concentration (gr/dscf)

$$c_s^{'}(gr/dscf) = 0.001 \times \frac{M_n}{V_{m(std)}} \times \frac{7000}{453.592}$$

$$c'_s \text{ (gr/dscf)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{\text{0.00 mg}}{\text{14.35 dscf}} \times \frac{\text{7000 gr}}{\text{lb}} \times \frac{\text{lb}}{\text{453.592 g}} = \frac{\text{8.60E-07 gr}}{\text{dscf}}$$

Lead Emissions Rate (kg/hr)

$$E(kg/hr) = c_s \times Q_{sd} \times \frac{kg}{1000\ g}$$

$$E \text{ (kg/hr)} = \frac{\text{kg}}{\text{1000 g}} \times \frac{\text{5.58E-08 g}}{\text{dscf}} \times \frac{\text{161,180 dscf}}{\text{hr}} = \frac{\text{8.99E-06 kg}}{\text{hr}}$$

Lead Emissions Rate (lb/hr)

$$E^{'}(lb/hr) = \frac{M_n \times Q_{sd}}{V_{m(std)}} \times \frac{lb \times g}{453.592 g \times 1000 mg}$$

$$E' \text{ (lb/hr)} = \frac{\text{g}}{\text{1000 mg}} \times \frac{\text{lb}}{\text{453.592 g}} \times \frac{\text{0.00 mg}}{\text{14.35 dscf}} \times \frac{\text{161,180 dscf}}{\text{hr}} = \frac{\text{1.98E-05 lb}}{\text{hr}}$$

Lead Emissions Rate (tpy)

$$E^{''}(ton/yr) = E^{'} \times \frac{8760}{2000}$$

$$E'' \text{ (tpy)} = \frac{\text{ton}}{\text{2000 lb}} \times \frac{\text{8,760 hr}}{\text{yr}} \times \frac{\text{0.00 lb}}{\text{hr}} = \frac{\text{8.68E-05 ton}}{\text{yr}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

APPENDIX B

EMISSION DATA RECORDS

EMISSION DATA RECORDS

Operations Data
(provided by Choctaw Defense Facility)

Date	Press	Caliber	Prod TOTAL during TEST	Weight of BLEMS (lbs)	Prod BLEMS	Lead Core Weight (Gr)	Brass Weight (Gr)	Lead (Lbs)	Brass (Lbs)	SCRAP Brass	SCRAP Bullets
18-Dec	1	38 SPL 142 GR FMJTC	43448	0	0	117.8	24.2	731.167771	150.205943	354	0.24
18-Dec	2	9MM 147 GR JHP	25902	0	0	97.2	26.8	359.667771	99.1676571	48	0
18-Dec	3	.380 90 GR JHP	20182	0	0	69	21	198.936857	60.546	54	
18-Dec	4	7.62 MM 147GR FMJ BT	14250	45.8	2181	100	47	203.571429	95.6785714	98	0
19-Dec	1	38 SPL 142 GR FMJTC	32539	0	0	117.8	24.2	547.584886	112.491971	333	0
19-Dec	2	9MM 147 GR JHP	32018	0	0	97.2	26.8	444.5928	122.5832	153	0
19-Dec	3	.380 90 GR JHP	31158	0	0	69	21	307.128857	93.474	88	0
19-Dec	4	7.62 MM 147GR FMJ BT	28588	47.5	2262	100	47	408.4	191.948	144	0

Date		Lbs of Lead Core Produced	SCRAP Cores (Lbs)	SCRAP Bleed(Lbs)	TOTAL LEAD SCRAPED
18-Dec	Header 1	1790.5	0	118	118
18-Dec	Header 2	765		30	30
18-Dec	Header 3	1632	0	55	55
18-Dec	Header 4	966	119	86	256
19-Dec	Header 1	1285	0	54	54
19-Dec	Header 2	635	0	0	0
19-Dec	Header 3	1593	0	60	60
19-Dec	Header 4	754	93	74	167

EMISSION DATA RECORDS

Vent #1 Reference Method Data

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE

Source Information	
Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room

Test Information			
Project #		amee-19-mcalester.ok-perf#1	
Operator		JW	
Date for Preliminary Run	(mm/dd/yy)	12/17/19	
Standard Temperature		68	°F
Standard Pressure		29.92	in Hg
Required Sample Vol.	indust. spec.	30	scf
Run Duration	≥ 2 min/point	60	minutes
Unit Number		Vent #1	
Base Run Number		V1Pb	
Number of Ports Available		5	
Number of Ports Used		5	
Port Inside Diameter		3.00	in
Stack Shape		Rectangular	

Test Equipment Information					
Run		**1**	**2**	**3**	
Test Date	(mm/dd/yy)	12/18/19	12/18/19	12/18/19	
Production Rate		Max	Max	Max	
Meter Box Number	from ACS	samp-cp-0029	samp-cp-0029	samp-cp-0029	
Meter Calibration Factor	(Y)	0.995	0.995	0.995	
Orifice Meter Coefficient	($\Delta H_{@}$)	1.882	1.882	1.882	in H_2O
Non-Console Manometer Used		No	No	No	
Pitot Identification	from ACS	A8877	2428	A8877	
Pitot Tube Coefficient	(C_p)	0.8290	0.8190	0.8290	
Nozzle Number	from ACS	G10	A10	G10	
Nozzle Diameter	(D_n)	0.312	0.314	0.312	in
Probe Number	from ACS	samp-hp-0067	samp-hp-0066	samp-hp-0067	
Probe Length		60.0	60.0	60.0	in
(SS, Glass ….) Liner Material	from list	glass	glass	glass	
Sample Case / Oven Number	from ACS	samp-bh-0039	samp-bh-0039	samp-bh-0039	
Impinger Case Number	from ACS	samp-bc-0019	samp-bc-0015	samp-bc-0019	

Testing Company Information	
Company Name	Air Hygiene International, Inc. (Tulsa, Oklahoma)
Address	1600 W Tacoma Street
City, State Zip	Broken Arrow, Oklahoma 74012
Project Manager	Paul Little
Phone Number	(918) 307-8865
Fax Number	(918) 307-9131

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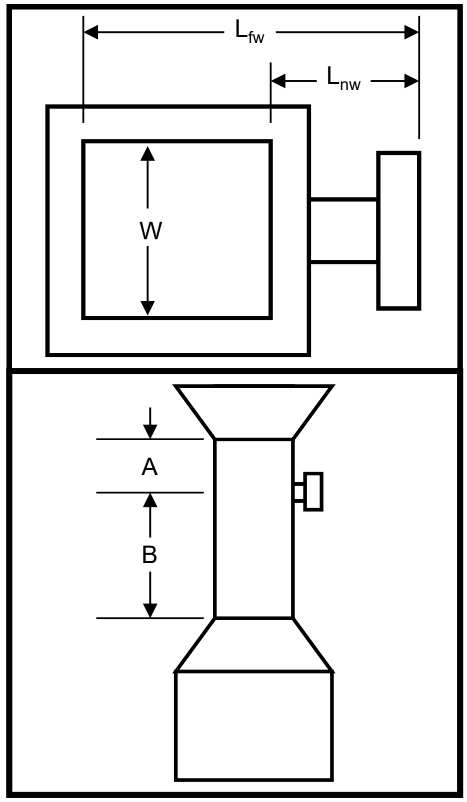
METHOD 1 - SAMPLE AND VELOCITY TRAVERSES FOR RECTANGULAR SOURCES

Plant Name	Choctaw Defense Facility	**Date**	12/17/19
Sampling Location	Centerfire Room	**Stack Type**	Rectangular
Operator	JW	**Ports Available**	5
Project #	amee-19-mcalester.ok-perf#1	**Ports Used**	5
Stack Size	Large (>24 inch diameter)	**Port ID (inches)**	3.00

Rectangular Stacks or Ducts			
Length to Far Wall of Stack	(L_{fw})	44.13	in
Length to Near Wall of Stack	(L_{nw})	0.13	in
Length of Stack	(L)	44.00	in
Width of Stack	(W)	43.00	in
Equivalent Stack Diam	(D_e)	43.49	in
Area of Stack	(A_s)	13.14	ft²



Distance from Port to Disturbances			
Distance Upstream	(A)	46.00	in
Diameters Upstream	(A_D)	1.06	diameters
Distance Downstream	(B)	101.00	in
Diameters Downstream	(B_D)	2.32	diameters

Number of Traverse Points Required			
Diameters to Flow Disturbance		**Minimum Number of[1] Traverse Points**	
Down Stream	**Up Stream**	**Particulate Points**	**Velocity Points**
2.00-4.99	0.50-1.24	25	16
5.00-5.99	1.25-1.49	20	16
6.00-6.99	1.50-1.74	16	12
7.00-7.99	1.75-1.99	12	12
>= 8.00	>=2.00	9 or 12[2]	9 or 12[2]
Upstream Spec		25	16
Downstream Spec		25	16
Traverse Pts Required		25	16

[1] Check Minimum Number of Points for the Upstream and Downstream conditions, then use the largest.

[2] 9 for Rectangular Stacks 12 to 24 inches
12 for All Stacks over 24 inches

- (●) Method 1 Trav
- ( ) 12 Point PM Trav (M201a ONLY)
- ( ) Velocity

Number of Traverse Points Used			
5	**Ports by**	5	**Across**
25	**Pts Used**	25	**Required**

LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS

Traverse Point Number	Percent of Stack Diameter from Inside Wall to Traverse Point — Number of Traverse Points on a Diameter: 1	2	3	4	5	6	7	8	9
1	0.500	0.250	0.167	0.125	0.100	0.083	0.071	0.063	0.056
2		0.750	0.500	0.375	0.300	0.250	0.214	0.188	0.167
3			0.833	0.625	0.500	0.417	0.357	0.313	0.278
4				0.875	0.700	0.583	0.500	0.438	0.389
5					0.900	0.750	0.643	0.563	0.500
6						0.917	0.786	0.688	0.611
7							0.929	0.813	0.722
8								0.938	0.833
9									0.944

Traverse Point Locations

Traverse Point Number	Fraction of Stack Dimension	Distance from Inside Wall	Distance Including Reference Length
		in	in
1	0.100	4 3/8	4 4/8
2	0.300	13 2/8	13 3/8
3	0.500	22	22 1/8
4	0.700	30 6/8	30 7/8
5	0.900	39 5/8	39 6/8
6			
7			
8			
9			

METHOD 2 - DETERMINATION OF STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant Name	Choctaw Defense Facility			
Sampling Location	Centerfire Room			
Operator	JW			
Project #	amee-19-mcalester.ok-perf#1			
Pitot Leak Check	x	**PreTest**	x	**PostTest**

Preliminary Run Date	12/17/19		
Stack Type	Rectangular		
Ports Available	5		
Thermocouple ID	samp-hp-0067		
Pitot Coefficient	0.8290	**Pitot Identification**	A8877

Stack Dimensions			
Area of Stack	(A_s)	13.14	ft²
Length of Stack	(L)	44.00	in
Width of Stack	(W)	43.00	in

Pressures			
Barometric Pressure	(P_b)	29.57	in Hg
Static Pressure	(P_{static})	0.10	in H_2O
Absolute Stack Pressure	(P_s)	29.58	in Hg

Stack Gas Composition			
Composition Data:	**Estimated Composition**		
Carbon Dioxide Concentration	($\%CO_2$)	0.00	%vd
Oxygen Concentration	($\%O_2$)	20.90	%vd
Carbon Monoxide Concentration	(ppmCO)	0.00	ppmvd
Nitrogen Concentration	($\%N_2$)	79.10	%vd
Stack Moisture Content	(B_{ws})	1.50	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Stack Wet Molecular Weight	(M_w)	28.67	lb/lb-mole

Results			
Avg Stack Gas Velocity	(v_s)	15.58	ft/sec
Avg Stack Dry Std Flow Rate	(Q_{sd})	733,024	dscf/hr
Avg Stack Dry Std Flow Rate	(Q_{sd})	12,217	dscf/min
Avg Stack Wet Flow Rate	(Q_{aw})	12,284	acf/min
Avg Stack Wet Std Flow Rate	(Q_{sw})	744,186	ascf/hr

40 CFR 60, Method 2G, Section 8.11.1 (but applies to all Method 2 type static pressure measurements):
If a Type S probe is used for this measurement, position the probe at or between any traverse point(s) and rotate the probe until a null differential pressure reading is obtained. Disconnect the tubing from one of the pressure ports; read and record the ΔP. For pressure devices with one-directional scales, if a deflection in the positive direction is noted with the negative side disconnected, then the static pressure is positive. Likewise, if a deflection in the positive direction is noted with the positive side disconnected, then the static pressure is negative.

Stack Cross Section Schematic

Velocity Traverse Data					
Run Number	V1Pb-V1				
Run Time	08:08	**Start**	08:48	**End**	
Traverse Point	**Velocity Head** (Δp)	**Null Angle** (N_a)	**Zero Deg Pressure** ($0^o{}_a$)	**Stack Temp** (t_s)	**Local Velocity** ($v_{s(l)}$)
	in H_2O	deg	in H_2O	°F	ft/sec
A-1	0.12	-3	0.03	55	19.13
A-2	0.12	-1	0.02	57	19.17
A-3	0.12	3	0.00	57	19.17
A-4	0.13	5	0.00	57	19.95
A-5	0.11	5	0.00	57	18.35
B-1	0.12	-3	0.04	57	19.17
B-2	0.07	0	0.00	57	14.64
B-3	0.03	0	0.00	57	9.58
B-4	0.07	0	0.00	57	14.64
B-5	0.10	5	0.20	57	17.50
C-1	0.12	5	0.20	57	19.17
C-2	0.06	0	0.00	57	13.55
C-3	0.06	0	0.00	57	13.55
C-4	0.03	0	0.00	57	9.58
C-5	0.09	5	0.30	57	16.60
D-1	0.11	0	0.00	57	18.35
D-2	0.07	-3	0.10	57	14.64
D-3	0.07	0	0.00	57	14.64
D-4	0.06	0	0.00	57	13.55
D-5	0.06	0	0.00	57	13.55
E-1	0.07	0	0.00	57	14.64
E-2	0.07	0	0.00	57	14.64
E-3	0.07	-3	0.10	57	14.64
E-4	0.06	-2	0.00	57	13.55
E-5	0.06	-2	0.10	57	13.55
Average	0.08	2		57	
	0.28	**= Square roots of Δp**			
Standard deviation of null angles =				2.0	

METHOD 3a - DETERMINATION OF DRY MOLECULAR WEIGHT BY ANALYZER

Plant Name	Choctaw Defense Facility	**Preliminary Run Date**	12/17/19
Sampling Location	Centerfire Room	**Operator**	JW

Gas Analysis Data								
Run Number	V1Pb-1		**Date**	12/18/19	**Run Start Time**	07:55	**Run Stop Time**	11:00
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**			
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)			
hh:mm	%	%	ppm	%	lb/lb-mole			
03:05	0.0	20.9	0.0	79.1	28.84			

Gas Analysis Data								
Run Number	V1Pb-2		**Date**	12/18/19	**Run Start Time**	12:47	**Run Stop Time**	13:59
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**			
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)			
hh:mm	%	%	ppm	%	lb/lb-mole			
01:12	0.0	20.9	0.0	79.1	28.84			

Gas Analysis Data								
Run Number	V1Pb-3		**Date**	12/18/19	**Run Start Time**	14:26	**Run Stop Time**	15:35
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**			
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)			
hh:mm	%	%	ppm	%	lb/lb-mole			
01:09	0.0	20.9	0.0	79.1	28.84			

METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES

Plant Name	Choctaw Defense Facility	**Preliminary Run Date**	12/17/19
Sampling Location	Centerfire Room	**Operator**	JW
Project #	amee-19-mcalester.ok-perf#1	**Ports Used**	5

Scale Daily Calibration					
Scale Number	SAMP-SC-0035	**Standard**	**Result**	**Difference**	**Pass/Fail**
Date		(g)	(g)	(g)	(± 0.5 g)
Preliminary Date	12/17/19	500	499.7	-0.3	Pass
Test Day 1	12/18/19	500	499.8	-0.2	Pass

Moisture Content Data									
Run Number		V1Pb-1		**Date**	12/18/19	**Start Time**	07:55	**Stop Time**	11:00
Meter Box Number		samp-cp-0029			**Meter Cal Factor**		(Y)	0.995	
Total Meter Volume		(V_m)	32.776	dcf	**Barometric Pressure**		(P_b)	29.54	in Hg
Average Stack Temp		$(t_s)_{avg}$	60	°F	**Stack Static Pressure**		(P_{static})	0.01	in H_2O
Average Meter Temp		$(t_m)_{avg}$	74	°F	**Avg Orifice Pressure**		$(\Delta H)_{avg}$	1.02	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	$(V_f),(W_f)$	698.40	671.60	614.40	817.70				
Initial Value	$(V_i),(W_i)$	704.80	668.50	613.90	811.50				
Net Value	$(V_n),(W_n)$	-6.4	3.1	0.5	6.2				
Results									
Total Weight		(W_t)	3.40	g	**Water Vol Weighed**		($V_{wsg(std)}$)	0.160	scf
Std Meter Volume		($V_{m(std)}$)	31.912	dscf	**Sat. Moisture Content**		($B_{ws(svp)}$)	1.79	%
Calc Moisture Content		($B_{ws(calc)}$)	0.50	%	**Final Moisture Content**		(B_{ws})	0.50	%

Moisture Content Data									
Run Number		V1Pb-2		**Date**	12/18/19	**Start Time**	12:47	**Stop Time**	13:59
Meter Box Number		samp-cp-0029			**Meter Cal Factor**		(Y)	0.995	
Total Meter Volume		(V_m)	32.421	dcf	**Barometric Pressure**		(P_b)	29.56	in Hg
Average Stack Temp		$(t_s)_{avg}$	69	°F	**Stack Static Pressure**		(P_{static})	0.01	in H_2O
Average Meter Temp		$(t_m)_{avg}$	72	°F	**Avg Orifice Pressure**		$(\Delta H)_{avg}$	1.05	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	$(V_f),(W_f)$	690.90	698.20	562.20	870.50				
Initial Value	$(V_i),(W_i)$	693.50	693.30	559.00	860.40				
Net Value	$(V_n),(W_n)$	-2.6	4.9	3.2	10.1				
Results									
Total Weight		(W_t)	15.60	g	**Water Vol Weighed**		($V_{wsg(std)}$)	0.736	scf
Std Meter Volume		($V_{m(std)}$)	31.695	dscf	**Sat. Moisture Content**		($B_{ws(svp)}$)	2.39	%
Calc Moisture Content		($B_{ws(calc)}$)	2.27	%	**Final Moisture Content**		(B_{ws})	2.27	%

Moisture Content Data									
Run Number		V1Pb-3		**Date**	12/18/19	**Start Time**	14:26	**Stop Time**	15:35
Meter Box Number		samp-cp-0029			**Meter Cal Factor**		(Y)	0.995	
Total Meter Volume		(V_m)	32.722	dcf	**Barometric Pressure**		(P_b)	29.54	in Hg
Average Stack Temp		$(t_s)_{avg}$	71	°F	**Stack Static Pressure**		(P_{static})	0.01	in H_2O
Average Meter Temp		$(t_m)_{avg}$	78	°F	**Avg Orifice Pressure**		$(\Delta H)_{avg}$	0.96	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	$(V_f),(W_f)$	694.90	676.50	617.20	825.10				
Initial Value	$(V_i),(W_i)$	704.60	671.20	615.60	817.70				
Net Value	$(V_n),(W_n)$	-9.7	5.3	1.6	7.4				
Results									
Total Weight		(W_t)	4.60	g	**Water Vol Weighed**		($V_{wsg(std)}$)	0.217	scf
Std Meter Volume		($V_{m(std)}$)	31.618	dscf	**Sat. Moisture Content**		($B_{ws(svp)}$)	2.57	%
Calc Moisture Content		($B_{ws(calc)}$)	0.68	%	**Final Moisture Content**		(B_{ws})	0.68	%

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/18/19
Operator	JW
Run Number	V1Pb-1

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8290	A8877
Average Stack Temp	(t_s)	60.4	°F
Average Meter Temp	(t_m)	74.1	
Orifice Meter Coefficient	($\Delta H@$)	1.882	in H_2O
Square Root ΔP	($\Delta p^{1/2}{}_{avg}$)	0.30	in H_2O
Stack Moisture Content	(B_{ws})	0.50	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.75	acfm
ΔP to ΔH Isokinetic Factor	(K)	10.55	

Leak Checks		*[change]*		*[level]*		*[time]*	
Train	**Pre**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	**Post**	0.000	ft³/min@	7.0	in Hg for	65.0	sec [≥60]
Pitot	**Pre (+)**	0.00	in H_2O	7.0	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.00	in H_2O	5.0	in H_2O for	20.0	sec [≥15]
PASS	**Post (+)**	0.00	in H_2O	8.0	in H_2O for	20.0	sec [≥15]
	Post (-)	0.00	in H_2O	6.0	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	G10		
Average Nozzle Diameter	(D_{na})	0.3120	in
Suggested Nozzle Diameter	(D_{ni})	0.2710	in
Probe Number	samp-hp-0067		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0039		
Impinger Case Number	samp-bc-0019		

Pressures			
Barometric Pressure	(P_b)	29.54	in Hg
Stack Static Pressure	(P_{static})	0.01	in H_2O
Absolute Stack Pressure	(P_s)	29.54	in Hg
Absolute Meter Pressure	(P_m)	29.68	in Hg

Nozzle Measurements			**ID: G10**	
Pre	0.312	0.313	0.311	**PASS**
Post	0.312	0.313	0.311	**PASS**

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Run Time			
Start	07:55	**End**	11:00

Weights	**Imp 1**	**Imp 2**	**Imp 3**	**Imp 4**	**Imp 5**	**Imp 6**	**Imp 7**	**Imp 8**
Pre	704.8	668.5	613.9	811.5				
Post	698.4	671.6	614.4	817.7				

Wash Volumes					
					ml
					ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0067	samp-hp-0067	samp-bh-0039	samp-bc-0019			**samp-cp-0029**		samp-cp-0029					
Traverse Point #	**Sampling Time (Θ)**	**Timer Time**	**Dry Gas Meter Reading (V_m)**	**Velocity Head (Δp)**	**Desired Orifice ΔH (ΔH_d)**	**Actual Orifice ΔH (ΔH_a)**	**Stack Temp (t_s)**	**Probe Temp (248±25°F)**	**Filter Temp (248±25°F)**	**Impinger Exit Temp (≤68°F)**	**Cond. Temp (≤--°F)**	**CPM Filter Temp (--±--°F)**	**Meter Inlet Temp (t_{mi})**	**Meter Outlet Temp (t_{mo})**	**Pump Vacuum**	**Square Root ΔP ($\Delta p^{1/2}$)**	**Local Stack Velocity (v_s)$_I$**	**Cumul. Meter Volume (V_m)$_{std}$**	**Cumul. Percent IsoKinetic (I)**	**Est-Run Meter Volume (V_m)$_{std}$**
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	663.978	0.14	1.477	1.50	56	252	250	39			60	60	3.0	0.37	20.66	1.634	103.0	40.849
A-2	2.4	00:02:24	665.610	0.13	1.372	1.40	56	253	249	41			60	60	3.0	0.36	19.91	3.266	104.8	40.819
A-3	4.8	00:04:48	667.240	0.16	1.688	1.70	56	251	250	39			61	61	3.5	0.40	22.08	4.825	100.7	40.210
A-4	7.2	00:07:12	668.800	0.14	1.477	1.50	56	253	250	32			68	68	3.0	0.37	20.66	6.413	100.5	40.079
A-5	9.6	00:09:36	670.410	0.15	1.583	1.60	56	254	251	33			69	69	3.0	0.39	21.38	7.965	99.3	39.825
B-1	12.0	00:12:00	671.987	0.12	1.266	1.30	56	252	252	34			74	74	3.0	0.35	19.13	9.391	99.0	39.128
B-2	14.4	00:14:24	673.450	0.11	1.161	1.20	56	253	249	43			75	75	3.0	0.33	18.31	10.801	99.2	38.574
B-3	16.8	00:16:48	674.900	0.07	0.739	0.75	57	254	250	43			75	75	3.0	0.26	14.62	12.258	102.8	38.305
B-4	19.2	00:19:12	676.400	0.07	0.739	0.75	57	254	253	43			75	75	3.0	0.26	14.62	13.074	101.0	36.316
B-5	21.6	00:21:36	677.240	0.13	1.372	1.40	59	249	252	44			76	76	3.5	0.36	19.96	14.541	100.5	36.352
C-1	24.0	00:24:00	678.751	0.12	1.266	1.30	60	250	253	44			76	76	3.5	0.35	19.20	16.025	100.6	36.421
C-2	26.4	00:26:24	680.280	0.06	0.633	0.64	60	253	251	44			77	77	3.0	0.24	13.58	17.070	100.6	35.563
C-3	28.8	00:28:48	681.360	0.06	0.633	0.64	61	254	250	44			77	77	3.0	0.24	13.59	18.096	100.5	34.799
C-4	31.2	00:31:12	682.420	0.05	0.528	0.53	62	252	248	45			77	77	3.0	0.22	12.42	19.053	100.6	34.023
C-5	33.6	00:33:36	683.410	0.08	0.844	0.85	63	254	250	45			77	77	3.0	0.28	15.72	20.194	100.3	33.657
D-1	36.0	00:36:00	684.589	0.08	0.844	0.85	63	253	249	45			77	77	3.0	0.28	15.72	21.367	100.2	33.385
D-2	38.4	00:38:24	685.800	0.07	0.739	0.75	63	254	249	45			77	77	3.0	0.26	14.71	22.470	100.1	33.044
D-3	40.8	00:40:48	686.940	0.07	0.739	0.75	64	253	250	45			77	77	3.0	0.26	14.72	23.592	100.2	32.767
D-4	43.2	00:43:12	688.100	0.08	0.844	0.85	64	254	252	45			77	77	3.0	0.28	15.74	24.773	100.1	32.596
D-5	45.6	00:45:36	689.320	0.08	0.844	0.85	64	249	255	45			77	77	3.0	0.28	15.74	25.978	100.2	32.473
E-1	48.0	00:48:00	690.565	0.10	1.055	1.10	64	250	250	47			78	78	3.0	0.32	17.59	26.785	99.0	31.887
E-2	50.4	00:50:24	691.400	0.09	0.950	1.00	64	253	249	47			78	78	3.0	0.30	16.69	28.631	102.0	32.536
E-3	52.8	00:52:48	693.310	0.08	0.844	0.85	64	252	249	47			78	78	3.0	0.28	15.74	29.810	101.9	32.402
E-4	55.2	00:55:12	694.530	0.07	0.739	0.75	65	251	249	49			78	78	3.0	0.26	14.73	30.921	101.8	32.209
E-5	57.6	00:57:36	695.680	0.06	0.633	0.64	65	254	249	49			78	78	3.0	0.24	13.64	31.958	101.8	31.958
Last Pt	60.0	01:00:00	696.754																	
Final Val	60.0	01:00:00	696.754											**Max Vac**	3.5	**Final Values**		31.958	101.8	
Average Values				0.09		1.02	60	252	250	43			74	74		0.30	16.83			
													74							

Notes:

Run Time: Run started at 07:55, but process experienced three lengthy delays because of site equipment issues. Test train was paused in place until production was re-established.

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/18/19
Operator	JW
Run Number	V1Pb-2

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8190	2428
Average Stack Temp	(t_s)	68.7	°F
Average Meter Temp	(t_m)	72.3	
Orifice Meter Coefficient	($\Delta H@$)	1.882	in H_2O
Square Root ΔP	($\Delta p^{1/2}_{avg}$)	0.31	in H_2O
Stack Moisture Content	(B_{ws})	2.27	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.53	acfm
ΔP to ΔH Isokinetic Factor	(K)	10.03	

Leak Checks		*[change]*		*[level]*		*[time]*	
Train	**Pre**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	**Post**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
Pitot	**Pre (+)**	0.00	in H_2O	5.0	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.00	in H_2O	6.0	in H_2O for	20.0	sec [≥15]
PASS	**Post (+)**	0.00	in H_2O	5.0	in H_2O for	20.0	sec [≥15]
	Post (-)	0.00	in H_2O	4.0	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	A10		
Average Nozzle Diameter	(D_{na})	0.3137	in
Suggested Nozzle Diameter	(D_{ni})	0.2294	in
Probe Number	samp-hp-0066		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0039		
Impinger Case Number	samp-bc-0015		

Nozzle Measurements			**ID: A10**	
Pre	0.314	0.314	0.313	**PASS**
Post	0.314	0.314	0.313	**PASS**

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Pressures			
Barometric Pressure	(P_b)	29.56	in Hg
Stack Static Pressure	(P_{static})	0.01	in H_2O
Absolute Stack Pressure	(P_s)	29.56	in Hg
Absolute Meter Pressure	(P_m)	29.70	in Hg

Run Time			
Start	12:47	**End**	13:59

Weights	**Imp 1**	**Imp 2**	**Imp 3**	**Imp 4**	**Imp 5**	**Imp 6**	**Imp 7**	**Imp 8**
Pre	693.5	693.3	559.0	860.4				
Post	690.9	698.2	562.2	870.5				

Wash Volumes					
					ml
					ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0066	samp-hp-0066	samp-bh-0039	samp-bc-0015			**samp-cp-0029**		samp-cp-0029					
Traverse Point #	**Sampling Time (Θ)**	**Timer Time**	**Dry Gas Meter Reading (V_m)**	**Velocity Head (Δp)**	**Desired Orifice ΔH (ΔH_d)**	**Actual Orifice ΔH (ΔH_a)**	**Stack Temp (t_s)**	**Probe Temp (248±25°F)**	**Filter Temp (248±25°F)**	**Impinger Exit Temp (≤68°F)**	**Cond. Temp (≤--°F)**	**CPM Filter Temp (--±--°F)**	**Meter Inlet Temp (t_{mi})**	**Meter Outlet Temp (t_{mo})**	**Pump Vacuum**	**Square Root ΔP ($\Delta p^{1/2}$)**	**Local Stack Velocity (v_s)$_i$**	**Cumul. Meter Volume (V_m)$_{std}$**	**Cumul. Percent IsoKinetic (I)**	**Est-Run Meter Volume (V_m)$_{std}$**
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	697.000	0.14	1.404	1.50	67	253	249	64			70	70	3.0	0.37	20.69	1.573	101.8	39.319
A-2	2.4	00:02:24	698.600	0.13	1.303	1.40	67	253	246	62			70	70	3.0	0.36	19.93	3.125	103.0	39.068
A-3	4.8	00:04:48	700.180	0.16	1.604	1.70	67	253	247	61			70	70	3.0	0.40	22.12	4.522	97.3	37.683
A-4	7.2	00:07:12	701.600	0.18	1.805	1.90	68	253	250	60			70	70	3.0	0.42	23.48	6.293	98.4	39.332
A-5	9.6	00:09:36	703.400	0.16	1.604	1.70	68	253	248	60			70	70	3.0	0.40	22.14	7.876	97.9	39.382
B-1	12.0	00:12:00	705.010	0.12	1.203	1.30	68	253	251	61			71	71	3.0	0.35	19.17	9.799	105.1	40.827
B-2	14.4	00:14:24	706.970	0.12	1.203	1.30	68	251	249	61			71	71	3.0	0.35	19.17	11.299	105.0	40.353
B-3	16.8	00:16:48	708.500	0.06	0.602	0.63	68	249	252	60			72	72	3.0	0.24	13.56	11.905	102.7	37.202
B-4	19.2	00:19:12	709.120	0.08	0.802	0.84	68	257	247	60			72	72	3.0	0.28	15.65	13.498	106.7	37.495
B-5	21.6	00:21:36	710.750	0.13	1.303	1.40	68	254	247	58			72	72	3.0	0.36	19.95	15.036	106.4	37.591
C-1	24.0	00:24:00	712.321	0.13	1.303	1.40	69	256	248	59			73	73	3.0	0.36	19.97	16.579	106.2	37.680
C-2	26.4	00:26:24	713.900	0.07	0.702	0.74	69	256	248	57			73	73	3.0	0.26	14.66	16.872	104.8	35.150
C-3	28.8	00:28:48	714.200	0.07	0.702	0.74	69	254	249	55			73	73	3.0	0.26	14.66	17.945	104.4	34.510
C-4	31.2	00:31:12	715.300	0.08	0.802	0.84	69	245	248	54			73	73	3.0	0.28	15.67	19.702	108.5	35.182
C-5	33.6	00:33:36	717.100	0.07	0.702	0.74	69	259	249	54			73	73	3.0	0.26	14.66	20.872	108.4	34.787
D-1	36.0	00:36:00	718.300	0.07	0.702	0.74	69	253	249	55			73	73	3.0	0.26	14.66	21.555	107.0	33.680
D-2	38.4	00:38:24	719.000	0.08	0.802	0.84	69	254	250	54			73	73	3.0	0.28	15.67	22.746	106.7	33.450
D-3	40.8	00:40:48	720.220	0.07	0.702	0.74	69	254	249	54			73	73	3.0	0.26	14.66	23.868	106.6	33.150
D-4	43.2	00:43:12	721.370	0.07	0.702	0.74	69	255	249	53			73	73	3.0	0.26	14.66	25.165	107.2	33.112
D-5	45.6	00:45:36	722.700	0.07	0.702	0.74	69	253	250	53			73	73	3.0	0.26	14.66	26.049	106.3	32.562
E-1	48.0	00:48:00	723.606	0.07	0.702	0.74	70	253	247	51			74	74	3.0	0.26	14.67	27.144	106.1	32.314
E-2	50.4	00:50:24	724.730	0.10	1.003	1.10	70	254	248	51			74	74	3.0	0.32	17.53	28.245	105.2	32.097
E-3	52.8	00:52:48	725.860	0.09	0.902	0.95	70	252	248	50			74	74	3.0	0.30	16.63	29.161	104.3	31.697
E-4	55.2	00:55:12	726.800	0.08	0.802	0.84	70	254	249	50			74	74	3.0	0.28	15.68	30.651	105.4	31.928
E-5	57.6	00:57:36	728.330	0.07	0.702	0.74	70	254	251	50			74	74	3.0	0.26	14.67	31.714	105.1	31.714
Last Pt	60.0	01:00:00	729.421																	
Final Val	60.0	01:00:00	729.421											**Max Vac**	3.0	**Final Values**		31.714	105.1	
Average Values				0.10		1.05	69	253	249	56			72	72		0.31	17.16			
													72							

Notes:

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/18/19
Operator	JW
Run Number	V1Pb-3

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8290	A8877
Average Stack Temp	(t_s)	70.8	°F
Average Meter Temp	(t_m)	78.1	
Orifice Meter Coefficient	($\Delta H@$)	1.882	in H_2O
Square Root ΔP	($\Delta p^{1/2}_{avg}$)	0.31	in H_2O
Stack Moisture Content	(B_{ws})	0.68	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.53	acfm
ΔP to ΔH Isokinetic Factor	(K)	10.39	

Leak Checks		*[change]*		*[level]*		*[time]*	
Train	**Pre**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	**Post**	0.000	ft³/min@	9.0	in Hg for	65.0	sec [≥60]
Pitot	**Pre (+)**	0.00	in H_2O	5.0	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.00	in H_2O	7.0	in H_2O for	20.0	sec [≥15]
PASS	**Post (+)**	0.00	in H_2O	6.0	in H_2O for	20.0	sec [≥15]
	Post (-)	0.00	in H_2O	6.0	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	G10		
Average Nozzle Diameter	(D_{na})	0.3120	in
Suggested Nozzle Diameter	(D_{ni})	0.2271	in
Probe Number	samp-hp-0067		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0039		
Impinger Case Number	samp-bc-0019		

Pressures			
Barometric Pressure	(P_b)	29.54	in Hg
Stack Static Pressure	(P_{static})	0.01	in H_2O
Absolute Stack Pressure	(P_s)	29.54	in Hg
Absolute Meter Pressure	(P_m)	29.68	in Hg

Nozzle Measurements			**ID: G10**	
Pre	0.312	0.313	0.311	**PASS**
Post	0.312	0.313	0.311	**PASS**

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Run Time			
Start	14:26	**End**	15:35

Weights	**Imp 1**	**Imp 2**	**Imp 3**	**Imp 4**	**Imp 5**	**Imp 6**	**Imp 7**	**Imp 8**
Pre	704.6	671.2	615.6	817.7				
Post	694.9	676.5	617.2	825.1				

Wash Volumes					
					ml
					ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0067	samp-hp-0067	samp-bh-0039	samp-bc-0019			**samp-cp-0029**		samp-cp-0029					
Traverse Point #	**Sampling Time (Θ)**	**Timer Time**	**Dry Gas Meter Reading (V_m)**	**Velocity Head (Δp)**	**Desired Orifice ΔH (ΔH_d)**	**Actual Orifice ΔH (ΔH_a)**	**Stack Temp (t_s)**	**Probe Temp (248±25°F)**	**Filter Temp (248±25°F)**	**Impinger Exit Temp (≤68°F)**	**Cond. Temp (≤--°F)**	**CPM Filter Temp (--±--°F)**	**Meter Inlet Temp (t_{mi})**	**Meter Outlet Temp (t_{mo})**	**Pump Vacuum**	**Square Root ΔP ($\Delta p^{1/2}$)**	**Local Stack Velocity ($(v_s)_i$)**	**Cumul. Meter Volume ($(V_m)_{std}$)**	**Cumul. Percent IsoKinetic (I)**	**Est-Run Meter Volume ($(V_m)_{std}$)**
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	729.733	0.16	1.663	1.60	69	258	247	63			76	76	3.5	0.40	22.37	1.717	102.6	42.918
A-2	2.4	00:02:24	731.500	0.15	1.559	1.50	69	257	248	63			76	76	3.5	0.39	21.66	3.232	98.4	40.400
A-3	4.8	00:04:48	733.060	0.15	1.559	1.50	69	253	250	63			76	76	3.5	0.39	21.66	4.922	100.4	41.017
A-4	7.2	00:07:12	734.800	0.14	1.455	1.40	69	255	249	60			76	76	3.5	0.37	20.92	6.418	99.3	40.110
A-5	9.6	00:09:36	736.340	0.14	1.455	1.40	69	255	249	58			76	76	3.5	0.37	20.92	8.008	99.8	40.041
B-1	12.0	00:12:00	737.978	0.13	1.351	1.30	71	248	248	56			76	76	3.5	0.36	20.20	9.457	99.2	39.403
B-2	14.4	00:14:24	739.470	0.10	1.039	1.00	71	254	250	55			76	76	3.5	0.32	17.72	10.747	99.0	38.382
B-3	16.8	00:16:48	740.800	0.08	0.831	0.80	71	250	250	54			76	76	3.5	0.28	15.85	12.104	100.8	37.826
B-4	19.2	00:19:12	742.200	0.08	0.831	0.80	71	256	249	52			77	77	3.5	0.28	15.85	13.179	100.0	36.607
B-5	21.6	00:21:36	743.310	0.07	0.728	0.70	71	255	252	50			78	78	3.5	0.26	14.82	14.312	100.2	35.781
C-1	24.0	00:24:00	744.484	0.13	1.351	1.30	71	253	247	51			78	78	3.5	0.36	20.20	15.779	100.0	35.861
C-2	26.4	00:26:24	746.000	0.08	0.831	0.80	71	253	252	50			79	79	3.5	0.28	15.85	16.945	99.9	35.303
C-3	28.8	00:28:48	747.210	0.08	0.831	0.80	71	250	248	49			79	79	3.5	0.28	15.85	18.112	99.8	34.831
C-4	31.2	00:31:12	748.420	0.06	0.624	0.60	71	250	246	49			79	79	3.5	0.24	13.72	19.124	99.8	34.150
C-5	33.6	00:33:36	749.470	0.08	0.831	0.80	71	255	246	49			79	79	4.0	0.28	15.85	20.253	99.6	33.755
D-1	36.0	00:36:00	750.641	0.08	0.831	0.80	71	252	250	49			79	79	4.0	0.28	15.85	21.400	99.4	33.437
D-2	38.4	00:38:24	751.830	0.08	0.831	0.80	71	256	248	49			80	80	4.0	0.28	15.85	22.526	99.2	33.126
D-3	40.8	00:40:48	753.000	0.07	0.728	0.70	71	253	258	49			80	80	4.0	0.26	14.82	23.584	99.1	32.756
D-4	43.2	00:43:12	754.100	0.07	0.728	0.70	71	256	249	49			80	80	4.0	0.26	14.82	24.479	98.4	32.209
D-5	45.6	00:45:36	755.030	0.07	0.728	0.70	71	252	250	49			80	80	4.0	0.26	14.82	25.786	99.4	32.232
E-1	48.0	00:48:00	756.388	0.10	1.039	1.00	72	256	249	54			80	80	4.0	0.32	17.73	27.049	99.2	32.201
E-2	50.4	00:50:24	757.700	0.09	0.935	0.90	72	255	248	51			79	79	4.0	0.30	16.82	28.293	99.3	32.151
E-3	52.8	00:52:48	758.990	0.08	0.831	0.80	72	252	249	50			79	79	4.0	0.28	15.86	29.479	99.3	32.043
E-4	55.2	00:55:12	760.220	0.07	0.728	0.70	72	254	251	49			79	79	4.0	0.26	14.84	30.559	99.3	31.832
E-5	57.6	00:57:36	761.340	0.07	0.728	0.70	72	253	249	49			79	79	4.0	0.26	14.84	31.634	99.2	31.634
Last Pt	60.0	01:00:00	762.455																	
Final Val	60.0	01:00:00	762.455											**Max Vac**	4.0	**Final Values**		31.634	99.2	
Average Values				0.10		0.96	71	254	249	53			78	78		0.31	17.19			
													78							

Notes:

EMISSION DATA RECORDS

Vent #2 Reference Method Data

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE

Source Information	
Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room

Test Information			
Project #		amee-19-mcalester.ok-perf#1	
Operator		JW	
Date for Preliminary Run	(mm/dd/yy)	12/18/19	
Standard Temperature		68	°F
Standard Pressure		29.92	in Hg
Required Sample Vol.	indust. spec.	30	scf
Run Duration	≥ 2 min/point	60	minutes
Unit Number		Vent #2	
Base Run Number		V2Pb	
Number of Ports Available		5	
Number of Ports Used		5	
Port Inside Diameter		3.00	in
Stack Shape		Rectangular	

Test Equipment Information					
Run		**1**	**2**	**3**	
Test Date	(mm/dd/yy)	12/18/19	12/19/19	12/19/19	
Production Rate		Max	Max	Max	ton/hr
Meter Box Number	from ACS	samp-cp-0029	samp-cp-0029	samp-cp-0029	
Meter Calibration Factor	(Y)	0.995	0.995	0.995	
Orifice Meter Coefficient	($\Delta H_@$)	1.882	1.882	1.882	in H_2O
Non-Console Manometer Used		No	No	No	
Pitot Identification	from ACS	A8877	2428	A8877	
Pitot Tube Coefficient	(C_p)	0.8290	0.8190	0.8290	
Nozzle Number	from ACS	G10	A10	G10	
Nozzle Diameter	(D_n)	0.312	0.314	0.312	in
Probe Number	from ACS	samp-hp-0067	samp-hp-0066	samp-hp-0067	
Probe Length		60.0	60.0	60.0	in
(SS, Glass ….) Liner Material	from list	glass	glass	glass	
Sample Case / Oven Number	from ACS	samp-bh-0039	samp-bh-0039	samp-bh-0039	
Impinger Case Number	from ACS	samp-bc-0019	samp-bc-0015	samp-bc-0019	

Testing Company Information	
Company Name	Air Hygiene International, Inc. (Tulsa, Oklahoma)
Address	1600 W Tacoma Street
City, State Zip	Broken Arrow, Oklahoma 74012
Project Manager	Paul Little
Phone Number	(918) 307-8865
Fax Number	(918) 307-9131

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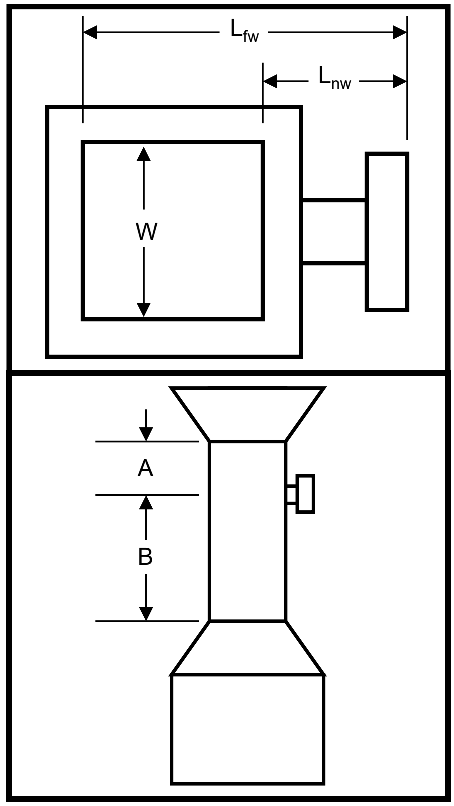
METHOD 1 - SAMPLE AND VELOCITY TRAVERSES FOR RECTANGULAR SOURCES

Plant Name	Choctaw Defense Facility	**Date**	12/18/19
Sampling Location	Centerfire Room	**Stack Type**	Rectangular
Operator	JW	**Ports Available**	5
Project #	amee-19-mcalester.ok-perf#1	**Ports Used**	5
Stack Size	Large (>24 inch diameter)	**Port ID (inches)**	3.00

Rectangular Stacks or Ducts			
Length to Far Wall of Stack	(L_{fw})	44.13	in
Length to Near Wall of Stack	(L_{nw})	0.13	in
Length of Stack	(L)	44.00	in
Width of Stack	(W)	43.00	in
Equivalent Stack Diam	(D_e)	43.49	in
Area of Stack	(A_s)	13.14	ft²



Distance from Port to Disturbances			
Distance Upstream	(A)	46.00	in
Diameters Upstream	(A_D)	1.06	diameters
Distance Downstream	(B)	101.00	in
Diameters Downstream	(B_D)	2.32	diameters

Number of Traverse Points Required			
Diameters to Flow Disturbance		**Minimum Number of[1] Traverse Points**	
Down Stream	**Up Stream**	**Particulate Points**	**Velocity Points**
2.00-4.99	0.50-1.24	25	16
5.00-5.99	1.25-1.49	20	16
6.00-6.99	1.50-1.74	16	12
7.00-7.99	1.75-1.99	12	12
>= 8.00	>=2.00	9 or 12[2]	9 or 12[2]
Upstream Spec		25	16
Downstream Spec		25	16
Traverse Pts Required		25	16

[1] Check Minimum Number of Points for the Upstream and Downstream conditions, then use the largest.

[2] 9 for Rectangular Stacks 12 to 24 inches
12 for All Stacks over 24 inches

- (●) Method 1 Trav
- ( ) 12 Point PM Trav (M201a ONLY)
- ( ) Velocity

Number of Traverse Points Used			
5	**Ports by**	5	**Across**
25	**Pts Used**	25	**Required**

LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS									
Traverse Point Number	Percent of Stack Diameter from Inside Wall to Traverse Point — Number of Traverse Points on a Diameter								
	1	2	3	4	5	6	7	8	9
1	0.500	0.250	0.167	0.125	0.100	0.083	0.071	0.063	0.056
2		0.750	0.500	0.375	0.300	0.250	0.214	0.188	0.167
3			0.833	0.625	0.500	0.417	0.357	0.313	0.278
4				0.875	0.700	0.583	0.500	0.438	0.389
5					0.900	0.750	0.643	0.563	0.500
6						0.917	0.786	0.688	0.611
7							0.929	0.813	0.722
8								0.938	0.833
9									0.944

Traverse Point Locations			
Traverse Point Number	**Fraction of Stack Dimension**	**Distance from Inside Wall**	**Distance Including Reference Length**
		in	in
1	0.100	4 3/8	4 4/8
2	0.300	13 2/8	13 3/8
3	0.500	22	22 1/8
4	0.700	30 6/8	30 7/8
5	0.900	39 5/8	39 6/8
6			
7			
8			
9			

METHOD 2 - DETERMINATION OF STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant Name	Choctaw Defense Facility		
Sampling Location	Centerfire Room		
Operator	JW		
Project #	amee-19-mcalester.ok-perf#1		
Pitot Leak Check	x	**PreTest**	x	**PostTest**

Preliminary Run Date	12/18/19		
Stack Type	Rectangular		
Ports Available	5		
Thermocouple ID	samp-hp-0067		
Pitot Coefficient	0.8290	**Pitot Identification**	A8877

Stack Dimensions			
Area of Stack	(A_s)	13.14	ft²
Length of Stack	(L)	44.00	in
Width of Stack	(W)	43.00	in

Pressures			
Barometric Pressure	(P_b)	29.57	in Hg
Static Pressure	(P_{static})	0.01	in H_2O
Absolute Stack Pressure	(P_s)	29.57	in Hg

Stack Gas Composition			
Composition Data:	**Estimated Composition**		
Carbon Dioxide Concentration	($\%CO_2$)	0.00	%vd
Oxygen Concentration	($\%O_2$)	20.90	%vd
Carbon Monoxide Concentration	(ppmCO)	0.00	ppmvd
Nitrogen Concentration	($\%N_2$)	79.10	%vd
Stack Moisture Content	(B_{ws})	1.50	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Stack Wet Molecular Weight	(M_w)	28.67	lb/lb-mole

Results			
Avg Stack Gas Velocity	(v_s)	16.46	ft/sec
Avg Stack Dry Std Flow Rate	(Q_{sd})	752,538	dscf/hr
Avg Stack Dry Std Flow Rate	(Q_{sd})	12,542	dscf/min
Avg Stack Wet Flow Rate	(Q_{aw})	12,978	acf/min
Avg Stack Wet Std Flow Rate	(Q_{sw})	763,998	ascf/hr

40 CFR 60, Method 2G, Section 8.11.1 (but applies to all Method 2 type static pressure measurements):
If a Type S probe is used for this measurement, position the probe at or between any traverse point(s) and rotate the probe until a null differential pressure reading is obtained. Disconnect the tubing from one of the pressure ports; read and record the ∆P. For pressure devices with one-directional scales, if a deflection in the positive direction is noted with the negative side disconnected, then the static pressure is positive. Likewise, if a deflection in the positive direction is noted with the positive side disconnected, then the static pressure is negative.

Stack Cross Section Schematic

Velocity Traverse Data					
Run Number	V2Pb-V1				
Run Time	15:58	**Start**	16:18	**End**	
Traverse Point	**Velocity Head** (Δp)	**Null Angle** (N_a)	**Zero Deg Pressure** ($0^o{}_a$)	**Stack Temp** (t_s)	**Local Velocity** ($v_{s(l)}$)
	in H_2O	deg	in H_2O	°F	ft/sec
A-1	0.09	0	0.00	72	16.84
A-2	0.07	2	0.10	72	14.85
A-3	0.07	2	0.01	72	14.85
A-4	0.09	4	0.02	72	16.84
A-5	0.11	3	0.02	72	18.62
B-1	0.09	-4	0.03	72	16.84
B-2	0.06	-3	0.03	72	13.75
B-3	0.06	0	0.00	72	13.75
B-4	0.06	0	0.02	72	13.75
B-5	0.13	6	0.05	72	20.24
C-1	0.10	0	0.00	72	17.75
C-2	0.06	-5	0.02	72	13.75
C-3	0.05	0	0.00	72	12.55
C-4	0.06	4	0.01	72	13.75
C-5	0.10	7	0.00	72	17.75
D-1	0.10	-5	0.01	72	17.75
D-2	0.06	0	0.02	72	13.75
D-3	0.06	3	0.00	72	13.75
D-4	0.07	8	0.03	72	14.85
D-5	0.13	5	0.03	72	20.24
E-1	0.11	0	0.00	72	18.62
E-2	0.07	-4	0.00	72	14.85
E-3	0.10	-5	0.02	72	17.75
E-4	0.14	3	0.00	71	20.99
E-5	0.17	9	0.03	70	23.10
Average	0.09	3		72	
	0.29	**= Square roots of ∆p**			
Standard deviation of null angles =				2.7	

METHOD 3a - DETERMINATION OF DRY MOLECULAR WEIGHT BY ANALYZER

Plant Name	Choctaw Defense Facility	**Preliminary Run Date**	12/18/19
Sampling Location	Centerfire Room	**Operator**	JW

Gas Analysis Data

Run Number	V2Pb-1		**Date**	12/18/19	**Run Start Time**	16:42	**Run Stop Time**	17:52
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**			
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)			
hh:mm	%	%	ppm	%	lb/lb-mole			
01:10	0.0	20.9	0.0	79.1	28.84			

Gas Analysis Data

Run Number	V2Pb-2		**Date**	12/19/19	**Run Start Time**	07:08	**Run Stop Time**	08:14
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**			
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)			
hh:mm	%	%	ppm	%	lb/lb-mole			
01:06	0.0	20.9	0.0	79.1	28.84			

Gas Analysis Data

Run Number	V2Pb-3		**Date**	12/19/19	**Run Start Time**	08:45	**Run Stop Time**	09:50
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**			
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)			
hh:mm	%	%	ppm	%	lb/lb-mole			
01:05	0.0	20.9	0.0	79.1	28.84			

METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES

Plant Name	Choctaw Defense Facility	**Preliminary Run Date**	12/18/19
Sampling Location	Centerfire Room	**Operator**	JW
Project #	amee-19-mcalester.ok-perf#1	**Ports Used**	5

Scale Daily Calibration					
Scale Number	SAMP-SC-0035	**Standard**	**Result**	**Difference**	**Pass/Fail**
Date		(g)	(g)	(g)	(± 0.5 g)
Test Day 1	12/18/19	500	499.8	-0.2	Pass
Test Day 2	12/19/19	500	499.7	-0.3	Pass

Moisture Content Data									
Run Number		V2Pb-1		**Date**	12/18/19	**Start Time**	16:42	**Stop Time**	17:52
Meter Box Number		samp-cp-0029			**Meter Cal Factor**		(Y)	0.995	
Total Meter Volume		(V_m)	35.527	dcf	**Barometric Pressure**		(P_b)	29.54	in Hg
Average Stack Temp		$(t_s)_{avg}$	65	°F	**Stack Static Pressure**		(P_{static})	0.01	in H_2O
Average Meter Temp		$(t_m)_{avg}$	77	°F	**Avg Orifice Pressure**		$(\Delta H)_{avg}$	1.16	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	$(V_f),(W_f)$	687.40	700.30	564.90	878.10				
Initial Value	$(V_i),(W_i)$	695.30	695.80	562.60	870.20				
Net Value	$(V_n),(W_n)$	-7.9	4.5	2.3	7.9				
Results									
Total Weight		(W_t)	6.80	g	**Water Vol Weighed**		($V_{wsg(std)}$)	0.321	scf
Std Meter Volume		($V_{m(std)}$)	34.394	dscf	**Sat. Moisture Content**		($B_{ws(svp)}$)	2.14	%
Calc Moisture Content		($B_{ws(calc)}$)	0.92	%	**Final Moisture Content**		(B_{ws})	0.92	%

Moisture Content Data									
Run Number		V2Pb-2		**Date**	12/19/19	**Start Time**	07:08	**Stop Time**	08:14
Meter Box Number		samp-cp-0029			**Meter Cal Factor**		(Y)	0.995	
Total Meter Volume		(V_m)	35.771	dcf	**Barometric Pressure**		(P_b)	29.51	in Hg
Average Stack Temp		$(t_s)_{avg}$	58	°F	**Stack Static Pressure**		(P_{static})	0.01	in H_2O
Average Meter Temp		$(t_m)_{avg}$	70	°F	**Avg Orifice Pressure**		$(\Delta H)_{avg}$	1.20	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	$(V_f),(W_f)$	705.70	663.20	616.00	831.30				
Initial Value	$(V_i),(W_i)$	714.50	658.80	614.80	825.20				
Net Value	$(V_n),(W_n)$	-8.8	4.4	1.2	6.1				
Results									
Total Weight		(W_t)	2.90	g	**Water Vol Weighed**		($V_{wsg(std)}$)	0.137	scf
Std Meter Volume		($V_{m(std)}$)	35.064	dscf	**Sat. Moisture Content**		($B_{ws(svp)}$)	1.66	%
Calc Moisture Content		($B_{ws(calc)}$)	0.39	%	**Final Moisture Content**		(B_{ws})	0.39	%

Moisture Content Data									
Run Number		V2Pb-3		**Date**	12/19/19	**Start Time**	08:45	**Stop Time**	09:50
Meter Box Number		samp-cp-0029			**Meter Cal Factor**		(Y)	0.995	
Total Meter Volume		(V_m)	34.793	dcf	**Barometric Pressure**		(P_b)	29.54	in Hg
Average Stack Temp		$(t_s)_{avg}$	59	°F	**Stack Static Pressure**		(P_{static})	0.01	in H_2O
Average Meter Temp		$(t_m)_{avg}$	79	°F	**Avg Orifice Pressure**		$(\Delta H)_{avg}$	1.09	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	$(V_f),(W_f)$	688.10	697.70	562.50	883.80				
Initial Value	$(V_i),(W_i)$	692.90	694.30	561.20	872.10				
Net Value	$(V_n),(W_n)$	-4.8	3.4	1.3	11.7				
Results									
Total Weight		(W_t)	11.60	g	**Water Vol Weighed**		($V_{wsg(std)}$)	0.547	scf
Std Meter Volume		($V_{m(std)}$)	33.600	dscf	**Sat. Moisture Content**		($B_{ws(svp)}$)	1.72	%
Calc Moisture Content		($B_{ws(calc)}$)	1.60	%	**Final Moisture Content**		(B_{ws})	1.60	%

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/18/19
Operator	JW
Run Number	V2Pb-1

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8290	A8877
Average Stack Temp	(t_s)	65.5	°F
Average Meter Temp	(t_m)	77.3	
Orifice Meter Coefficient	($\Delta H@$)	1.882	in H_2O
Square Root ΔP	($\Delta p^{1/2}{}_{avg}$)	0.33	in H_2O
Stack Moisture Content	(B_{ws})	0.92	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.75	acfm
ΔP to ΔH Isokinetic Factor	(K)	10.44	

Leak Checks		*[change]*		*[level]*		*[time]*	
Train	**Pre**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	**Post**	0.000	ft³/min@	7.0	in Hg for	65.0	sec [≥60]
Pitot	**Pre (+)**	0.00	in H_2O	7.0	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.00	in H_2O	5.0	in H_2O for	20.0	sec [≥15]
PASS	**Post (+)**	0.00	in H_2O	8.0	in H_2O for	20.0	sec [≥15]
	Post (-)	0.00	in H_2O	6.0	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	G10		
Average Nozzle Diameter	(D_{na})	0.3120	in
Suggested Nozzle Diameter	(D_{ni})	0.2661	in
Probe Number	samp-hp-0067		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0039		
Impinger Case Number	samp-bc-0019		

Pressures			
Barometric Pressure	(P_b)	29.54	in Hg
Stack Static Pressure	(P_{static})	0.01	in H_2O
Absolute Stack Pressure	(P_s)	29.54	in Hg
Absolute Meter Pressure	(P_m)	29.68	in Hg

Nozzle Measurements			ID: G10
Pre	0.312	0.313	0.311	**PASS**
Post	0.312	0.313	0.311	**PASS**

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Run Time			
Start	16:42	**End**	17:52

Weights	**Imp 1**	**Imp 2**	**Imp 3**	**Imp 4**	**Imp 5**	**Imp 6**	**Imp 7**	**Imp 8**
Pre	695.3	695.8	562.6	870.2				
Post	687.4	700.3	564.9	878.1				

Wash Volumes					
					ml
					ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0067	samp-hp-0067	samp-bh-0039	samp-bc-0019			samp-cp-0029		samp-cp-0029					
Traverse Point #	**Sampling Time (Θ)**	**Timer Time**	**Dry Gas Meter Reading (V_m)**	**Velocity Head (Δp)**	**Desired Orifice ΔH (ΔH_d)**	**Actual Orifice ΔH (ΔH_a)**	**Stack Temp (t_s)**	**Probe Temp (248±25°F)**	**Filter Temp (248±25°F)**	**Impinger Exit Temp (≤68°F)**	**Cond. Temp (≤--°F)**	**CPM Filter Temp (--±--°F)**	**Meter Inlet Temp (t_{mi})**	**Meter Outlet Temp (t_{mo})**	**Pump Vacuum**	**Square Root ΔP ($\Delta p^{1/2}$)**	**Local Stack Velocity (v_s)$_I$**	**Cumul. Meter Volume (V_m)$_{std}$**	**Cumul. Percent IsoKinetic (I)**	**Est-Run Meter Volume (V_m)$_{std}$**
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	763.058	0.11	1.149	1.20	70	248	250	59			74	74	4.0	0.33	18.57	1.473	106.5	36.826
A-2	2.4	00:02:24	764.570	0.11	1.149	1.20	70	248	252	53			75	75	4.0	0.33	18.57	2.893	104.6	36.159
A-3	4.8	00:04:48	766.030	0.10	1.044	1.10	68	250	252	51			75	75	4.0	0.32	17.68	4.322	105.8	36.015
A-4	7.2	00:07:12	767.500	0.10	1.044	1.10	68	252	249	49			75	75	4.0	0.32	17.68	5.683	105.1	35.518
A-5	9.6	00:09:36	768.900	0.08	0.835	0.85	66	252	249	45			75	75	4.0	0.28	15.78	6.811	103.5	34.054
B-1	12.0	00:12:00	770.061	0.09	0.940	0.96	65	256	249	48			76	76	4.0	0.30	16.72	8.100	103.4	33.750
B-2	14.4	00:14:24	771.390	0.12	1.253	1.30	65	249	249	46			76	76	4.0	0.35	19.31	9.547	102.8	34.095
B-3	16.8	00:16:48	772.880	0.07	0.731	0.75	65	252	249	45			76	76	4.0	0.26	14.75	10.671	102.7	33.347
B-4	19.2	00:19:12	774.040	0.07	0.731	0.75	65	253	249	45			77	77	4.0	0.26	14.75	11.774	102.4	32.706
B-5	21.6	00:21:36	775.180	0.09	0.940	0.96	65	255	249	45			77	77	4.0	0.30	16.72	13.164	103.2	32.909
C-1	24.0	00:24:00	776.615	0.09	0.940	0.96	65	250	249	45			77	77	4.0	0.30	16.72	14.282	102.1	32.459
C-2	26.4	00:26:24	777.770	0.11	1.149	1.20	65	256	249	45			77	77	4.0	0.33	18.49	15.929	103.8	33.185
C-3	28.8	00:28:48	779.470	0.07	0.731	0.75	65	256	249	45			77	77	4.0	0.26	14.75	17.139	104.2	32.959
C-4	31.2	00:31:12	780.720	0.09	0.940	0.96	65	253	248	45			77	77	4.0	0.30	16.72	18.368	103.8	32.800
C-5	33.6	00:33:36	781.990	0.11	1.149	1.20	65	256	249	45			78	78	4.0	0.33	18.49	19.774	103.6	32.957
D-1	36.0	00:36:00	783.444	0.11	1.149	1.20	65	257	250	45			78	78	4.0	0.33	18.49	21.143	103.2	33.037
D-2	38.4	00:38:24	784.860	0.10	1.044	1.10	65	245	249	45			78	78	4.0	0.32	17.62	22.468	103.1	33.041
D-3	40.8	00:40:48	786.230	0.11	1.149	1.20	65	254	248	47			79	79	4.0	0.33	18.49	23.790	102.6	33.042
D-4	43.2	00:43:12	787.600	0.10	1.044	1.10	65	257	249	47			79	79	4.0	0.32	17.62	25.112	102.5	33.042
D-5	45.6	00:45:36	788.970	0.09	0.940	0.96	65	254	250	47			80	80	4.0	0.30	16.72	26.328	102.2	32.910
E-1	48.0	00:48:00	790.233	0.16	1.671	1.70	64	256	250	47			79	79	4.0	0.40	22.27	27.987	102.0	33.318
E-2	50.4	00:50:24	791.950	0.16	1.671	1.70	64	255	249	47			79	79	4.0	0.40	22.27	29.698	102.0	33.748
E-3	52.8	00:52:48	793.720	0.16	1.671	1.70	64	252	248	47			79	79	4.0	0.40	22.27	31.331	101.8	34.056
E-4	55.2	00:55:12	795.410	0.14	1.462	1.50	64	252	248	46			80	80	4.0	0.37	20.83	32.854	101.5	34.223
E-5	57.6	00:57:36	796.990	0.15	1.566	1.60	64	253	249	46			80	80	4.0	0.39	21.57	34.393	101.2	34.393
Last Pt	60.0	01:00:00	798.585																	
Final Val	60.0	01:00:00	798.585											**Max Vac**	4.0	**Final Values**		34.393	101.2	
Average Values				0.11		1.16	65	253	249	47			77	77		0.33	18.15			
													77							

Notes:

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/19/19
Operator	JW
Run Number	V2Pb-2

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8190	2428
Average Stack Temp	(t_s)	58.2	°F
Average Meter Temp	(t_m)	70.2	
Orifice Meter Coefficient	($\Delta H@$)	1.882	in H_2O
Square Root ΔP	($\Delta p^{1/2}{}_{avg}$)	0.33	in H_2O
Stack Moisture Content	(B_{ws})	0.39	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.57	acfm
ΔP to ΔH Isokinetic Factor	(K)	10.51	

Leak Checks		*[change]*		*[level]*		*[time]*	
Train	**Pre**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	**Post**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
Pitot	**Pre (+)**	0.00	in H_2O	5.0	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.00	in H_2O	6.0	in H_2O for	20.0	sec [≥15]
PASS	**Post (+)**	0.00	in H_2O	5.0	in H_2O for	20.0	sec [≥15]
	Post (-)	0.00	in H_2O	4.0	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	A10		
Average Nozzle Diameter	(D_{na})	0.3137	in
Suggested Nozzle Diameter	(D_{ni})	0.2336	in
Probe Number	samp-hp-0066		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0039		
Impinger Case Number	samp-bc-0015		

Pressures			
Barometric Pressure	(P_b)	29.51	in Hg
Stack Static Pressure	(P_{static})	0.01	in H_2O
Absolute Stack Pressure	(P_s)	29.51	in Hg
Absolute Meter Pressure	(P_m)	29.65	in Hg

Nozzle Measurements			**ID: A10**
Pre	0.314	0.314	0.313	**PASS**
Post	0.314	0.314	0.313	**PASS**

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Run Time			
Start	07:08	**End**	08:14

Weights	**Imp 1**	**Imp 2**	**Imp 3**	**Imp 4**	**Imp 5**	**Imp 6**	**Imp 7**	**Imp 8**
Pre	714.5	658.8	614.8	825.2				
Post	705.7	663.2	616.0	831.3				

Wash Volumes					
					ml
					ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0066	samp-hp-0066	samp-bh-0039	samp-bc-0015			samp-cp-0029		samp-cp-0029					
Traverse Point #	**Sampling Time (Θ)**	**Timer Time**	**Dry Gas Meter Reading (V_m)**	**Velocity Head (Δp)**	**Desired Orifice ΔH (ΔH_d)**	**Actual Orifice ΔH (ΔH_a)**	**Stack Temp (t_s)**	**Probe Temp (248±25°F)**	**Filter Temp (248±25°F)**	**Impinger Exit Temp (≤68°F)**	**Cond. Temp (≤--°F)**	**CPM Filter Temp (--±--°F)**	**Meter Inlet Temp (t_{mi})**	**Meter Outlet Temp (t_{mo})**	**Pump Vacuum**	**Square Root ΔP ($\Delta p^{1/2}$)**	**Local Stack Velocity (v_s)$_i$**	**Cumul. Meter Volume (V_m)$_{std}$**	**Cumul. Percent IsoKinetic (I)**	**Est-Run Meter Volume (V_m)$_{std}$**
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	798.888	0.14	1.471	1.50	59	252	250	37			58	58	3.0	0.37	20.47	1.619	102.4	40.463
A-2	2.4	00:02:24	800.500	0.12	1.261	1.30	59	249	249	37			58	58	3.0	0.35	18.96	3.114	102.3	38.923
A-3	4.8	00:04:48	801.990	0.16	1.681	1.70	59	257	248	37			58	58	3.0	0.40	21.89	4.882	103.2	40.682
A-4	7.2	00:07:12	803.750	0.14	1.471	1.50	59	256	250	37			58	58	3.0	0.37	20.47	6.518	103.3	40.740
A-5	9.6	00:09:36	805.380	0.17	1.786	1.80	59	252	249	37			58	58	3.0	0.41	22.56	8.372	104.0	41.861
B-1	12.0	00:12:00	807.225	0.14	1.471	1.50	57	257	249	39			62	62	3.0	0.37	20.43	9.892	102.7	41.215
B-2	14.4	00:14:24	808.750	0.12	1.261	1.30	57	255	250	43			64	64	3.0	0.35	18.92	11.410	102.8	40.748
B-3	16.8	00:16:48	810.280	0.08	0.841	0.84	57	252	250	43			65	65	3.0	0.28	15.45	12.616	102.6	39.426
B-4	19.2	00:19:12	811.500	0.07	0.736	0.74	57	250	249	44			68	68	3.0	0.26	14.45	13.737	102.4	38.158
B-5	21.6	00:21:36	812.640	0.13	1.366	1.40	57	255	248	44			69	69	3.0	0.36	19.69	15.288	102.4	38.220
C-1	24.0	00:24:00	814.218	0.12	1.261	1.30	58	252	252	48			71	71	3.0	0.35	18.94	16.719	102.0	37.999
C-2	26.4	00:26:24	815.680	0.08	0.841	0.84	58	255	250	48			72	72	3.0	0.28	15.46	17.930	101.9	37.353
C-3	28.8	00:28:48	816.920	0.06	0.631	0.63	58	249	248	48			73	73	3.0	0.24	13.39	19.127	102.8	36.783
C-4	31.2	00:31:12	818.150	0.07	0.736	0.74	59	251	248	48			74	74	3.0	0.26	14.48	20.070	101.9	35.840
C-5	33.6	00:33:36	819.120	0.11	1.156	1.20	59	249	248	47			75	75	3.0	0.33	18.15	21.402	101.5	35.670
D-1	36.0	00:36:00	820.491	0.11	1.156	1.20	59	255	249	46			75	75	3.0	0.33	18.15	22.790	101.3	35.610
D-2	38.4	00:38:24	821.920	0.09	0.946	0.95	59	258	247	48			76	76	3.0	0.30	16.42	24.050	101.2	35.367
D-3	40.8	00:40:48	823.220	0.09	0.946	0.95	59	253	249	48			76	76	3.0	0.30	16.42	25.319	101.2	35.166
D-4	43.2	00:43:12	824.530	0.08	0.841	0.84	58	253	250	49			77	77	3.0	0.28	15.46	26.489	101.0	34.854
D-5	45.6	00:45:36	825.740	0.15	1.576	1.60	58	252	249	49			77	77	3.0	0.39	21.17	27.997	100.6	34.996
E-1	48.0	00:48:00	827.296	0.15	1.576	1.60	58	255	248	50			77	77	3.0	0.39	21.17	29.599	100.4	35.237
E-2	50.4	00:50:24	828.950	0.16	1.681	1.70	58	252	249	50			78	78	3.0	0.40	21.87	31.253	100.3	35.515
E-3	52.8	00:52:48	830.660	0.12	1.261	1.30	58	249	251	50			78	78	3.0	0.35	18.94	32.741	100.3	35.588
E-4	55.2	00:55:12	832.200	0.09	0.946	0.95	58	251	249	50			79	79	3.0	0.30	16.40	34.003	100.3	35.420
E-5	57.6	00:57:36	833.510	0.07	0.736	0.74	58	256	248	50			79	79	3.0	0.26	14.46	35.110	100.3	35.110
Last Pt	60.0	01:00:00	834.659																	
Final Val	60.0	01:00:00	834.659											**Max Vac**	3.0	**Final Values**		35.110	100.3	
Average Values				0.11		1.20	58	253	249	45			70	70		0.33	18.17			
													70							

Notes:

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/19/19
Operator	JW
Run Number	V2Pb-3

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8290	A8877
Average Stack Temp	(t_s)	59.3	°F
Average Meter Temp	(t_m)	78.6	
Orifice Meter Coefficient	($\Delta H@$)	1.882	in H_2O
Square Root ΔP	($\Delta p^{1/2}{}_{avg}$)	0.32	in H_2O
Stack Moisture Content	(B_{ws})	1.60	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.58	acfm
ΔP to ΔH Isokinetic Factor	(K)	10.47	

Leak Checks		[change]		[level]		[time]	
Train	Pre	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	Post	0.000	ft³/min@	9.0	in Hg for	65.0	sec [≥60]
Pitot	Pre (+)	0.00	in H_2O	5.0	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.00	in H_2O	7.0	in H_2O for	20.0	sec [≥15]
PASS	Post (+)	0.00	in H_2O	6.0	in H_2O for	20.0	sec [≥15]
	Post (-)	0.00	in H_2O	6.0	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	G10		
Average Nozzle Diameter	(D_{na})	0.3120	in
Suggested Nozzle Diameter	(D_{ni})	0.2345	in
Probe Number	samp-hp-0067		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0039		
Impinger Case Number	samp-bc-0019		

Pressures			
Barometric Pressure	(P_b)	29.54	in Hg
Stack Static Pressure	(P_{static})	0.01	in H_2O
Absolute Stack Pressure	(P_s)	29.54	in Hg
Absolute Meter Pressure	(P_m)	29.68	in Hg

Nozzle Measurements			ID: G10	
Pre	0.312	0.313	0.311	PASS
Post	0.312	0.313	0.311	PASS

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Run Time			
Start	08:45	End	09:50

Weights	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6	Imp 7	Imp 8
Pre	692.9	694.3	561.2	872.1				
Post	688.1	697.7	562.5	883.8				

Wash Volumes					
					ml
					ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0067	samp-hp-0067	samp-bh-0039	samp-bc-0019			samp-cp-0029		samp-cp-0029					
Traverse Point #	Sampling Time (Θ)	Timer Time	Dry Gas Meter Reading (V_m)	Velocity Head (Δp)	Desired Orifice ΔH (ΔH_d)	Actual Orifice ΔH (ΔH_a)	Stack Temp (t_s)	Probe Temp (248±25°F)	Filter Temp (248±25°F)	Impinger Exit Temp (≤68°F)	Cond. Temp (≤--°F)	CPM Filter Temp (--±--°F)	Meter Inlet Temp (t_{mi})	Meter Outlet Temp (t_{mo})	Pump Vacuum	Square Root ΔP ($\Delta p^{1/2}$)	Local Stack Velocity (v_s)$_i$	Cumul. Meter Volume (V_m)$_{std}$	Cumul. Percent IsoKinetic (I)	Est-Run Meter Volume (V_m)$_{std}$
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	834.988	0.12	1.257	1.20	59	249	249	47			77	77	4.0	0.35	19.22	1.407	96.9	35.167
A-2	2.4	00:02:24	836.440	0.13	1.361	1.30	59	255	249	47			77	77	4.0	0.36	20.01	2.880	97.2	35.995
A-3	4.8	00:04:48	837.960	0.15	1.571	1.60	59	257	249	45			77	77	4.0	0.39	21.49	4.509	98.4	37.573
A-4	7.2	00:07:12	839.640	0.15	1.571	1.60	59	245	249	47			78	78	4.0	0.39	21.49	6.154	99.2	38.464
A-5	9.6	00:09:36	841.340	0.15	1.571	1.60	59	249	250	47			78	78	4.0	0.39	21.49	7.805	99.7	39.023
B-1	12.0	00:12:00	843.045	0.12	1.257	1.20	59	244	249	49			78	78	4.0	0.35	19.22	9.241	99.6	38.502
B-2	14.4	00:14:24	844.530	0.11	1.152	1.10	59	246	249	49			79	79	4.0	0.33	18.40	10.582	99.2	37.792
B-3	16.8	00:16:48	845.920	0.07	0.733	0.72	59	252	249	48			79	79	4.0	0.26	14.68	11.681	99.2	36.503
B-4	19.2	00:19:12	847.060	0.07	0.733	0.72	59	258	249	48			79	79	4.0	0.26	14.68	12.780	99.2	35.500
B-5	21.6	00:21:36	848.200	0.13	1.361	1.30	59	252	250	49			79	79	4.0	0.36	20.01	14.267	99.1	35.667
C-1	24.0	00:24:00	849.740	0.12	1.257	1.20	59	245	246	50			79	79	4.0	0.35	19.22	15.657	98.8	35.583
C-2	26.4	00:26:24	851.180	0.06	0.628	0.62	59	252	248	51			79	79	4.0	0.24	13.59	16.697	99.0	34.786
C-3	28.8	00:28:48	852.260	0.06	0.628	0.62	59	252	249	51			79	79	4.0	0.24	13.59	17.709	98.9	34.057
C-4	31.2	00:31:12	853.310	0.06	0.628	0.62	59	255	249	50			79	79	4.0	0.24	13.59	18.731	99.0	33.448
C-5	33.6	00:33:36	854.370	0.11	1.152	1.10	59	253	251	50			79	79	4.0	0.33	18.40	20.029	98.6	33.381
D-1	36.0	00:36:00	855.715	0.08	0.838	0.83	59	252	250	50			78	78	4.0	0.28	15.69	21.212	98.7	33.144
D-2	38.4	00:38:24	856.940	0.09	0.943	0.93	59	254	249	51			79	79	4.0	0.30	16.65	22.476	98.8	33.053
D-3	40.8	00:40:48	858.250	0.09	0.943	0.93	60	251	248	50			79	79	4.0	0.30	16.66	23.749	98.9	32.985
D-4	43.2	00:43:12	859.570	0.08	0.838	0.83	60	254	249	50			79	79	4.0	0.28	15.71	24.945	99.0	32.822
D-5	45.6	00:45:36	860.810	0.10	1.047	1.05	60	254	248	50			79	79	4.0	0.32	17.56	26.270	99.1	32.837
E-1	48.0	00:48:00	862.183	0.15	1.571	1.60	60	252	248	51			78	78	4.0	0.39	21.51	27.941	99.3	33.263
E-2	50.4	00:50:24	863.910	0.15	1.571	1.60	60	247	249	51			79	79	4.0	0.39	21.51	29.593	99.5	33.629
E-3	52.8	00:52:48	865.620	0.12	1.257	1.20	60	251	249	51			79	79	4.0	0.35	19.24	31.138	99.8	33.845
E-4	55.2	00:55:12	867.220	0.09	0.943	0.93	60	249	250	51			79	79	4.0	0.30	16.66	32.411	99.9	33.761
E-5	57.6	00:57:36	868.540	0.08	0.838	0.83	60	249	249	50			79	79	4.0	0.28	15.71	33.607	99.9	33.607
Last Pt	60.0	01:00:00	869.781																	
Final Val	60.0	01:00:00	869.781											Max Vac	4.0	Final Values		33.607	99.9	
Average Values				0.11		1.09	59	251	249	49			79	79		0.32	17.84			
													79							

Notes:

EMISSION DATA RECORDS

Vent #3 Reference Method Data

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE

Source Information	
Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room

Test Information			
Project #		amee-19-mcalester.ok-perf#1	
Operator		JW	
Date for Preliminary Run	(mm/dd/yy)	12/19/19	
Standard Temperature		68	°F
Standard Pressure		29.92	in Hg
Required Sample Vol.	indust. spec.	30	scf
Run Duration	≥ 2 min/point	60	minutes
Unit Number		Vent #3	
Base Run Number		V3Pb	
Number of Ports Available		5	
Number of Ports Used		5	
Port Inside Diameter		3.00	in
Stack Shape		Rectangular	

Test Equipment Information					
Run		**1**	**2**	**3**	
Test Date	(mm/dd/yy)	12/19/19	12/19/19	12/19/19	
Production Rate		Max	Max	Max	ton/hr
Meter Box Number	from ACS	samp-cp-0029	samp-cp-0029	samp-cp-0029	
Meter Calibration Factor	(Y)	0.995	0.995	0.995	
Orifice Meter Coefficient	($\Delta H_@$)	1.882	1.882	1.882	in H_2O
Non-Console Manometer Used		Yes	Yes	Yes	
Pitot Identification	from ACS	A8877	2428	A8877	
Pitot Tube Coefficient	(C_p)	0.8290	0.8190	0.8290	
Nozzle Number	from ACS	G12	F14	G14	
Nozzle Diameter	(D_n)	0.386	0.433	0.436	in
Probe Number	from ACS	samp-hp-0067	samp-hp-0066	samp-hp-0067	
Probe Length		60.0	60.0	60.0	in
(SS, Glass ….) Liner Material	from list	glass	glass	glass	
Sample Case / Oven Number	from ACS	samp-bh-0038	samp-bh-0038	samp-bh-0038	
Impinger Case Number	from ACS	samp-bc-0015	samp-bc-0019	samp-bc-0015	

Testing Company Information	
Company Name	Air Hygiene International, Inc. (Tulsa, Oklahoma)
Address	1600 W Tacoma Street
City, State Zip	Broken Arrow, Oklahoma 74012
Project Manager	Paul Little
Phone Number	(918) 307-8865
Fax Number	(918) 307-9131

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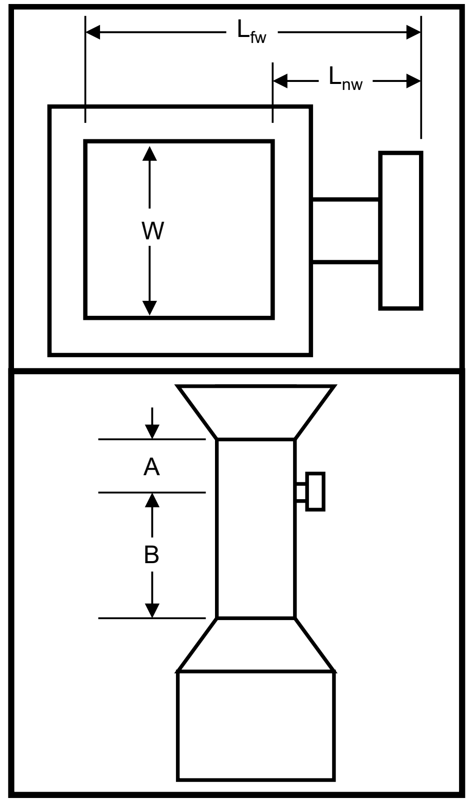
METHOD 1 - SAMPLE AND VELOCITY TRAVERSES FOR RECTANGULAR SOURCES

Plant Name	Choctaw Defense Facility	**Date**	12/19/19
Sampling Location	Centerfire Room	**Stack Type**	Rectangular
Operator	JW	**Ports Available**	5
Project #	amee-19-mcalester.ok-perf#1	**Ports Used**	5
Stack Size	Large (>24 inch diameter)	**Port ID (inches)**	3.00

Rectangular Stacks or Ducts			
Length to Far Wall of Stack	(L_{fw})	36.13	in
Length to Near Wall of Stack	(L_{nw})	0.13	in
Length of Stack	(L)	36.00	in
Width of Stack	(W)	36.00	in
Equivalent Stack Diam	(D_e)	36.00	in
Area of Stack	(A_s)	9.00	ft²



Distance from Port to Disturbances			
Distance Upstream	(A)	12.00	in
Diameters Upstream	(A_D)	0.33	diameters
Distance Downstream	(B)	44.00	in
Diameters Downstream	(B_D)	1.22	diameters

Number of Traverse Points Required			
Diameters to Flow Disturbance		**Minimum Number of Traverse Points**[1]	
Down Stream	**Up Stream**	**Particulate Points**	**Velocity Points**
2.00-4.99	0.50-1.24	25	16
5.00-5.99	1.25-1.49	20	16
6.00-6.99	1.50-1.74	16	12
7.00-7.99	1.75-1.99	12	12
>= 8.00	>=2.00	9 or 12[2]	9 or 12[2]
Upstream Spec		25	16
Downstream Spec		25	16
Traverse Pts Required		25	16

[1] Check Minimum Number of Points for the Upstream and Downstream conditions, then use the largest.

[2] 9 for Rectangular Stacks 12 to 24 inches
12 for All Stacks over 24 inches

(●) Method 1 Trav
( ) 12 Point PM Trav (M201a ONLY)
( ) Velocity

Stack does NOT meet Method 1 criteria.

Number of Traverse Points Used			
5	**Ports by**	5	**Across**
25	**Pts Used**	25	**Required**

LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS

Traverse Point Number	Percent of Stack Diameter from Inside Wall to Traverse Point — Number of Traverse Points on a Diameter: 1	2	3	4	5	6	7	8	9
1	0.500	0.250	0.167	0.125	0.100	0.083	0.071	0.063	0.056
2		0.750	0.500	0.375	0.300	0.250	0.214	0.188	0.167
3			0.833	0.625	0.500	0.417	0.357	0.313	0.278
4				0.875	0.700	0.583	0.500	0.438	0.389
5					0.900	0.750	0.643	0.563	0.500
6						0.917	0.786	0.688	0.611
7							0.929	0.813	0.722
8								0.938	0.833
9									0.944

Traverse Point Locations

Traverse Point Number	**Fraction of Stack Dimension**	**Distance from Inside Wall**	**Distance Including Reference Length**
		in	in
1	0.100	3 5/8	3 6/8
2	0.300	10 6/8	10 7/8
3	0.500	18	18 1/8
4	0.700	25 2/8	25 3/8
5	0.900	32 3/8	32 4/8
6			
7			
8			
9			

METHOD 2 - DETERMINATION OF STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant Name	Choctaw Defense Facility		
Sampling Location	Centerfire Room		
Operator	JW		
Project #	amee-19-mcalester.ok-perf#1		
Pitot Leak Check	x	**PreTest**	x **PostTest**

Preliminary Run Date	12/19/19		
Stack Type	Rectangular		
Ports Available	5		
Thermocouple ID	samp-hp-0067		
Pitot Coefficient	0.8290	**Pitot Identification**	A8877

Stack Dimensions			
Area of Stack	(A_s)	9.00	ft²
Length of Stack	(L)	36.00	in
Width of Stack	(W)	36.00	in

Pressures			
Barometric Pressure	(P_b)	29.53	in Hg
Static Pressure	(P_{static})	0.02	in H_2O
Absolute Stack Pressure	(P_s)	29.53	in Hg

Stack Gas Composition			
Composition Data:	**Estimated Composition**		
Carbon Dioxide Concentration	(%CO_2)	0.00	%vd
Oxygen Concentration	(%O_2)	20.90	%vd
Carbon Monoxide Concentration	(ppmCO)	0.00	ppmvd
Nitrogen Concentration	(%N_2)	79.10	%vd
Stack Moisture Content	(B_{ws})	1.00	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Stack Wet Molecular Weight	(M_w)	28.73	lb/lb-mole

Results			
Avg Stack Gas Velocity	(v_s)	5.40	ft/sec
Avg Stack Dry Std Flow Rate	(Q_{sd})	172,211	dscf/hr
Avg Stack Dry Std Flow Rate	(Q_{sd})	2,870	dscf/min
Avg Stack Wet Flow Rate	(Q_{aw})	2,915	acf/min
Avg Stack Wet Std Flow Rate	(Q_{sw})	173,951	ascf/hr

40 CFR 60, Method 2G, Section 8.11.1 (but applies to all Method 2 type static pressure measurements):
If a Type S probe is used for this measurement, position the probe at or between any traverse point(s) and rotate the probe until a null differential pressure reading is obtained. Disconnect the tubing from one of the pressure ports; read and record the ΔP. For pressure devices with one-directional scales, if a deflection in the positive direction is noted with the negative side disconnected, then the static pressure is positive. Likewise, if a deflection in the positive direction is noted with the positive side disconnected, then the static pressure is negative.

Stack Cross Section Schematic

Velocity Traverse Data					
Run Number	V3Pb-V1				
Run Time	11:09	**Start**	11:43	**End**	
Traverse Point	**Velocity Head** (Δp)	**Null Angle** (N_a)	**Zero Deg Pressure** ($0^o{}_a$)	**Stack Temp** (t_s)	**Local Velocity** ($v_{s(l)}$)
	in H_2O	deg	in H_2O	°F	ft/sec
A-1	0.010	0	0.00	64	5.57
A-2	0.015	0	0.00	64	6.82
A-3	0.010	0	0.00	64	5.57
A-4	0.015	0	0.00	64	6.82
A-5	0.015	0	0.00	64	6.82
B-1	0.015	0	0.00	64	6.82
B-2	0.015	0	0.00	64	6.82
B-3	0.015	0	0.00	64	6.82
B-4	0.015	0	0.00	64	6.82
B-5	0.010	0	0.00	64	5.57
C-1	0.010	0	0.00	64	5.57
C-2	0.010	0	0.00	64	5.57
C-3	0.010	0	0.00	64	5.57
C-4	0.005	0	0.00	64	3.94
C-5	0.005	0	0.00	64	3.94
D-1	0.010	0	0.00	64	5.57
D-2	0.010	0	0.00	64	5.57
D-3	0.010	0	0.00	64	5.57
D-4	0.010	0	0.00	64	5.57
D-5	0.005	0	0.00	64	3.94
E-1	0.005	0	0.00	64	3.94
E-2	0.005	0	0.00	64	3.94
E-3	0.005	0	0.00	64	3.94
E-4	0.005	0	0.00	64	3.94
E-5	0.005	0	0.00	64	3.94
Average	0.010			64	
	0.10	**= Square roots of Δp**			
Standard deviation of null angles =					

METHOD 3a - DETERMINATION OF DRY MOLECULAR WEIGHT BY ANALYZER

Plant Name	Choctaw Defense Facility	**Preliminary Run Date**	12/19/19
Sampling Location	Centerfire Room	**Operator**	JW

Gas Analysis Data

Run Number	V3Pb-1		**Date**	12/19/19	**Run Start Time**	12:01	**Run Stop Time**	13:08
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**			
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)			
hh:mm	%	%	ppm	%	lb/lb-mole			
01:07	0.0	20.9	0.0	79.1	28.84			

Gas Analysis Data

Run Number	V3Pb-2		**Date**	12/19/19	**Run Start Time**	13:47	**Run Stop Time**	14:54
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**			
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)			
hh:mm	%	%	ppm	%	lb/lb-mole			
01:07	0.0	20.9	0.0	79.1	28.84			

Gas Analysis Data

Run Number	V3Pb-3		**Date**	12/19/19	**Run Start Time**	15:11	**Run Stop Time**	16:18
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**			
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)			
hh:mm	%	%	ppm	%	lb/lb-mole			
01:07	0.0	20.9	0.0	79.1	28.84			

METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES

Plant Name	Choctaw Defense Facility	**Preliminary Run Date**	12/19/19
Sampling Location	Centerfire Room	**Operator**	JW
Project #	amee-19-mcalester.ok-perf#1	**Ports Used**	5

Scale Daily Calibration					
Scale Number	SAMP-SC-0035	**Standard**	**Result**	**Difference**	**Pass/Fail**
Date		(g)	(g)	(g)	(± 0.5 g)
Test Day 1	12/19/19	500	499.7	-0.3	Pass

Moisture Content Data								
Run Number		V3Pb-1		**Date**	12/19/19	**Start Time**	12:01	**Stop Time**	13:08
Meter Box Number		samp-cp-0029			**Meter Cal Factor**	(Y)	0.995	
Total Meter Volume		(V_m)	14.567	dcf	**Barometric Pressure**	(P_b)	29.53	in Hg
Average Stack Temp		$(t_s)_{avg}$	64	°F	**Stack Static Pressure**	(P_{static})	0.02	in H_2O
Average Meter Temp		$(t_m)_{avg}$	67	°F	**Avg Orifice Pressure**	$(\Delta H)_{avg}$	0.21	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	$(V_f),(W_f)$	706.40	667.00	614.20	889.60				
Initial Value	$(V_i),(W_i)$	706.00	666.20	614.00	886.90				
Net Value	$(V_n),(W_n)$	0.4	0.8	0.2	2.7				
Results									
Total Weight		(W_t)	4.10	g	**Water Vol Weighed**	$(V_{wsg(std)})$	0.193	scf
Std Meter Volume		$(V_{m(std)})$	14.348	dscf	**Sat. Moisture Content**	$(B_{ws(svp)})$	2.06	%
Calc Moisture Content		$(B_{ws(calc)})$	1.33	%	**Final Moisture Content**	(B_{ws})	1.33	%

Moisture Content Data								
Run Number		V3Pb-2		**Date**	12/19/19	**Start Time**	13:47	**Stop Time**	14:54
Meter Box Number		samp-cp-0029			**Meter Cal Factor**	(Y)	0.995	
Total Meter Volume		(V_m)	21.053	dcf	**Barometric Pressure**	(P_b)	29.45	in Hg
Average Stack Temp		$(t_s)_{avg}$	64	°F	**Stack Static Pressure**	(P_{static})	0.02	in H_2O
Average Meter Temp		$(t_m)_{avg}$	72	°F	**Avg Orifice Pressure**	$(\Delta H)_{avg}$	0.41	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	$(V_f),(W_f)$	698.40	693.70	562.20	887.30				
Initial Value	$(V_i),(W_i)$	699.20	692.20	562.00	883.80				
Net Value	$(V_n),(W_n)$	-0.8	1.5	0.2	3.5				
Results									
Total Weight		(W_t)	4.40	g	**Water Vol Weighed**	$(V_{wsg(std)})$	0.207	scf
Std Meter Volume		$(V_{m(std)})$	20.488	dscf	**Sat. Moisture Content**	$(B_{ws(svp)})$	2.01	%
Calc Moisture Content		$(B_{ws(calc)})$	1.00	%	**Final Moisture Content**	(B_{ws})	1.00	%

Moisture Content Data								
Run Number		V3Pb-3		**Date**	12/19/19	**Start Time**	15:11	**Stop Time**	16:18
Meter Box Number		samp-cp-0029			**Meter Cal Factor**	(Y)	0.995	
Total Meter Volume		(V_m)	19.976	dcf	**Barometric Pressure**	(P_b)	29.45	in Hg
Average Stack Temp		$(t_s)_{avg}$	63	°F	**Stack Static Pressure**	(P_{static})	0.02	in H_2O
Average Meter Temp		$(t_m)_{avg}$	73	°F	**Avg Orifice Pressure**	$(\Delta H)_{avg}$	0.38	in H_2O
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		HNO_3	HNO_3	-	Sil Gel				
Final Value	$(V_f),(W_f)$	704.60	667.80	614.60	893.10				
Initial Value	$(V_i),(W_i)$	706.80	666.90	614.30	889.60				
Net Value	$(V_n),(W_n)$	-2.2	0.9	0.3	3.5				
Results									
Total Weight		(W_t)	2.50	g	**Water Vol Weighed**	$(V_{wsg(std)})$	0.118	scf
Std Meter Volume		$(V_{m(std)})$	19.399	dscf	**Sat. Moisture Content**	$(B_{ws(svp)})$	2.00	%
Calc Moisture Content		$(B_{ws(calc)})$	0.60	%	**Final Moisture Content**	(B_{ws})	0.60	%

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/19/19
Operator	JW
Run Number	V3Pb-1

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8290	A8877
Average Stack Temp	(t_s)	64.3	°F
Average Meter Temp	(t_m)	66.7	
Orifice Meter Coefficient	$(\Delta H@)$	1.882	in H_2O
Square Root ΔP	$(\Delta p^{1/2}{}_{avg})$	0.09	in H_2O
Stack Moisture Content	(B_{ws})	1.33	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.75	acfm
ΔP to ΔH Isokinetic Factor	(K)	23.96	

Leak Checks		*[change]*		*[level]*		*[time]*	
Train	**Pre**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	**Post**	0.000	ft³/min@	9.0	in Hg for	65.0	sec [≥60]
Pitot	**Pre (+)**	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
<3.0in	**Post (+)**	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
	Post (-)	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	G12		
Average Nozzle Diameter	(D_{na})	0.3863	in
Suggested Nozzle Diameter	(D_{ni})	0.3692	in
Probe Number	samp-hp-0067		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0038		
Impinger Case Number	samp-bc-0015		

Nozzle Measurements			**ID: G12**	
Pre	0.387	0.387	0.385	**PASS**
Post	0.387	0.387	0.385	**PASS**

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Pressures			
Barometric Pressure	(P_b)	29.53	in Hg
Stack Static Pressure	(P_{static})	0.02	in H_2O
Absolute Stack Pressure	(P_s)	29.53	in Hg
Absolute Meter Pressure	(P_m)	29.67	in Hg

Run Time			
Start	12:01	**End**	13:08

Weights	**Imp 1**	**Imp 2**	**Imp 3**	**Imp 4**	**Imp 5**	**Imp 6**	**Imp 7**	**Imp 8**
Pre	706.0	666.2	614.0	886.9				
Post	706.4	667.0	614.2	889.6				

Wash Volumes					
					ml
					ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0067	samp-hp-0067	samp-bh-0038	samp-bc-0015			samp-cp-0029		samp-cp-0029					
Traverse Point #	**Sampling Time (Θ)**	**Timer Time**	**Dry Gas Meter Reading (V_m)**	**Velocity Head (Δp)**	**Desired Orifice ΔH (ΔH_d)**	**Actual Orifice ΔH (ΔH_a)**	**Stack Temp (t_s)**	**Probe Temp (248±25°F)**	**Filter Temp (248±25°F)**	**Impinger Exit Temp (≤68°F)**	**Cond. Temp (≤--°F)**	**CPM Filter Temp (--±--°F)**	**Meter Inlet Temp (t_{mi})**	**Meter Outlet Temp (t_{mo})**	**Pump Vacuum**	**Square Root ΔP ($\Delta p^{1/2}$)**	**Local Stack Velocity ($(v_s)_i$)**	**Cumul. Meter Volume ($(V_m)_{std}$)**	**Cumul. Percent IsoKinetic (I)**	**Est-Run Meter Volume ($(V_m)_{std}$)**
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	870.050	0.005	0.120	0.12	63	257	252	52			63	63	1.0	0.07	3.94	0.347	76.5	8.678
A-2	2.4	00:02:24	870.400	0.010	0.240	0.25	63	254	254	48			63	63	1.0	0.10	5.57	0.744	68.7	9.299
A-3	4.8	00:04:48	870.800	0.010	0.240	0.25	63	260	245	48			64	64	1.0	0.10	5.57	1.605	103.9	13.378
A-4	7.2	00:07:12	871.670	0.010	0.240	0.25	63	260	244	47			64	64	1.0	0.10	5.57	2.249	102.9	14.056
A-5	9.6	00:09:36	872.320	0.005	0.120	0.12	63	258	244	48			64	64	1.0	0.07	3.94	2.702	102.4	13.511
B-1	12.0	00:12:00	872.778	0.010	0.240	0.25	63	251	246	48			64	64	1.0	0.10	5.57	3.318	101.2	13.826
B-2	14.4	00:14:24	873.400	0.005	0.120	0.12	63	253	249	49			65	65	1.0	0.07	3.94	3.822	102.5	13.650
B-3	16.8	00:16:48	873.910	0.010	0.240	0.25	63	253	246	48			65	65	1.0	0.10	5.57	4.415	101.2	13.797
B-4	19.2	00:19:12	874.510	0.005	0.120	0.12	63	257	246	49			66	66	1.0	0.07	3.94	4.869	101.1	13.524
B-5	21.6	00:21:36	874.970	0.005	0.120	0.12	64	256	242	50			66	66	1.0	0.07	3.94	5.264	100.0	13.160
C-1	24.0	00:24:00	875.371	0.015	0.359	0.37	64	257	248	51			66	66	1.0	0.12	6.83	6.042	99.9	13.733
C-2	26.4	00:26:24	876.160	0.010	0.240	0.25	64	256	251	49			67	67	1.0	0.10	5.57	6.682	99.9	13.922
C-3	28.8	00:28:48	876.810	0.010	0.240	0.25	65	255	251	50			67	67	1.0	0.10	5.58	7.263	99.2	13.968
C-4	31.2	00:31:12	877.400	0.010	0.240	0.25	65	254	251	50			68	68	1.0	0.10	5.58	7.971	100.2	14.233
C-5	33.6	00:33:36	878.120	0.015	0.359	0.37	65	252	246	50			68	68	1.0	0.12	6.83	8.740	100.0	14.567
D-1	36.0	00:36:00	878.903	0.010	0.240	0.25	65	254	245	50			68	68	1.0	0.10	5.58	9.376	100.0	14.650
D-2	38.4	00:38:24	879.550	0.015	0.359	0.37	65	257	245	50			68	68	1.0	0.12	6.83	10.182	100.2	14.974
D-3	40.8	00:40:48	880.370	0.005	0.120	0.12	65	255	251	51			69	69	1.0	0.07	3.94	10.643	100.3	14.782
D-4	43.2	00:43:12	880.840	0.005	0.120	0.12	65	255	248	53			69	69	1.0	0.07	3.94	11.094	100.2	14.597
D-5	45.6	00:45:36	881.300	0.005	0.120	0.12	65	252	246	54			69	69	1.0	0.07	3.94	11.528	100.1	14.410
E-1	48.0	00:48:00	881.743	0.010	0.240	0.25	65	255	245	53			69	69	1.0	0.10	5.58	12.182	100.2	14.503
E-2	50.4	00:50:24	882.410	0.010	0.240	0.25	65	251	254	53			69	69	1.0	0.10	5.58	12.820	100.2	14.568
E-3	52.8	00:52:48	883.060	0.005	0.120	0.12	66	250	252	53			69	69	1.0	0.07	3.95	13.281	100.2	14.436
E-4	55.2	00:55:12	883.530	0.005	0.120	0.12	66	255	245	53			69	69	1.0	0.07	3.95	13.742	100.3	14.314
E-5	57.6	00:57:36	884.000	0.010	0.240	0.25	66	252	247	53			69	69	1.0	0.10	5.58	14.347	100.0	14.347
Last Pt	60.0	01:00:00	884.617																	
Final Val	60.0	01:00:00	884.617											**Max Vac**	1.0	**Final Values**		14.347	100.0	
Average Values				0.009		0.21	64	255	248	50			67	67		0.09	5.07			
													67							

Notes:

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/19/19
Operator	JW
Run Number	V3Pb-2

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8190	2428
Average Stack Temp	(t_s)	63.6	°F
Average Meter Temp	(t_m)	71.9	
Orifice Meter Coefficient	($\Delta H@$)	1.882	in H_2O
Square Root ΔP	($\Delta p^{1/2}_{avg}$)	0.10	in H_2O
Stack Moisture Content	(B_{ws})	1.00	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.24	acfm
ΔP to ΔH Isokinetic Factor	(K)	37.40	

Leak Checks		[change]		[level]		[time]	
Train	Pre	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	Post	0.000	ft³/min@	8.0	in Hg for	65.0	sec [≥60]
Pitot	Pre (+)	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
<3.0in	Post (+)	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
	Post (-)	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	F14		
Average Nozzle Diameter	(D_{na})	0.4327	in
Suggested Nozzle Diameter	(D_{ni})	0.2023	in
Probe Number	samp-hp-0066		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0038		
Impinger Case Number	samp-bc-0019		

Pressures			
Barometric Pressure	(P_b)	29.45	in Hg
Stack Static Pressure	(P_{static})	0.02	in H_2O
Absolute Stack Pressure	(P_s)	29.45	in Hg
Absolute Meter Pressure	(P_m)	29.59	in Hg

Nozzle Measurements			ID: F14	
Pre	0.432	0.433	0.433	PASS
Post	0.432	0.433	0.433	PASS

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Run Time			
Start	13:47	End	14:54

Weights	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6	Imp 7	Imp 8
Pre	699.2	692.2	562.0	883.8				
Post	698.4	693.7	562.2	887.3				

Wash Volumes					
					ml
					ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0066	samp-hp-0066	samp-bh-0038	samp-bc-0019			samp-cp-0029		samp-cp-0029					
Traverse Point #	Sampling Time (Θ)	Timer Time	Dry Gas Meter Reading (V_m)	Velocity Head (Δp)	Desired Orifice ΔH (ΔH_d)	Actual Orifice ΔH (ΔH_a)	Stack Temp (t_s)	Probe Temp (248±25°F)	Filter Temp (248±25°F)	Impinger Exit Temp (≤68°F)	Cond. Temp (≤--°F)	CPM Filter Temp (--±--°F)	Meter Inlet Temp (t_{mi})	Meter Outlet Temp (t_{mo})	Pump Vacuum	Square Root ΔP ($\Delta p^{1/2}$)	Local Stack Velocity $(v_s)_I$	Cumul. Meter Volume $(V_m)_{std}$	Cumul. Percent IsoKinetic (I)	Est-Run Meter Volume $(V_m)_{std}$
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	884.816	0.015	0.561	0.56	65	257	249	61			69	69	2.0	0.12	6.76	0.993	102.0	24.815
A-2	2.4	00:02:24	885.830	0.015	0.561	0.56	65	252	248	53			70	70	2.0	0.12	6.76	1.970	101.2	24.620
A-3	4.8	00:04:48	886.830	0.015	0.561	0.56	65	256	248	51			70	70	2.0	0.12	6.76	2.917	100.0	24.311
A-4	7.2	00:07:12	887.800	0.010	0.374	0.37	65	254	249	52			70	70	2.0	0.10	5.52	3.718	100.2	23.238
A-5	9.6	00:09:36	888.620	0.010	0.374	0.37	64	254	250	52			70	70	2.0	0.10	5.51	4.500	99.9	22.502
B-1	12.0	00:12:00	889.421	0.010	0.374	0.30	64	252	250	51			70	70	2.0	0.10	5.51	5.290	99.8	22.043
B-2	14.4	00:14:24	890.230	0.015	0.561	0.56	64	251	248	51			70	70	2.0	0.12	6.75	6.179	98.6	22.069
B-3	16.8	00:16:48	891.140	0.005	0.187	0.19	64	256	249	51			71	71	2.0	0.07	3.90	6.793	99.5	21.229
B-4	19.2	00:19:12	891.770	0.010	0.374	0.37	64	250	249	53			71	71	2.0	0.10	5.51	7.544	99.0	20.955
B-5	21.6	00:21:36	892.540	0.005	0.187	0.19	64	253	249	54			71	71	2.0	0.07	3.90	8.118	99.2	20.294
C-1	24.0	00:24:00	893.129	0.015	0.561	0.56	64	258	248	55			71	71	2.0	0.12	6.75	9.094	99.3	20.668
C-2	26.4	00:26:24	894.130	0.015	0.561	0.56	64	254	248	55			71	71	2.0	0.12	6.75	10.049	99.2	20.936
C-3	28.8	00:28:48	895.110	0.015	0.561	0.56	64	257	249	55			72	72	2.0	0.12	6.75	11.062	99.7	21.273
C-4	31.2	00:31:12	896.150	0.015	0.561	0.56	64	255	250	54			72	72	2.0	0.12	6.75	12.055	99.9	21.526
C-5	33.6	00:33:36	897.170	0.010	0.374	0.37	64	255	249	54			73	73	2.0	0.10	5.51	12.890	100.2	21.483
D-1	36.0	00:36:00	898.030	0.015	0.561	0.56	62	256	251	56			73	73	2.0	0.12	6.74	13.929	100.7	21.765
D-2	38.4	00:38:24	899.100	0.010	0.374	0.37	62	249	251	55			73	73	2.0	0.10	5.50	14.706	100.5	21.627
D-3	40.8	00:40:48	899.900	0.010	0.374	0.37	62	254	249	55			73	73	2.0	0.10	5.50	15.483	100.4	21.504
D-4	43.2	00:43:12	900.700	0.015	0.561	0.56	62	252	249	55			74	74	2.0	0.12	6.74	16.395	100.0	21.572
D-5	45.6	00:45:36	901.640	0.005	0.187	0.19	63	249	249	55			74	74	2.0	0.07	3.89	17.030	100.5	21.288
E-1	48.0	00:48:00	902.296	0.010	0.374	0.37	63	252	249	55			74	74	2.0	0.10	5.50	17.819	100.4	21.213
E-2	50.4	00:50:24	903.110	0.015	0.561	0.60	63	255	249	55			74	74	2.0	0.12	6.74	18.799	100.4	21.362
E-3	52.8	00:52:48	904.120	0.005	0.187	0.19	63	256	248	56			74	74	2.0	0.07	3.89	19.370	100.4	21.055
E-4	55.2	00:55:12	904.710	0.005	0.187	0.19	63	255	250	56			74	74	2.0	0.07	3.89	19.932	100.4	20.763
E-5	57.6	00:57:36	905.290	0.005	0.187	0.19	63	255	249	56			74	74	2.0	0.07	3.89	20.493	100.4	20.493
Last Pt	60.0	01:00:00	905.869																	
Final Val	60.0	01:00:00	905.869											Max Vac	2.0	Final Values		20.493	100.4	
Average Values				0.011		0.41	64	254	249	54			72	72		0.10	5.67			
													72							

Notes:

METHOD 12 (LEAD) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	Choctaw Defense Facility
Sampling Location	Centerfire Room
Project #	amee-19-mcalester.ok-perf#1

Date	12/19/19
Operator	JW
Run Number	V3Pb-3

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient / ID	(C_p)	0.8290	A8877
Average Stack Temp	(t_s)	63.4	°F
Average Meter Temp	(t_m)	73.0	
Orifice Meter Coefficient	($\Delta H@$)	1.882	in H_2O
Square Root ΔP	($\Delta p^{1/2}_{avg}$)	0.10	in H_2O
Stack Moisture Content	(B_{ws})	0.60	%
Stack Dry Molecular Weight	(M_d)	28.84	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.34	acfm
ΔP to ΔH Isokinetic Factor	(K)	39.87	

Leak Checks		*[change]*		*[level]*		*[time]*	
Train	**Pre**	0.000	ft³/min@	15.0	in Hg for	65.0	sec [≥60]
PASS	**Post**	0.000	ft³/min@	7.0	in Hg for	65.0	sec [≥60]
Pitot	**Pre (+)**	0.00	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
	Pre (-)	0.000	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
<3.0in	**Post (+)**	0.000	in H_2O	0.3	in H_2O for	20.0	sec [≥15]
	Post (-)	0.000	in H_2O	0.3	in H_2O for	20.0	sec [≥15]

Sampling Equipment			
Meter Box Number	samp-cp-0029		
Meter Cal Factor	(Y)	0.995	
Nozzle Number	G14		
Average Nozzle Diameter	(D_{na})	0.4360	in
Suggested Nozzle Diameter	(D_{ni})	0.2439	in
Probe Number	samp-hp-0067		in
Probe Length	60		in
Liner Material	glass		
Sample Case / Oven Number	samp-bh-0038		
Impinger Case Number	samp-bc-0015		

Nozzle Measurements		**ID: G14**	
Pre 0.437	0.435	0.436	**PASS**
Post 0.437	0.435	0.436	**PASS**

Barometer ID
SAMP-WE-0031
Scale ID
SAMP-SC-0035

Pressures			
Barometric Pressure	(P_b)	29.45	in Hg
Stack Static Pressure	(P_{static})	0.02	in H_2O
Absolute Stack Pressure	(P_s)	29.45	in Hg
Absolute Meter Pressure	(P_m)	29.59	in Hg

Run Time			
Start	15:11	**End**	16:18

Weights	**Imp 1**	**Imp 2**	**Imp 3**	**Imp 4**	**Imp 5**	**Imp 6**	**Imp 7**	**Imp 8**
Pre	706.8	666.9	614.3	889.6				
Post	704.6	667.8	614.6	893.1				

Wash Volumes					
					ml
					ml

Identification Nos.		samp-cp-0029	samp-cp-0029	samp-cp-0029			samp-hp-0067	samp-hp-0067	samp-bh-0038	samp-bc-0015			**samp-cp-0029**		samp-cp-0029					
Traverse Point #	**Sampling Time (Θ)**	**Timer Time**	**Dry Gas Meter Reading (V_m)**	**Velocity Head (Δp)**	**Desired Orifice ΔH (ΔH_d)**	**Actual Orifice ΔH (ΔH_a)**	**Stack Temp (t_s)**	**Probe Temp (248±25°F)**	**Filter Temp (248±25°F)**	**Impinger Exit Temp (≤68°F)**	**Cond. Temp (≤--°F)**	**CPM Filter Temp (--±--°F)**	**Meter Inlet Temp (t_{mi})**	**Meter Outlet Temp (t_{mo})**	**Pump Vacuum**	**Square Root ΔP ($\Delta p^{1/2}$)**	**Local Stack Velocity (v_s)$_i$**	**Cumul. Meter Volume (V_m)$_{std}$**	**Cumul. Percent IsoKinetic (I)**	**Est-Run Meter Volume (V_m)$_{std}$**
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	906.315	0.015	0.598	0.59	64	258	252	58			72	72	2.0	0.12	6.83	1.027	102.3	25.674
A-2	2.4	00:02:24	907.370	0.015	0.598	0.59	64	256	250	55			73	73	2.0	0.12	6.83	1.999	99.6	24.982
A-3	4.8	00:04:48	908.370	0.015	0.598	0.59	64	256	249	55			73	73	2.0	0.12	6.83	3.019	100.3	25.157
A-4	7.2	00:07:12	909.420	0.010	0.399	0.40	63	254	248	52			73	73	2.0	0.10	5.57	3.854	100.6	24.087
A-5	9.6	00:09:36	910.280	0.010	0.399	0.40	63	255	248	50			73	73	2.0	0.10	5.57	4.695	100.9	23.475
B-1	12.0	00:12:00	911.146	0.010	0.399	0.40	63	252	249	51			73	73	2.0	0.10	5.57	5.524	101.0	23.018
B-2	14.4	00:14:24	912.000	0.010	0.399	0.40	63	255	249	50			73	73	2.0	0.10	5.57	6.311	100.3	22.539
B-3	16.8	00:16:48	912.810	0.010	0.399	0.40	63	254	250	49			73	73	2.0	0.10	5.57	7.127	100.2	22.271
B-4	19.2	00:19:12	913.650	0.010	0.399	0.40	63	255	250	49			73	73	2.0	0.10	5.57	7.923	99.9	22.009
B-5	21.6	00:21:36	914.470	0.010	0.399	0.40	63	256	247	48			73	73	2.0	0.10	5.57	8.730	99.8	21.825
C-1	24.0	00:24:00	915.301	0.010	0.399	0.40	63	251	250	51			73	73	2.0	0.10	5.57	9.535	99.6	21.671
C-2	26.4	00:26:24	916.130	0.005	0.199	0.20	63	255	249	50			73	73	2.0	0.07	3.94	10.118	99.7	21.078
C-3	28.8	00:28:48	916.730	0.010	0.399	0.40	63	252	249	50			73	73	2.0	0.10	5.57	10.914	99.5	20.988
C-4	31.2	00:31:12	917.550	0.010	0.399	0.40	63	253	259	49			73	73	2.0	0.10	5.57	11.720	99.4	20.929
C-5	33.6	00:33:36	918.380	0.015	0.598	0.60	63	254	249	49			73	73	2.0	0.12	6.82	12.582	98.4	20.970
D-1	36.0	00:36:00	919.267	0.005	0.199	0.20	63	252	248	51			73	73	2.0	0.07	3.94	12.711	97.7	19.861
D-2	38.4	00:38:24	919.400	0.010	0.399	0.40	63	253	250	50			73	73	2.0	0.10	5.57	13.886	101.5	20.421
D-3	40.8	00:40:48	920.610	0.005	0.199	0.20	63	255	247	49			73	73	2.0	0.07	3.94	14.439	101.3	20.055
D-4	43.2	00:43:12	921.180	0.010	0.399	0.40	63	252	247	49			73	73	2.0	0.10	5.57	15.245	101.1	20.060
D-5	45.6	00:45:36	922.010	0.010	0.399	0.40	64	252	248	49			74	74	2.0	0.10	5.57	16.050	101.0	20.062
E-1	48.0	00:48:00	922.840	0.010	0.399	0.40	64	255	249	51			73	73	2.0	0.10	5.57	16.788	100.5	19.986
E-2	50.4	00:50:24	923.600	0.005	0.199	0.20	64	252	248	50			73	73	2.0	0.07	3.94	17.467	101.1	19.849
E-3	52.8	00:52:48	924.300	0.005	0.199	0.20	64	251	252	49			73	73	2.0	0.07	3.94	18.050	101.1	19.619
E-4	55.2	00:55:12	924.900	0.005	0.199	0.20	64	252	252	49			73	73	2.0	0.07	3.94	18.535	100.7	19.308
E-5	57.6	00:57:36	925.400	0.010	0.399	0.40	64	253	247	49			73	73	2.0	0.10	5.57	19.400	100.9	19.400
Last Pt	60.0	01:00:00	926.291																	
Final Val	60.0	01:00:00	926.291											**Max Vac**	2.0	**Final Values**		19.400	100.9	
Average Values				0.010		0.38	63	254	249	50			73	73		0.10	5.38			
													73							

Notes:

APPENDIX C

LABORATORY ANALYSIS

Your Project #: AMEE-19-MCALESTER.OK-PERF#1

Attention: Data Reports

Air Hygiene International Inc
1600 West Tacoma Street
Broken Arrow, OK
USA 74012

Report Date: 2020/01/08
Report #: R6029908
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B9AE876
Received: 2019/12/24, 13:11

Sample Matrix: Stack Sampling Train
Samples Received: 11

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Lead in Filter by ICPMS (M12mod) (1)	11	2020/01/07	2020/01/07	BRL SOP-00103	EPA 12 m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) EPA Method 12 Modification - The analysis for the lead was completed using ICPMS instead of flame AA.

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Your Project #: AMEE-19-MCALESTER.OK-PERF#1

Attention: Data Reports

Air Hygiene International Inc
1600 West Tacoma Street
Broken Arrow, OK
USA 74012

Report Date: 2020/01/08
Report #: R6029908
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B9AE876
Received: 2019/12/24, 13:11

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
Email: Clayton.Johnson@bvlabs.com
Phone# (905)817-5769
==
This report has been generated and distributed using a secure automated process.
BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

BV Labs Job #: B9AE876
Report Date: 2020/01/08

Air Hygiene International Inc
Client Project #: AMEE-19-MCALESTER.OK-PERF#1

EPA M12 - LEAD DETERMINATION BY ICPMS (STACK SAMPLING TRAIN)

BV Labs ID		LRI790	LRI791		LRI792	LRI792	LRI793		
Sampling Date		2019/12/17	2019/12/17		2019/12/18	2019/12/18	2019/12/18		
	UNITS	**M12- FILTER BLANKS**	**M12- HNO3 BLANK**	**RDL**	**M12- V1- R1**	**M12- V1- R1 Lab-Dup**	**M12- V1- R2**	**RDL**	**QC Batch**
Metals									
Inorganic Lead (Pb)	ug	<0.2	0.6	0.2	3.2	3.4	2.8	0.5	6526725

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

BV Labs ID		LRI794	LRI795	LRI796	LRI797	LRI798	LRI799	LRI800		
Sampling Date		2019/12/18	2019/12/18	2019/12/19	2019/12/19	2019/12/19	2019/12/19	2019/12/19		
	UNITS	**M12- V1- R3**	**M12- V2- R1**	**M12- V2- R2**	**M12- V2- R3**	**M12- V3- R1**	**M12- V3- R2**	**M12- V3- R3**	**RDL**	**QC Batch**
Metals										
Inorganic Lead (Pb)	ug	2.1	1.4	2.3	2.0	1.4	1.1	1.2	0.5	6526725

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

TEST SUMMARY

BV Labs ID: LRI790
Sample ID: M12- FILTER BLANKS
Matrix: Stack Sampling Train
Collected: 2019/12/17
Shipped:
Received: 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI791
Sample ID: M12- HNO3 BLANK
Matrix: Stack Sampling Train
Collected: 2019/12/17
Shipped:
Received: 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI792
Sample ID: M12- V1- R1
Matrix: Stack Sampling Train
Collected: 2019/12/18
Shipped:
Received: 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI792 Dup
Sample ID: M12- V1- R1
Matrix: Stack Sampling Train
Collected: 2019/12/18
Shipped:
Received: 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI793
Sample ID: M12- V1- R2
Matrix: Stack Sampling Train
Collected: 2019/12/18
Shipped:
Received: 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI794
Sample ID: M12- V1- R3
Matrix: Stack Sampling Train
Collected: 2019/12/18
Shipped:
Received: 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI795
Sample ID: M12- V2- R1
Matrix: Stack Sampling Train
Collected: 2019/12/18
Shipped:
Received: 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

TEST SUMMARY

BV Labs ID: LRI796 **Collected:** 2019/12/19
Sample ID: M12- V2- R2 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI797 **Collected:** 2019/12/19
Sample ID: M12- V2- R3 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI798 **Collected:** 2019/12/19
Sample ID: M12- V3- R1 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI799 **Collected:** 2019/12/19
Sample ID: M12- V3- R2 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

BV Labs ID: LRI800 **Collected:** 2019/12/19
Sample ID: M12- V3- R3 **Shipped:**
Matrix: Stack Sampling Train **Received:** 2019/12/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lead in Filter by ICPMS (M12mod)	ICP1	6526725	2020/01/07	2020/01/07	Nan Raykha

GENERAL COMMENTS

EPA M12 - LEAD DETERMINATION BY ICPMS (STACK SAMPLING TRAIN)

Lead in Filter by ICPMS (M12mod): Post digestion duplicate and spike were done on sample LRI792.

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
6526725	N_R	Matrix Spike(LRI792)	Inorganic Lead (Pb)	2020/01/07		104	%	75 - 125
6526725	N_R	Matrix Spike DUP(LRI792)	Inorganic Lead (Pb)	2020/01/07		101	%	75 - 125
6526725	N_R	MS/MSD RPD	Inorganic Lead (Pb)	2020/01/07	3.0		%	20
6526725	N_R	Spiked Blank	Inorganic Lead (Pb)	2020/01/07		100	%	85 - 115
6526725	N_R	Spiked Blank DUP	Inorganic Lead (Pb)	2020/01/07		96	%	85 - 115
6526725	N_R	RPD	Inorganic Lead (Pb)	2020/01/07	3.5		%	20
6526725	N_R	Method Blank	Inorganic Lead (Pb)	2020/01/07	<0.5		ug	
6526725	N_R	RPD - Sample/Sample Dup	Inorganic Lead (Pb)	2020/01/07	4.9		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

John Bowman, Supervisor, Metals Group

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
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1 of 3

B9AE876

SAMPLE DESCRIPTION AND CHAIN OF CUSTODY RECORD

Air Hygiene International, Inc.
1600 W Tacoma Street
Broken Arrow, Oklahoma 74012
(888) 461-8778
www.airhygiene.com

Project Number:	amee-19-mcalester.ok-perf#1	Laboratory Analysis Requested:	
Person Taking Samples:	Paul Little	EPA Method 12 - Lead	

Sample Number	Location	Date	Volume	Analysis Method			
				Method 12			
HNO3-Blank	Choctaw Defense Facility, Vent 1	12/17/19	As Marked	x			
Filter Blank	Choctaw Defense Facility, Vent 1	12/17/19	N/A	x			
V1-R1-Filter	Choctaw Defense Facility, Vent 1	12/18/19	N/A	x			
V1-R1-PW	Choctaw Defense Facility, Vent 1	12/18/19	As Marked	x			
V1-R1-IMPC	Choctaw Defense Facility, Vent 1	12/18/19	As Marked	x			
V1-R2-Filter	Choctaw Defense Facility, Vent 1	12/18/19	N/A	x			
V1-R2-PW	Choctaw Defense Facility, Vent 1	12/18/19	As Marked	x			
V1-R2-IMPC	Choctaw Defense Facility, Vent 1	12/18/19	As Marked	x			
V1-R3-Filter	Choctaw Defense Facility, Vent 1	12/18/19	N/A	x			
V1-R3-PW	Choctaw Defense Facility, Vent 1	12/18/19	As Marked	x			
V1-R3-IMPC	Choctaw Defense Facility, Vent 1	12/18/19	As Marked	x			

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
[signature]	12/20/19	08:45	[signature]	12/20/19	08:50
[signature]	12/20/19	13:50	FIDELE NTAMWEMEZI [signature]	2019/12/24	13:11

EE V1 COC

2 of 3

B9AE876

SAMPLE DESCRIPTION AND CHAIN OF CUSTODY RECORD

Air Hygiene International, Inc.
1600 W Tacoma Street
Broken Arrow, Oklahoma 74012
(888) 461-8778
www.airhygiene.com

Project Number:	amee-19-mcalester.ok-perf#1	Laboratory Analysis Requested:	
Person Taking Samples:	Paul Little	EPA Method 12 - Lead	

Sample Number	Location	Date	Volume	Analysis Method: Method 12			
V2-R1-Filter	Choctaw Defense Facility, Vent 2	12/18/19	N/A	x			
V2-R1-PW	Choctaw Defense Facility, Vent 2	12/18/19	As Marked	x			
V2-R1-IMPC	Choctaw Defense Facility, Vent 2	12/19/19	As Marked	x			
V2-R2-Filter	Choctaw Defense Facility, Vent 2	12/19/19	N/A	x			
V2-R2-PW	Choctaw Defense Facility, Vent 2	12/19/19	As Marked	x			
V2-R2-IMPC	Choctaw Defense Facility, Vent 2	12/19/19	As Marked	x			
V2-R3-Filter	Choctaw Defense Facility, Vent 2	12/19/19	N/A	x			
V2-R3-PW	Choctaw Defense Facility, Vent 2	12/19/19	As Marked	x			
V2-R3-IMPC	Choctaw Defense Facility, Vent 2	12/19/19	As Marked	x			

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
Paul [signature]	12/20/19	08:45	[signature]	12/24/19	08:50
[signature]	12/24/19	13:50	FIDELE NTAMWEMEZI [signature]	2019/12/24	13:11

EE V2 - COC

3 of 3

B9AE876

SAMPLE DESCRIPTION AND CHAIN OF CUSTODY RECORD

Air Hygiene International, Inc.
1600 W Tacoma Street
Broken Arrow, Oklahoma 74012
(888) 461-8778
www.airhygiene.com

Project Number:	amee-19-mcalester.ok-perf#1	Laboratory Analysis Requested:	
Person Taking Samples:	Paul Little	EPA Method 12 - Lead	

Sample Number	Location	Date	Volume	Analysis Method: Method 12			
V3-R1-Filter	Choctaw Defense Facility, Vent 3	12/19/19	N/A	x			
V3-R1-PW	Choctaw Defense Facility, Vent 3	12/19/19	As Marked	x			
V3-R1-IMPC	Choctaw Defense Facility, Vent 3	12/19/19	As Marked	x			
V3-R2-Filter	Choctaw Defense Facility, Vent 3	12/19/19	N/A	x			
V3-R2-PW	Choctaw Defense Facility, Vent 3	12/19/19	As Marked	x			
V3-R2-IMPC	Choctaw Defense Facility, Vent 3	12/19/19	As Marked	x			
V3-R3-Filter	Choctaw Defense Facility, Vent 3	12/19/19	N/A	x			
V3-R3-PW	Choctaw Defense Facility, Vent 3	12/19/19	As Marked	x			
V3-R3-IMPC	Choctaw Defense Facility, Vent 3	12/19/19	As Marked	x			

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
[signature]	12/20/19	08:45	[signature]	12/20/19	08:50
[signature]	12/24/19	13:50	FIDELE NTAMWEMEZI [signature]	2019/12/24	13:11

EE V3 - COC

APPENDIX D

QUALITY ASSURANCE AND QUALITY CONTROL DATA

QA/QC PROGRAM

AIR HYGIENE ensures the quality and validity of its emission measurement and reporting procedures through a rigorous quality assurance (QA) program. The program is developed and administered by an internal QA team and encompasses six major areas:

1. Field Qualifications
2. QA reviews of reports, laboratory work, and field testing;
3. Equipment calibration and maintenance;
4. Chain-of-custody;
5. Training; and
6. Knowledge of current test methods

Field Qualifications

Air Hygiene personnel are required to gain and maintain competence with testing methods and techniques according to their job titles and the roles they play during field testing events. Qualifications for each job description include:

Staff Technician - An entry level position with responsibility to test on the stack by performing duties that include: keep trucks and trailers stocked and clean, travel to and from job site, be the “hands of the test” on the stack; stay on a stack during the sample test, set up and tear down equipment on-site, perform maintenance on equipment in the shop and on-site.

Test Technician or Specialist - Acts as the “hands of the test” on the stack by performing duties that include: stay on a stack during the sample test, migrate to the testing trailer and learn the different analyzers and testing methods used on site, set up and tear down testing equipment on site, learn the system for testing from Testing Managers and Project Managers, travel to and from job site; including driving responsibilities under DOT requirements, follow directions of Testing Managers and Project Managers, learn the proper way to conduct on-site test of stationary stacks

Test Manager or Engineer - Directs and coordinates all aspects of a successful test by performing the following duties personally or through subordinate supervisors including: operating analyzers and consoles during testing along with QA/QC procedures, supervise set up and tear down of equipment on site, writing, reviewing, and revising final test reports, working with the client or state personnel while on the job site, managing pre-test checklists and onsite testing procedures, diagnose and repair any problems that may arise with the equipment, safely operate a man lift and drive a truck with or without a trailer, act as crew leader in the field, write protocols and reports, maintain project log of services performed on the job, verify all equipment needed for a job was loaded on the trailer. Test Managers must hold at least one QSTI certificate.

Project Manager - Directs and coordinates all aspects of a successful test by performing the following duties personally or through subordinate supervisors including: operating analyzers and consoles during testing along with QA/QC procedures, supervise set up and tear down of equipment on site, writing, reviewing, and revising final test reports, working with the client or state personnel while on the job site, managing pre-test checklists and onsite testing procedures, diagnose and repair any problems that may arise with the equipment, safely operate a man lift and drive a truck with or without a trailer, act as crew leader in the field, write protocols and reports, maintain project log of services performed on the job, verify all equipment needed for a job was loaded on the trailer. Project Managers typically hold QSTI certificates in Groups 1 through 4.

QA Reviews

Air Hygiene’s review procedure includes review of each source test report, along with laboratory and fieldwork, by the QA Team. The most important review is the one that takes place before a test program begins. The QA Team works closely with technical division personnel to prepare and review test protocols. Test protocol review includes selection of appropriate test procedures, evaluation of interferences or other restrictions that might preclude use of standard test procedures, and evaluation and/or development of alternate procedures.

Equipment Calibration and Maintenance

The equipment used to conduct the emission measurements is maintained according to the manufacturer’s instructions to ensure proper operation. In addition to the maintenance program, calibrations are carried out on each measurement device according to the schedule outlined by the Environmental Protection Agency. Quality control checks are also conducted in the field for each test program. In conformance with ASTM D7036 Section 15.3.15, all metering and monitoring equipment meets or exceeds the uncertainty criteria contained in the method language that pertains to that equipment.

Chain-of-Custody

Air Hygiene maintains full chain-of-custody documentation on all samples and data sheets. In addition to normal documentation of changes between field sample custodians, laboratory personnel, and field test personnel, Air Hygiene documents every individual who handles any test component in the field (e.g., probe wash, impinger loading and recovery, filter loading and recovery, etc.). Samples are stored in a locked area to which only Air Hygiene personnel have access. Field data sheets are secured at Air Hygiene's offices upon return from the field.

Training

Personnel's training is essential to ensure quality testing. Air Hygiene has formal and informal training programs, which include:

1. Attendance at EPA-sponsored training courses
2. Enrollment in EPA correspondence courses
3 A requirement for all technicians to read and understand Air Hygiene's QA manual
4. In-house training and QA meetings on a regular basis
5. Maintenance of training records

Knowledge of Current Test Methods

With the constant updating of standard test methods and the wide variety of emerging test procedures, it is essential that any qualified source tester keep abreast of new developments. Air Hygiene subscribes to services, which provide updates on EPA reference methods, rules, and regulations. Additionally, source test personnel regularly attend and present papers at testing and emission-related seminars and conferences. Air Hygiene personnel maintain membership in the Air and Waste Management Association and the American Industrial Hygiene Association.

Reproduction and Distribution Policy

Reproducing portions of this test report may omit critical or substantial documentation or be taken out of context and due care must be exercised in this regard. Furthermore, this test report and its associated data shall not be reproduced in full or in part without the written consent of the customer.

Data Provided by Client

Data provided by the Client is clearly identified in the report. Air Hygiene accepts data provided by the Client as accurate.

COMBUSTION TESTING QUALITY ASSURANCE ACTIVITIES

In conformance with ASTM D7036 Section 15.3.11 and 13, all testing was performed without any real or apparent errors, with the exception of those that would be listed in Section 2.0 of this report. In addition, all testing was conducted according to the approved testing protocol, test methods, Air Hygiene Quality Manual, or ASTM D7036, with the exception of specifics noted in Section 2.0 of this report. A number of quality assurance activities were undertaken before, during, and after this testing project. This section of the report combined with the documentation in Appendix C describes each of those activities.

Air Hygiene collected and reported the enclosed test data in accordance with the procedures and quality assurance activities described in this test report. Air Hygiene makes no warranty as to the suitability of the test methods. Air Hygiene also assumes no liability relating to the interpretation and use of the test data.

INSTRUMENTAL ANALYSIS
QUALITY ASSURANCE DATA

Date: December 18-19, 2019
Company: Choctaw Defense Facility
Location: McAlester, Oklahoma
Techs: PL / JW / IHM

Sample System Leak Check

Date	Sample System	Leak Rate (l/min)
December 18-19, 2019	1	0

Accredited Laboratory

A2LA has accredited

AIR HYGIENE INTERNATIONAL, INC.

Broken Arrow, OK

for technical competence in the field of

Environmental Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the A2LA *R219 – Specific Requirements – TNI Field Sampling and Measurement Organization Accreditation Program*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION
CORPORATE SEAL 1978 DISTRICT OF COLUMBIA
A2LA

Presented this 18th day of December 2019

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3796.01
Valid to August 31, 2021

For the tests to which this accreditation applies, please refer to the laboratory's Envrionmental Scope of Accreditation.

American Association for Laboratory Accreditation

Accredited Air Emission Testing Body

A2LA has accredited

AIR HYGIENE INTERNATIONAL, INC.

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

Presented this 18th day of December 2019.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3796.02
Valid to August 31, 2021

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

SOURCE EVALUATION SOCIETY

SES

Qualified Source Testing Individual

LET IT BE KNOWN THAT

PAUL R. LITTLE

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

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 2ND DAY OF SEPTEMBER 2016 AND EFFECTIVE UNTIL SEPTEMBER 1ST, 2021

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills

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

Theresa M. Lowe

Theresa Lowe, QSTI/QSTO Review Board

Bruce Randall QSTI/QSTO Review Board

CERTIFICATE NO. 2010-458

SOURCE EVALUATION SOCIETY CORPORATE SEAL 1995 NORTH CAROLINA

Daily Observations - December 18, 2019
McAlester Regional Airport Station 34.92 °N, 95.76 °W

Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precip.	Condition
12:53 AM	22 °F	19 °F	89 %	CALM	0 mph	0 mph	29.53 in	0.0 in	Fair
1:53 AM	22 °F	19 °F	89 %	CALM	0 mph	0 mph	29.52 in	0.0 in	Partly Cloudy
2:53 AM	22 °F	18 °F	85 %	SW	3 mph	0 mph	29.53 in	0.0 in	Fair
3:53 AM	23 °F	19 °F	85 %	SW	5 mph	0 mph	29.52 in	0.0 in	Fair
4:53 AM	24 °F	20 °F	84 %	SW	3 mph	0 mph	29.52 in	0.0 in	Fair
5:53 AM	24 °F	19 °F	81 %	CALM	0 mph	0 mph	29.52 in	0.0 in	Fair
6:53 AM	21 °F	18 °F	88 %	CALM	0 mph	0 mph	29.54 in	0.0 in	Fair
7:53 AM	21 °F	17 °F	85 %	CALM	0 mph	0 mph	29.55 in	0.0 in	Fair
8:53 AM	30 °F	26 °F	85 %	CALM	0 mph	0 mph	29.56 in	0.0 in	Fair
9:53 AM	38 °F	26 °F	62 %	CALM	0 mph	0 mph	29.57 in	0.0 in	Fair
10:53 AM	44 °F	25 °F	47 %	CALM	0 mph	0 mph	29.57 in	0.0 in	Fair
11:53 AM	50 °F	24 °F	36 %	VAR	3 mph	0 mph	29.55 in	0.0 in	Fair
12:53 PM	54 °F	17 °F	23 %	VAR	3 mph	0 mph	29.53 in	0.0 in	Fair
1:53 PM	57 °F	15 °F	19 %	WNW	8 mph	0 mph	29.51 in	0.0 in	Fair
2:53 PM	57 °F	15 °F	19 %	W	7 mph	0 mph	29.49 in	0.0 in	Fair
3:53 PM	57 °F	16 °F	20 %	WSW	7 mph	0 mph	29.49 in	0.0 in	Fair
4:53 PM	53 °F	18 °F	25 %	S	5 mph	0 mph	29.49 in	0.0 in	Partly Cloudy
5:53 PM	46 °F	19 °F	34 %	S	3 mph	0 mph	29.49 in	0.0 in	Fair
6:53 PM	40 °F	23 °F	51 %	CALM	0 mph	0 mph	29.50 in	0.0 in	Fair
7:53 PM	39 °F	22 °F	50 %	CALM	0 mph	0 mph	29.50 in	0.0 in	Fair
8:53 PM	38 °F	22 °F	53 %	CALM	0 mph	0 mph	29.50 in	0.0 in	Fair
9:53 PM	31 °F	23 °F	72 %	CALM	0 mph	0 mph	29.50 in	0.0 in	Fair
10:53 PM	29 °F	22 °F	75 %	SW	3 mph	0 mph	29.51 in	0.0 in	Fair
11:53 PM	36 °F	21 °F	55 %	CALM	0 mph	0 mph	29.50 in	0.0 in	Fair

Daily Observations - December 19, 2019
McAlester Regional Airport Station 34.92 °N, 95.76 °W

Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precip.	Condition
12:53 AM	36 °F	20 °F	52 %	SW	5 mph	0 mph	29.49 in	0.0 in	Fair
1:53 AM	37 °F	20 °F	50 %	SSW	6 mph	0 mph	29.50 in	0.0 in	Fair
2:53 AM	38 °F	19 °F	47 %	S	5 mph	0 mph	29.51 in	0.0 in	Fair
3:53 AM	37 °F	19 °F	48 %	S	5 mph	0 mph	29.51 in	0.0 in	Fair
4:53 AM	38 °F	19 °F	47 %	S	5 mph	0 mph	29.50 in	0.0 in	Fair
5:53 AM	39 °F	20 °F	46 %	S	3 mph	0 mph	29.50 in	0.0 in	Fair
6:53 AM	38 °F	20 °F	48 %	S	5 mph	0 mph	29.51 in	0.0 in	Fair
7:53 AM	38 °F	21 °F	51 %	S	5 mph	0 mph	29.52 in	0.0 in	Fair
8:53 AM	42 °F	23 °F	47 %	SSW	7 mph	0 mph	29.53 in	0.0 in	Fair
9:53 AM	48 °F	23 °F	37 %	SSW	8 mph	0 mph	29.53 in	0.0 in	Fair
10:53 AM	53 °F	22 °F	30 %	S	8 mph	0 mph	29.53 in	0.0 in	Partly Cloudy
11:53 AM	54 °F	20 °F	26 %	SSW	14 mph	0 mph	29.50 in	0.0 in	Fair
12:53 PM	56 °F	19 °F	24 %	SSW	16 mph	22 mph	29.47 in	0.0 in	Fair
1:53 PM	57 °F	20 °F	24 %	SSW	10 mph	17 mph	29.45 in	0.0 in	Mostly Cloudy
2:53 PM	58 °F	20 °F	23 %	S	12 mph	20 mph	29.44 in	0.0 in	Fair
3:53 PM	58 °F	19 °F	22 %	SSE	12 mph	17 mph	29.44 in	0.0 in	Fair
4:53 PM	55 °F	18 °F	23 %	VAR	6 mph	0 mph	29.44 in	0.0 in	Fair
5:53 PM	51 °F	20 °F	29 %	SSE	6 mph	0 mph	29.45 in	0.0 in	Partly Cloudy
6:53 PM	44 °F	21 °F	40 %	ESE	6 mph	0 mph	29.45 in	0.0 in	Fair
7:53 PM	44 °F	22 °F	42 %	SE	6 mph	0 mph	29.46 in	0.0 in	Fair
8:53 PM	43 °F	22 °F	43 %	SE	6 mph	0 mph	29.46 in	0.0 in	Fair
9:53 PM	41 °F	22 °F	47 %	SE	6 mph	0 mph	29.46 in	0.0 in	Fair
10:53 PM	43 °F	23 °F	45 %	SSE	6 mph	0 mph	29.47 in	0.0 in	Fair
11:53 PM	39 °F	23 °F	53 %	SSE	5 mph	0 mph	29.47 in	0.0 in	Fair

APPENDIX E

EQUIPMENT CALIBRATION RECORDS

APEX SOURCE TESTING EQUIPMENT INSTRUMENTS

Apex Instruments, Inc.
204 Technology Park Lane
Fuquay-Varina, NC 27526

S-TYPE PITOT TUBE CALIBRATION SHEET

Reference USEPA Reference Method 2 (40CFR60, App. A, Meth. 2)

PITOT SERIAL#	2428	**CALIBRATION DATE:**	20-Mar-09	
PITOT TYPE:	MPT-6-181	**BAROMETRIC PRESSURE:**	29.50	in Hg
STD. PITOT TYPE:	Ellipsoidal	**STATIC PRESSURE**	-1.6	in H_20
Cp(std):	0.990	**BLOCKAGE %:**	N/A	
CALIBRATED BY:	BC & JP	**CORRECTION FACTOR:**	1.00	

	SIDE "A" CALIBRATION			
RUN NO.	**Pstd in H_2O**	**P(s) in H2O**	**Cp(s)**	**DEVIATION Cp(s) - avg.Cp(s)**
1	0.549	0.800	0.820	0.001
2	0.546	0.799	0.818	-0.001
3	0.548	0.800	0.819	0.000
		AVERAGE	0.819	

	SIDE "B" CALIBRATION			
RUN NO.	**Pstd in H_2O**	**P(s) in H_2O**	**Cp(s)**	**DEVIATION Cp(s) - avg.Cp(s)**
1	0.547	0.801	0.818	-0.001
2	0.548	0.798	0.820	0.001
3	0.547	0.799	0.819	0.000
		AVERAGE	0.819	

OVERALL AVERAGE 0.819

ACCEPTANCE CRITERIA

AVG. ICp (A) - AVG. Cp (B)I	0.0001	**must be less than or equal to 0.01**
Standard Deviation A =	0.0009	**must be less than or equal to 0.01**
Standard Deviation B =	0.0011	**must be less than or equal to 0.01**

If each of the above criteria are met the overall avg. Cp (Side A or Side B) may be used.

I certify that the above pitot tube was tested in accordance with the US EPA Method 2 standards.
See the Code of Federal Regulations, Title 40, Pat 60, Appendix A, Method 2, Item 4.

Signature Bob Christie Date 3-20-09

Title Welding Sup.

APEX INSTRUMENTS SOURCE TESTING EQUIPMENT

Certificate of Calibration

S-Type Pitot Tube Calibration

See the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 2, Item 4.

Pitot Information

Pitot Type:	S
Pitot Serial #:	A8877
Jig ID:	APEX-WT-CAL
Blockage %:	< 2
Correction Factor:	1.00

Calibration Conditions

Bar. Pressure (in Hg):	29.93
Elevation (ft):	407
Adj. Bar. Pressure (in Hg):	29.52
Static Pressure (in H20):	-0.6
Tunnel Velocity (ft/s):	50
Tunnel Temperature (°F):	79
Humidity (%):	40

Reference Pitot Information

Std. Pitot Type	Ellipsoidal
Cp(std):	0.990
Serial #:	APEX-RP1

Side "A" Calibration

Run No.	Δ Pstd in H20	Δ Ps in H20	Cp(s)	Deviation Cp(s) - avg.Cp(s)
1	0.558	0.800	0.827	-0.001
2	0.560	0.799	0.829	0.001
3	0.560	0.803	0.827	-0.001
		"A" Average	0.827	0.001
				(must be ≤ 0.01)

Side "B" Calibration

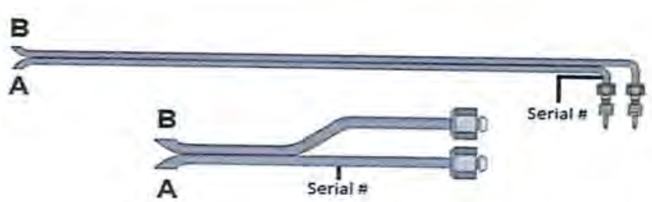
Run No.	Δ Pstd in H20	Δ Ps in H20	Cp(s)	Deviation Cp(s) - avg.Cp(s)
1	0.560	0.796	0.830	0.000
2	0.557	0.794	0.829	-0.001
3	0.558	0.792	0.831	0.001
		"B" Average	0.830	0.001
				(must be ≤ 0.01)

Average	Acceptance Criteria	Overall Avg
-0.003		0.829

AVG. Cp(A) - AVG. Cp(B) must be ≤ 0.01

If the Average and both Deviation Averages "A" & "B" are ≤ 0.01, then the OVERALL AVERAGE above may be used.

*** If NOT, use the "A" Average OR "B" Average.**



$$C_{p(s)} = C_{p(std)} \sqrt{\frac{\Delta p_{std}}{\Delta p_s}}$$

$$\text{Deviation} = C_{p(s)} - C_p(A)$$

$$\text{Avg Dev} = \sigma(A) = \frac{\sum_1^3 [C_{p(s)} - C_p(A)]}{3}$$

Technician: Bo Pritchard **Signature:** Bo P **Date:** 8/23/2019

I certify that the above pitot tube was tested in accordance with the US EPA Method 2 standards.

P:\APEX PRODUCTS NEW\P PRODUCTS\Pitot Tubes Calibration Data\~Pitot Calibration 2019\[1601 AIR HYGIENE #3.xlsx]Method 2 (A & B)

METERING SYSTEM DRY GAS METER CALIBRATION SHEET
EPA Reference Method
Metering System Pre-Test Calibration
Air Hygiene Assett ID: samp-cp-0029

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current\[SAMP-CP-0029 Calibration 4-30-19.xls]Original (5 point)

Make: apex
Model #: 522
Serial #: 1706009

Date: 04/30/19
Barometric Pressure: 29.07 (in. Hg)
Theoretical Critical Vacuum: 13.71 (in. Hg)

DRY GAS METER READINGS

ΔH	Time	Volume			Initial Temperature	
		Initial	Final	Total	Inlet	Outlet
(in. H2O)	(min)	(ft³)	(ft³)	(ft³)	(°F)	(°F)
0.34	17.00	91.550	96.880	5.330	73.0	73.0
0.68	12.00	96.880	102.320	5.440	74.0	74.0
1.10	10.00	102.320	108.350	6.030	76.0	76.0
1.90	10.00	108.350	116.170	7.820	78.0	78.0
3.50	10.00	116.170	126.920	10.750	80.0	80.0

Final Temperature		Orifice	K' Orifice	Actual	Ambient Temperature		
Inlet	Outlet	Serial#	Coefficient	Vacuum	Initial	Final	Average
(°F)	(°F)	(number)	(see above)	(in. Hg)	(°F)	(°F)	(°F)
74.0	74.0	140	0.2395	16.0	73.4	73.3	73.4
76.0	76.0	148	0.3446	16.0	73.3	73.4	73.4
78.0	78.0	155	0.4561	16.0	73.5	73.6	73.6
80.0	80.0	163	0.5897	16.0	73.6	73.5	73.6
82.0	82.0	173	0.8096	16.0	73.5	73.4	73.5

RESULTS

DRY GAS METER		ORIFICE		
VOLUME CORRECTED Vm(std) (ft³)	VOLUME CORRECTED Vm(std) (liters)	VOLUME CORRECTED Vcr(std) (ft³)	VOLUME CORRECTED Vcr(std) (liters)	VOLUME NOMINAL Vcr (ft³)
5.128	145.21	5.125	145.1	5.330
5.223	147.92	5.205	147.4	5.414
5.774	163.53	5.740	162.6	5.972
7.476	211.71	7.421	210.2	7.722
10.280	291.12	10.190	288.6	10.600

DRY GAS METER CALIBRATION FACTOR Y		ORIFICE CALIBRATION FACTOR ΔH@		
Variation (number)	Value (number)	Value (in. H2O)	Value (mm H2O)	Variation (in. H2O)
0.005	1.000	2.023	51.40	0.141
0.002	0.997	1.949	49.51	0.067
-0.001	0.994	1.794	45.57	-0.088
-0.002	0.993	1.847	46.91	-0.035
-0.004	0.991	1.798	45.67	-0.084
AVERAGE:	**0.995**	**1.882**	47.81	**PASSED**

Notes:

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter,acceptable tolerance of individual values from the average is +/- 0.02. For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H_20 that equates to 0.75 cfm of air at 68 ^oF and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/- 0.2. For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above. The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

SIGNATURE: Craig McCarty

DATE: 04/30/19 04/30/19

METERING SYSTEM THERMOCOUPLE CALIBRATION SHEET
EPA Reference Method
Metering System Pre-Test Calibration
Air Hygiene Assett ID: samp-cp-0029

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current\[SAMP-CP-0029 Calibration 4-30-19.xls]Original (5 point)

Make: apex
Model #: 522
Serial #: 1706009

Date: 04/30/19
Barometric Pressure: 29.06 (in. Hg)
Temperature (ASTM cal): 73.10 (°F)

Thermocouple	100 (°F)		600 (°F)		1200 (°F)	
	Reading	% Error	Reading	% Error	Reading	% Error
Stack	100.00	0.00	601.00	0.17	1203.00	0.25
Probe	100.00	0.00	601.00	0.17	1203.00	0.25
Filter	100.00	0.00	601.00	0.17	1203.00	0.25
Dryer	100.00	0.00	601.00	0.17	1203.00	0.25
Aux.	100.00	0.00	601.00	0.17	1203.00	0.25

Note: Calibrated against an ALTEK Thermocouple Source Series 22, ID: samp-tc-0003
Direct temperature output calibrated to ASTM and IPTS standards as outlined in ALTEK Data Sheet 22.

Thermocouple	73.10 (°F)		Responded to heating/cooling with the anticipated outcome?
	Reading	(±°F)	
DGM In	73.0	0.10	yes
DGM Out	73.0	0.10	yes

Note: Calibrated against Reference Thermometer ID: a070717

SIGNATURE: Craig McCarty

DATE: 04/30/19 04/30/19

Standard for Calibration of Console Thermocouple Systems

40 CFR, Part 60
Appendix A, Method 5
10.3.2 The temperature data recorded in the field shall be considered valid. If, during calibration, the absolute temperature measured with the sensor being calibrated and the reference sensor **agree within 1.5 percent**, the temperature data taken in the field shall be considered valid.

Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

Check the continuity of the thermocouple by subjecting it to a change in the temperature (e.g.., removing it from the stack or touching an ice cube). This step will also check for loose connections and reversed connections (noted by a wrong change in the temperature).

PROBE (STACK), HOTBOX (FILTER), AND GOOSENECK (EXIT) THERMOCOUPLE CALIBRATION SHEET
EPA Reference Method
Metering System Pre-Test Calibration

Air Hygiene Assett ID(s): **Probe:** samp-hp-0086 **Hotbox:** samp-bh-0012 **Gooseneck:** samp-ad-0028

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current\[SAMP-CP-0029 Calibration 4-30-19.xls]Original (5 point)

Barometric Pressure: 29.06

Thermo-couples		Temps (°F)	Signature		Date	
Stack	**Ref**	73.10	Craig McCarty		04/30/19	04/30/19
	Read	73.00				
	±°F	0.10				
Probe	**Ref**	73.10	Craig McCarty		04/30/19	04/30/19
	Read	73.00				
	±°F	0.10				
Filter	**Ref**	73.10	Craig McCarty		04/30/19	04/30/19
	Read	73.00				
	±°F	0.10				
Cond.	**Ref**	73.10	Craig McCarty		04/30/19	04/30/19
	Read	73.00				
	±°F	0.10				
CPM	**Ref**	73.10	Craig McCarty		04/30/19	04/30/19
	Read	73.00				
	±°F	0.10				
Exit	**Ref**	73.10	Craig McCarty		04/30/19	04/30/19
	Read	73.00				
	±°F	0.10				

Note: Calibrated against Reference Thermometer ID: a070717

Thermocouple	Responded to heating/cooling with the anticipated outcome?
Stack	yes
Probe	yes
Filter	yes
Cond.	yes
CPM	yes
Exit	yes

Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

Check the continuity of the thermocouple by subjecting it to a change in the temperature (e.g.., removing it from the stack or touching an ice cube). This step will also check for loose connections and reversed connections (noted by a wrong change in the temperature).

Alternative Post-Test Metering System Calibration
RM 5, Section 16.3.1.3

$$\gamma_{qa} = \frac{\theta}{V_m}\sqrt{\frac{0.0319T_m}{\Delta H@\left(P_{bar}+\frac{\Delta H_{avg}}{13.6}\right)}\frac{29}{M_d}}\left(\sqrt{\Delta H}\right)_{avg}$$

Parameters	Variable	Run 1	Run 2	Run 3	Units
Run Time	Θ	60.00	60.00	60.00	minutes
Actual Meter Volume	V_m	14.567	21.053	19.976	dcf
Meter Temperature	T_m	526.72	531.92	533.00	°R
Meter Pressure at 0.75 cfm	ΔH@	1.882	1.882	1.882	in. H_2O
Barometric Pressure	P_{bar}	29.53	29.45	29.45	in. Hg
Average Meter Pressure	ΔH_{avg}	0.21	0.41	0.38	in. H_2O
Dry Molecular Weight	M_d	28.84	28.84	28.84	lb/lb-mol
Average √Meter Pressure	$(\Delta H)^{1/2}{}_{avg}$	0.45	0.63	0.61	(in. $H_2O)^{1/2}$
Run Specific Gamma	Y_{aq}	1.0253	0.9913	1.0171	

Constants:
0.0319 = (29.92/528) $(0.75)^2$(in. Hg/°R) cfm^2
29 = Dry molecular weight of air, lb/lb-mole
13.6 = conversion from inches of water to inches of mercury

$Y_{aq\ (avg)}$	1.0112
Y_i	0.9950
%Diff	1.63%
Criteria	%Diff <5%
Result	**PASS**

Example Calculation (Run 1)

$$Y_{aq} = \frac{60.00}{14.567} \times \sqrt{\frac{0.0319 \times 526.72}{1.882 \times \left(29.53 + \frac{0.21}{13.6}\right)} \times \frac{29}{28.84}} \times 0.4516 = 1.0253$$

Field Balance Weight Verfication
Annual 500g Field Balance Stock Weight vs. 500g ISO 17025 Traceable Weight
Air Hygiene Asset ID: samp-sc-0035

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\Field Balance Weights\2019\[samp-sc-0035-219.xlsm]Balance
Make: Ohaus
Model #: ScoutPro SP2001
Serial #: B432902768
Field Weight #: sc--35
Trailer #: 219

ISO 17025 Weight ID LABS-WT-0005
ISO S/N 1000128090
ISO Cal Due 1/15/2019

ISO 17025 Certfified Weight (g)	Field Balance Weight (g)	± g
500.00	499.80	0.20
		must be within ±0.5g

Pranay Uc. (signature) 01/15/19 (date)

ISO 17025 Certfified Weight (g)	Field Balance Weight (g)	± g
500.00	499.80	0.20
		must be within ±0.5g

Pranay Uc. (signature) 01/15/19 (date)

ISO 17025 Certfified Weight (g)	Field Balance Weight (g)	± g
500.00	499.80	0.20
		must be within ±0.5g

Pranay Uc. (signature) 01/15/19 (date)

Note: Calibrated against ISO 17025 Certified weight LABS-WT-0005

EPA Method 4 - Section 10.3, EPA Method 5 - Section 10.7, EPA Method 202 - Section 10.3: Field Balance Calibration Check. Check the calibration of the balance used to weigh impingers with a weight that is at least 500g or within 50g of a loaded impinger. The weight must be ASTM E617-13 "Standard Specification for Laboratory Weights and Precision Mass Standards" Class 6 (or better). Daily before used, the field balance must meausure within ±0.5g of the certified mass. If the daily balance calibration check fails, perform corrective measures and repeat the check before using balance.

ISO 17025 Certified 500g Weight is certified annually. Certified weight is used to verify Class 6 or better weight that accompanies each field balance on the balance it will be used. Acceptance critieria is certified weight must be within ±0.5g of Class 6 or better weight.

WEATHER STATION CALIBRATION SHEET
Temperature, Barometric Pressure, and Relative Humidity Periodic Calibration
Air Hygiene Asset ID: SAMP-we-0031

Filename: \\AHI-FILESVR\public\Shared\QAQC\Calibrations\Weather Stations\2019\[SAMP-we-0031_219.xlsm]112013
Make: Kestrel — ISO 17025 Weather Station ID SAMP-WE-0033
Model #: 4000 — ISO 17025 S/N A026334
Serial #: 552037 — ISO 17025 Cal Due 8/3/2019

ASTM Temp (deg F) (±1.5°)	Thermo. (deg F)	± deg F	ASTM Barometer (in. Hg) (±0.1 in Hg)	Barometric (in. Hg)	± in. Hg	Time
70.10	70.00	0.10	29.34	29.31	0.03	07:50

Sean Barnes (signature) — 05/10/19 (date)

ASTM Temp (deg F) (±1.5°)	Thermo. (deg F)	± deg F	ASTM Barometer (in. Hg) (±0.1 in Hg)	Barometric (in. Hg)	± in. Hg	Time
69.90	69.70	0.20	29.34	29.33	0.01	08:07

Sean Barnes (signature) — 05/10/19 (date)

ASTM Temp (deg F) (±1.5°)	Thermo. (deg F)	± deg F	ASTM Barometer (in. Hg) (±0.1 in Hg)	Barometric (in. Hg)	± in. Hg	Time
69.50	69.60	0.10	29.35	29.33	0.02	08:39

Sean Barnes (signature) — 05/10/19 (date)

ASTM Temp (deg F) (±1.5°)	Thermo. (deg F)	± deg F	ASTM Barometer (in. Hg) (±0.1 in Hg)	Barometric (in. Hg)	± in. Hg	Time
69.50	69.30	0.20	29.35	29.33	0.02	09:06

Sean Barnes (signature) — 05/10/19 (date)

Note: Verified against ISO 17025 Traceable Barometer and Thermometer (SAMP-WE-0033).

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