Source Test Plan for 2025 Compliance Testing
Kiln Exhaust Stack
Mutual Materials
Facility ID No. 26-0088
Gresham, OR

Prepared For:

Mutual Materials
2300 SE Hogan Rd
Gresham, OR 97080

Prepared By:

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For Submission To:

Oregon Department of Environmental Quality
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Portland, OR 97232-4100

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MONTROSE AIR QUALITY SERVICES

STAC STACK TESTING ACCREDITATION COUNCIL

ACCREDITED TO ASTM D7036 ONLY CERT #3925.01

Review and Certification

I certify that, to the best of my knowledge, the information contained in this document is complete and accurate and conforms to the requirements of the Montrose Quality Management System and ASTM D7036-04.

Signature:	Austin Goracke	**Date:**	02 / 11 / 2025
Name:	Austin Goracke	**Title:**	Field Project Manager

I have reviewed, technically and editorially, details and other appropriate written materials contained herein. I hereby certify that to the best of my knowledge the presented material is authentic and accurate and conforms to the requirements of the Montrose Quality Management System and ASTM D7036-04.

Signature:	Andy Vella	**Date:**	02 / 11 / 2025
Name:	Andy Vella	**Title:**	Sr Reporting/QC Specialist

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1.0 Introduction

1.1 Summary of Test Program

Mutual Materials contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance emissions test program on the following units at the facility located in Gresham, OR: Kiln Exhaust Stack. The tests are conducted to determine concentrations and mass rates of HF, HCl, HBr, Br_2, Cl_2 and total Flourides at the Kiln Exhaust Stack in compliance with the ODEQ letter dated November 18, 2024.

The specific objectives are to:

- Measure emissions and mass rates of HF, HCl, HBr, Br2, Cl2 and total fluorides at the exhaust of the Kiln Exhaust Stack
- Collect 6 samples of brick (3 pre and 3 post kiln) and analyze for HF and total fluorides
- Conduct the test program with a focus on safety

Montrose will provide the test personnel and the necessary equipment to measure emissions as outlined in this test plan. Facility personnel will provide the process and production data to be included in the final report. A summary of the test program and proposed schedule is presented in Table 1-1.

Table 1-1
Summary of Test Program and Proposed Schedule

Proposed Test Date(s)	Unit ID/ Source Name	Activity/Parameters	Test Methods	No. of Runs	Duration (Minutes)
2/19/2025	Kiln Exhaust Stack	Traverse Points	EPA M1	--	--
		Stack Gas Velocity, Volumetric Flow Rate	EPA M2	3	60
		O_2, CO_2	EPA M3A	3	60
		H_2O	EPA M4	3	60
		HF, HCl, HBr, Br_2, Cl_2	EPA M26	3	60
		Total F	EPA M13B	3	60

To simplify this test plan, a list of Units and Abbreviations is included in Appendix A. Throughout this test plan, chemical nomenclature, acronyms, and reporting units are not defined. Please refer to the list for specific details.

1.2 Applicable Regulations and Emission Limits

The results from this test program are presented in units consistent with those listed in the applicable regulations or requirements. The reporting units and emission limits are presented in Table 1-2.

Table 1-2
Reporting Units and Emission Limits

Unit ID/ Source Name	Parameter	Reporting Units	Emission Limit	Emission Limit Reference
Kiln Exhaust Stack	Traverse Points	--	--	--
	Stack Gas Velocity, Volumetric Flow Rate	dscfm	--	--
	O_2, CO_2	%	--	--
	H_2O	%	--	--
	HF HCl HBr Br_2 Cl_2	mg/dscm ppmvd lb/hr lb emitted/ton of fired brick	-- -- -- --	-- -- -- --
	F	mg/dscm lb/hr,	-- --	-- --
	Total Fluorides (13B fluoride – HF (as F-))	mg/dscm lb/hr lb emitted/ton of fired brick	-- -- --	-- -- --

1.3 Key Personnel

A list of project participants is included below:

Facility Information

Source Location:	Mutual Materials 2300 SE Hogan Rd Gresham, OR 97080
Project Contact:	James Smith
Role:	Plant Manager
Company:	Mutual Materials
Telephone:	253-495-2719
Email:	jcsmith@mutualmaterials.com

Agency Information

Regulatory Agency:	Oregon Department of Environmental Quality
Agency Contact:	Joshua Muswieck
Telephone:	503-229-5071
Email:	joshua.muswieck@deq.oregon.gov

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC
Contact:	Austin Goracke
Title:	Field Project Manager
Telephone:	541-264-9154
Email:	agoracke@montrose-env.com

Laboratory Information

Laboratory:	Alliance Technical Group
City, State:	Tigard, OR
Lab Registration #:	OR100051
Method:	EPA M26 and EPA M13B

Laboratory:	The National Brick Research Center (Bishop Materials Laboratory)
City, State:	Anderson, SC
Lab Reference #:	12671.31498.31499
Method:	Fluoride Mass Balance

Table 1-3 details the roles and responsibilities of the test team.

Table 1-3
Test Personnel and Responsibilities

Role	Primary Assignment	Additional Responsibilities
Client Project Manager	Coordinate Project	Post-test follow up
Technician	Execute stack platform responsibilities	Preparation, support PM

2.0 Plant and Sampling Location Descriptions

2.1 Process Description, Operation, and Control Equipment

Mutual Materials owns and operates a brick and structural clay products (BSCP) manufacturing facility in Gresham, Oregon. Clay is excavated and open-air dried at the site. The dry clay is screened to ensure the correct particle size. Water is added to achieve the proper consistency. The clay is then formed, extruded, cut to brick size, and loaded into the natural gas-fired tunnel kiln. For this test event Mutual Use brick will likely be used during production. Mutual Use brick is a high production product type which typically accounts for 40-45% of Mutual Materials annual production. Additives include iron oxide and white casting clay additives. In addition, testing will be conducted without the lime flour additive. This approach is representative of worst-case operating conditions for fluoride and HF emissions.

2.2 Flue Gas Sampling Location

Actual stack measurements, number of traverse points, and location of traverse points will be evaluated in the field as part of the test program. Table 2-1 presents the anticipated stack measurements and traverse points for the sampling locations listed.

Table 2-1
Sampling Locations

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
Kiln Exhaust Stack	TBD	TBD	TBD	TBD

Sample locations are verified in the field to conform to EPA Method 1. Acceptable cyclonic flow conditions are confirmed prior to testing using EPA Method 1, Section 11.4. Appendix A presents stack schematics and process flow diagrams.

2.3 Operating Conditions and Process Data

Emission tests are performed while the source/units and air pollution control devices are operating at the conditions required by the permit. The unit is tested while operating at the normal maximum operating rates of the kiln, while using process material and fuel that generate the highest emissions for the pollutants being tested.

Plant personnel are responsible for establishing the test conditions and collecting all applicable unit-operating data. Data collected includes the following parameters:

- Kiln production rate (tons fired brick/hr)
- Product type produced
- Percent recycled brick (grog) in feedstock
- Kiln temperature(s) in Fahrenheit
- Natural gas usage (MMscf/hr)

2.4 Plant Safety

Montrose will comply with all safety requirements at the facility. The facility Client Sponsor, or designated point of contact, is responsible for ensuring routine compliance with plant entry, health, and safety requirements. The Client Sponsor has the authority to impose or waive facility restrictions. The Montrose test team leader has the authority to negotiate any deviations from the facility restrictions with the Client Sponsor. Any deviations must be documented.

2.4.1 Safety Responsibilities

Planning

- Montrose must complete a field review with the Client Sponsor prior to the project date. The purpose of the review is to develop a scope of work that identifies the conditions, equipment, methods, and physical locations that will be utilized along with any policies or procedures that will affect our work
- We must reach an agreement on the proper use of client emergency services and ensure that proper response personnel are available, as needed
- The potential for chemical exposure and actions to be taken in case of exposure must be communicated to Montrose. This information must include expected concentrations of the chemicals and the equipment used to identify the substances.
- Montrose will provide a list of equipment being brought to the site, if required by the client

Project Day

- Montrose personnel will arrive with the appropriate training and credentials for the activities they will be performing and the equipment that they will operate
- Our team will meet daily to review the Project Scope, Job Hazard Assessment, and Work Permits. The Client Sponsor and Operations Team are invited to participate.
- Montrose will provide equipment that can interface with the client utilities previously identified in the planning phase and only work with equipment that our client has made ready and prepared for connection

- We will follow client direction regarding driving safety, safe work permitting, staging of equipment, and other crafts or work in the area
- As per 40 CFR Part 60 Subpart A, Section 60.8, the facility must provide the following provisions at each sample location:
  - Sampling ports, which meet EPA minimum requirements for testing. The caps should be removed or be hand-tight.
  - Safe sampling platforms
  - Safe access to the platforms and test ports, including any scaffolding or man lifts
  - Sufficient utilities to perform all necessary testing
- Montrose will use the client communication system, as directed, in case of plant or project emergency
- Any adverse conditions, unplanned shutdowns or other deviations to the agreed scope and project plan must be reviewed with the Client Sponsor prior to continuing work. This will include any safe work permit and hazard assessment updates.

Completion

- Montrose personnel will report any process concerns, incidents or near misses to the Client Sponsor prior to leaving the site
- Montrose will clean up our work area to the same condition as it was prior to our arrival
- We will ensure that all utilities, connection points or equipment have been returned to the pre-project condition or as stated in the safe work permit. In addition, we will walk out the job completion with Operations and the Client Sponsor if required by the facility.

2.4.2 Safety Program and Requirements

Montrose has a comprehensive health and safety program that satisfies State and Federal OSHA requirements. The program includes an Illness and Injury Prevention Program, site-specific safety meetings, and training in safety awareness and procedures. The basic elements include:

- All regulatory required policies/procedures and training for OSHA, EPA, FMCSA, and MSHA
- Medical monitoring, as necessary
- Use of Personal Protective Equipment (PPE) and chemical detection equipment
- Hazard communication
- Pre-test and daily toolbox meetings
- Continued evaluation of work and potential hazards

- Near-miss and incident reporting procedures as required by Montrose and the Client

Montrose will provide standard PPE to employees. The PPE will include but is not limited to; hard hats, safety shoes, glasses with side shields or goggles, hearing protection, hand protections, and fall protection. In addition, our trailers are equipped with four gas detectors to ensure that workspace has no unexpected equipment leaks or other ambient hazards.

The detailed Site Safety Plan for this project is attached to this test plan in Appendix "S".

3.0 Sampling and Analytical Procedures

3.1 Test Methods

The test methods for this test program have been presented in Table 1-1. Additional information regarding specific applications or modifications to standard procedures is presented below.

3.1.1 EPA Method 1

Sample and Velocity Traverses for Stationary Source

EPA Method 1 is used to assure that representative measurements of volumetric flow rate are obtained by dividing the cross-section of the stack or duct into equal areas, and then locating a traverse point within each of the equal areas. Acceptable sample locations must be located at least two stack or duct equivalent diameters downstream from a flow disturbance and one-half equivalent diameter upstream from a flow disturbance.

Pertinent information regarding the performance of the method is presented below:

- No test method options or exceptions

The sample port and traverse point locations are detailed in Appendix A.

3.1.2 EPA Method 2

Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)

EPA Method 2 is used to measure the gas velocity using an S-type pitot tube connected to a pressure measurement device, and to measure the gas temperature using a calibrated thermocouple connected to a thermocouple indicator. Typically, Type S (Stausscheibe) pitot tubes conforming to the geometric specifications in the test method are used, along with an inclined manometer. The measurements are made at traverse points specified by EPA Method 1. The molecular weight of the gas stream is determined from independent measurements of O_2, CO_2, and moisture. The stack gas volumetric flow rate is calculated using the measured average velocity head, the area of the duct at the measurement plane, the measured average temperature, the measured duct static pressure, the molecular weight of the gas stream, and the measured moisture.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - S-type pitot tube coefficient is 0.84
  - Shortridge multimeter may be used to measure velocity
  - A dry molecular weight of 29.0 lb/lb-mol is utilized in flow rate calculations for processes that emit essentially air

3.1.3 EPA Method 3A

Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)

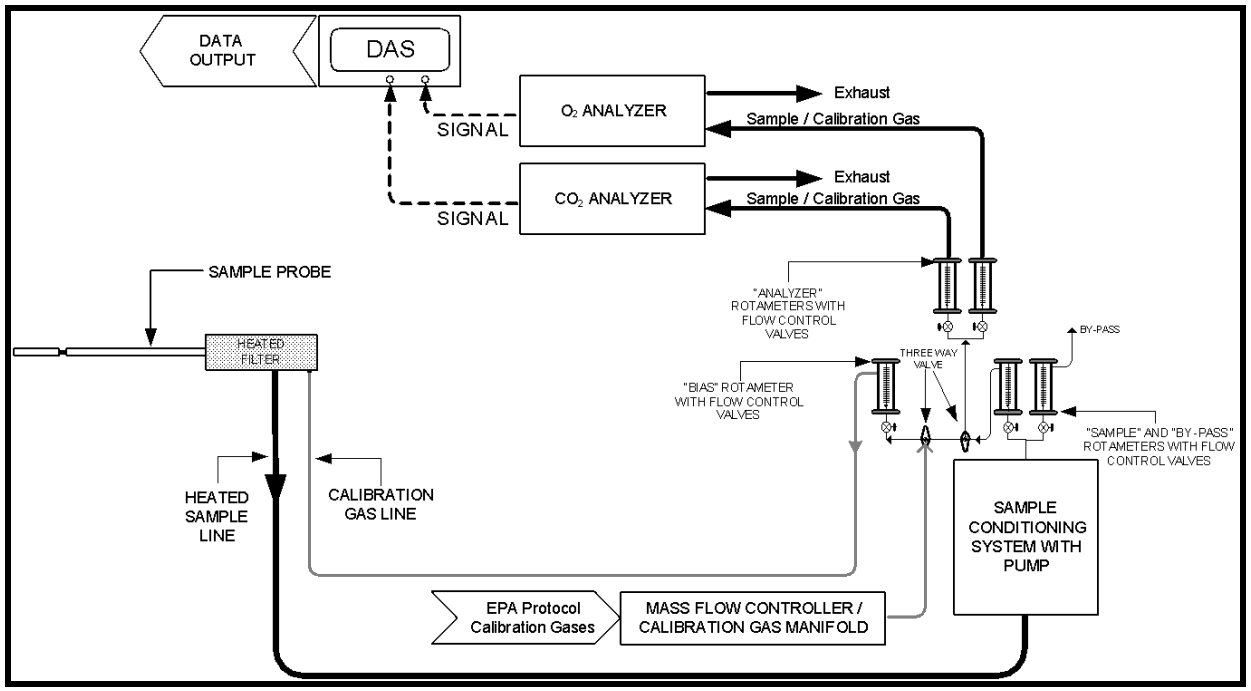
EPA Method 3A is an instrumental test method used to measure the concentration of O_2 and CO_2 in stack gas. The effluent gas is continuously or intermittently sampled and conveyed to analyzers that measure the concentration of O_2 and CO_2. The performance requirements of the method must be met to validate data.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - Single-point sampling is performed if O_2 and CO_2 measurements are for molecular weight calculations only
  - If the stratification test provisions in section 8.1.2 of Method 7E are used to reduce the number of required sampling points, the alternative acceptance criterion for three-point sampling will be ±0.5 percent CO_2 or O_2, and the alternative acceptance criterion for single-point sampling will be ±0.3 percent CO_2 or O_2. In that case single-point integrated sampling as described in section 8.2.1 of Method 3 may be used

The typical sampling system is detailed in Figure 3-1.

Figure 3-1
EPA Method 3A (O_2/CO_2) Sampling Train



3.1.4 EPA Method 4

Determination of Moisture Content in Stack Gas

EPA Method 4 is a manual, non-isokinetic method used to measure the moisture content of gas streams. Gas is sampled at a constant sampling rate through a probe and impinger train. Moisture is removed using a series of pre-weighed impingers containing methodology-specific liquids and silica gel immersed in an ice water bath. The impingers are weighed after each run to determine the percent moisture.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - Moisture sampling is performed as part of the pollutant sample trains
  - Since it is theoretically impossible for measured moisture to be higher than psychrometric moisture, the psychrometric moisture is also calculated, and the lower moisture value is used in the calculations
- Method Exceptions:
  - None

3.1.5 EPA Method 26

Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources Non-Isokinetic Method

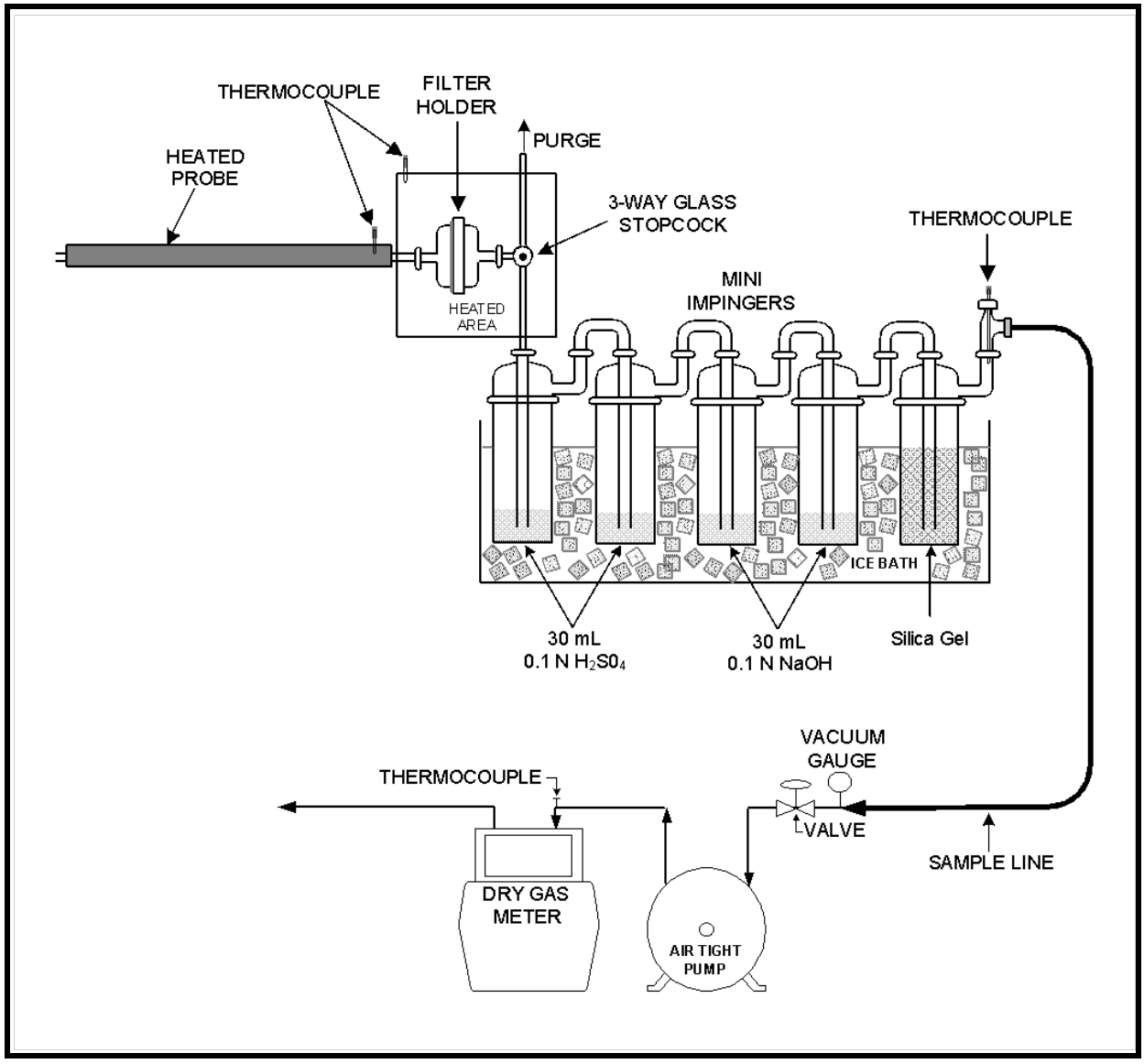
An integrated sample is extracted from the source and passed through a prepurged heated probe and filter into dilute sulfuric acid and dilute sodium hydroxide solutions which collect the gaseous hydrogen halides and halogens, respectively. The filter collects particulate matter including halide salts but is not routinely recovered and analyzed. The hydrogen halides are solubilized in the acidic solution and form chloride (Cl−), bromide (Br−), and fluoride (F−) ions. The halogens have a very low solubility in the acidic solution and pass through to the alkaline solution where they are hydrolyzed to form a proton (H+), the halide ion, and the hypohalous acid (HClO or HBrO). Sodium thiosulfate is added in excess to the alkaline solution to assure reaction with hypohalous acid to form a second halide ion such that 2 halide ions are formed for each molecule of halogen gas. The halide ions in the separate solutions are measured by ion chromatography (IC).

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - When used, the optional cyclone is inserted between the probe liner and filter holder and located in the heated filter box
  - Filterable particulate matter is not recovered
  - HF emissions by EPA Method 26 will be reported separately. HF emissions will be subtracted from Total fluoride emissions by EPA Method 13B to get a fluoride value. Fluoride = Total Fluoride – Hydrogen Fluoride

The typical sampling system is detailed in Figure 3-2.

Figure 3-2
EPA Method 26 Sampling Train



3.1.6 EPA Method 13B

Determination of Total Fluoride Emissions from Stationary Source (Specific Ion Electrode Method)

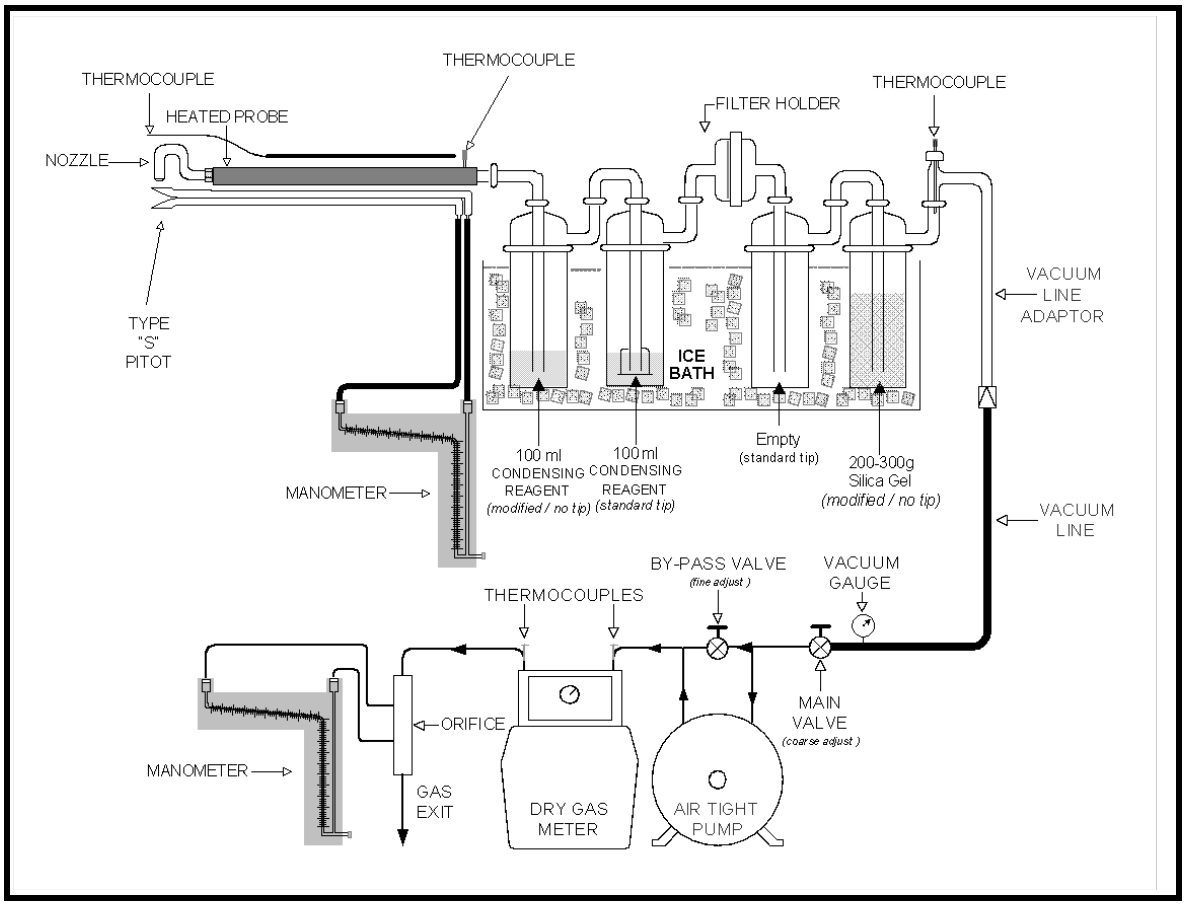
EPA Method 13B is a manual, isokinetic test method used to measure emissions of F–. Gaseous and particulate F– are withdrawn isokinetically from the source and collected in water and on a filter. The total F– is then determined by the specific ion electrode method.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - Ion Chromatography will be used for analysis
  - HF emissions by EPA Method 26 will be reported separately. HF emissions will be subtracted from Total fluoride emissions by EPA Method 13B to get a fluoride value. Fluoride = Total Fluoride – Hydrogen Fluoride

The typical sampling system is detailed in Figure 3-3.

Figure 3-3
EPA Method 13B Sampling Train



3.2 Process Test Methods

A total of 6 samples will be collected by Mutual Materials/Montrose during the test event. Three samples will consist of dried bricks (post dryer but pre kiln) which would otherwise be going into the kiln during testing. The following three samples will consist of fired brick (post kiln) which will have been in the kiln during testing. Care will be taken by Mutual Materials/Montrose to choose as representative samples as possible. Once these samples are collected, they will be sent to Bishop Materials Laboratory at Clemson University for mass balance testing. The test report will include the full lab report and will be reported in lb fluoride emitted/ton of fired brick.

4.0 Quality Assurance and Reporting

4.1 QA Audits

Montrose has instituted a rigorous QA/QC program for its air quality testing. Quality assurance audits are performed as part of the test program to ensure that the results are calculated using the highest quality data available. This program ensures that the emissions data we report are as accurate as possible. The procedures included in the cited reference methods are followed during preparation, sampling, calibration, and analysis. Montrose is responsible for preparation, calibration, and cleaning of the sampling apparatus. Montrose will also perform the sampling, sample recovery, storage, and shipping. Approved contract laboratories may perform some of the preparation and sample analyses, as needed.

4.2 Quality Control Procedures

Montrose calibrates and maintains equipment as required by the methods performed and applicable regulatory guidance. Montrose follows internal procedures to prevent the use of malfunctioning or inoperable equipment in test programs. All equipment is operated by trained personnel. Any incidence of nonconforming work encountered during testing is reported and addressed through the corrective action system.

4.2.1 Equipment Inspection and Maintenance

Each piece of field equipment that requires calibration is assigned a unique identification number to allow tracking of its calibration history. All field equipment is visually inspected prior to testing and includes pre-test calibration checks as required by the test method or regulatory agency.

4.2.2 Audit Samples

When required by the test method and available, Montrose obtains EPA TNI SSAS audit samples from an accredited provider for analysis along with the samples. Currently, the SSAS program has been suspended pending the availability of a second accredited audit sample provider. If the program is reinstated, the audit samples will be ordered. If required as part of the test program, the audit samples are stored, shipped, and analyzed along with the emissions samples collected during the test program. The audit sample results are reported along with the emissions sample results.

4.3 Data Analysis and Validation

Montrose converts the raw field, laboratory, and process data to reporting units consistent with the permit or subpart. Calculations are made using proprietary computer spreadsheets or data acquisition systems. One run of each test method is also verified using a separate example calculation. The example calculations are checked against the spreadsheet results and are included in the final report. The “Standard Conditions” for this project are 29.92 inches of mercury and 68 °F.

4.4 Sample Identification and Custody

The on-site Field Project Manager will assume or assign the role of sample and data custodian until relinquishing custody. The sample custodian will follow proper custody procedures before departing from the test site including:

- Assign the unique sample identification number to each sample
- Attach sample labels and integrity seals to all samples
- Complete COC form(s), ensuring that the sample identification numbers on the samples match the sample identification numbers on the COC
- Pack and store samples in accordance with the test method requirements in appropriate transport containers for protection from breakage, contamination, or loss
- Keep samples in a secure locked area if not in the direct presence of Montrose staff

The sample custodian will follow proper custody procedures upon arriving at the Montrose office including:

- Remove samples and COC documents from vehicles and check into designated secure sample holding areas
- Store samples requiring additional measures such as refrigeration or dry ice appropriately

4.5 Quality Statement

Montrose is qualified to conduct this test program and has established a quality management system that led to accreditation with ASTM Standard D7036-04 (Standard Practice for Competence of Air Emission Testing Bodies). Montrose participates in annual functional assessments for conformance with D7036-04 which are conducted by the American Association for Laboratory Accreditation (A2LA). All testing performed by Montrose is supervised on site by at least one Qualified Individual (QI) as defined in D7036-04 Section 8.3.2. Data quality objectives for estimating measurement uncertainty within the documented limits in the test methods are met by using approved test protocols for each project as defined in D7036-04 Sections 7.2.1 and 12.10. Additional quality assurance information is included in the appendices. The content of this test plan is modeled after the EPA Emission Measurement Center Guideline Document (GD-042).

4.6 Reporting

Montrose will prepare a final report to present the test data, calculations/equations, descriptions, and results. Prior to release by Montrose, each report is reviewed and certified by the project manager and their supervisor, or a peer. Source test reports will be submitted to the facility or appropriate regulatory agency (upon customer approval) within

60 days of the completion of the field work. The report will include a series of appendices to present copies of the intermediate calculations and example calculations, raw field data, laboratory analysis data, process data, and equipment calibration data.

4.6.1 Example Report Format

The report is divided into various sections describing the different aspects of the source testing program. Figure 4-1 presents a typical Table of Contents for the final report.

Figure 4-1
Typical Report Format

Cover Page

Certification of Report

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4.6.2 Example Presentation of Test Results

Table 4-1 presents the typical tabular format that is used to summarize the results in the final source test report. Separate tables will outline the results for each target analyte and compare them to their respective emissions limits.

Table 4-1
Example HF Emissions Results -
Kiln Exhaust Stack

Parameter/Units	Run 1	Run 2	Run 3	Average
Date	XX	XX	XX	XX
Time	XX	XX	XX	XX
Process Data				
parameter 1, units	XX	XX	XX	XX
parameter 2, units	XX	XX	XX	XX
Sampling & Flue Gas Parameters				
sample duration, minutes	XX	XX	XX	XX
O_2, % volume dry	XX	XX	XX	XX
CO_2, % volume dry	XX	XX	XX	XX
flue gas temperature, °F	XX	XX	XX	XX
moisture content, % volume	XX	XX	XX	XX
volumetric flow rate, dscfm	XX	XX	XX	XX
HF				
ppm	XX	XX	XX	XX
lb/hr	XX	XX	XX	XX
lbs/ton fired material	XX	XX	XX	XX

Appendix A
Supporting Information

Appendix A.1
Units and Abbreviations

UNITS OF MEASUREMENT

@ X% O_2	corrected to X% oxygen (corrected for dilution air)
|CC|	absolute value of the confidence coefficient
|d|	absolute value of the mean differences
°C	degrees Celsius
°F	degrees Fahrenheit
°R	degrees Rankine
" H_2O	inches of water column
13.6	specific gravity of mercury
ΔH	pressure drop across orifice meter, inches H_2O
ΔP	velocity head of stack gas, inches H_2O
θ	total sampling time, minutes
µg	microgram
ρ_a	density of acetone, mg/ml
ρ_w	density of water, 0.9982 g/ml or 0.002201 lb/ml
acfm	actual cubic feet of gas per minute at stack conditions
A_n	cross-sectional area of nozzle, ft^2
A_s	cross-sectional area of stack, square feet (ft^2)
Btu	British thermal unit
B_{ws}	proportion by volume of water vapor in gas stream
C_a	particulate matter concentration in stack gas, gr/acf
C_{Avg}	average unadjusted gas concentration, ppmv
C_{Dir}	measured concentration of calibration gas, ppmv
cf or ft^3	cubic feet
cfm	cubic feet per minute
C_{Gas}	average gas concentration adjusted for bias, ppmv
C_M	average of initial and final system bias check responses from upscale calibration gas, ppmv
cm or m^3	cubic meters
C_{MA}	actual concentration of the upscale calibration gas, ppmv
C_O	average of initial and final system bias check responses from low-level calibration gas, ppmv
C_p	pitot tube coefficient
C_s	particulate matter concentration in stack gas, gr/dscf
CS	calibration span, % or ppmv
C_S	measured concentration of calibration gas, ppmv
C_V	manufactured certified concentration of calibration gas, ppmv
D	drift assessment, % of span
dcf	dry cubic feet
dcm	dry cubic meters
D_n	diameter of nozzle, inches
D_s	diameter of stack, inches
dscf	dry standard cubic feet
dscfm	dry standard cubic feet per minute
dscm	dry standard cubic meters
F_d	F-factor, dscf/MMBtu of heat input
fpm	feet per minute
fps	feet per second
ft	feet
ft^2	square feet
g	gram
gal	gallons

gr	grains (7000 grains per pound)
gr/dscf	grains per dry standard cubic feet
hr	hour
I	percent of isokinetic sampling
in	inch
k	kilo or thousand (metric units, multiply by 10^3)
K	kelvin (temperature)
K_3	conversion factor 0.0154 gr/mg
K_4	conversion factor 0.002668 ((in. Hg)(ft^3))/((ml)(°R))
kg	kilogram
K_p	pitot tube constant (85.49 ft/sec)
kwscfh	thousand wet standard cubic feet per hour
l	liters
lb/hr	pounds per hour
lb/MMBtu	pounds per million Btu
lpm	liters per minute
m	meter or milli
M	thousand (English units) or mega (million, metric units)
m^3	cubic meters
m_a	mass of residue of acetone after evaporation, mg
M_d	molecular weight of stack gas; dry basis, lb/lb-mole
meq	milliequivalent
mg	milligram
Mg	megagram (10^6 grams)
min	minute
ml or mL	milliliter
mm	millimeter
MM	million (English units)
MMBtu/hr	million Btu per hour
m_n	total amount of particulate matter collected, mg
mol	mole
mol. wt. or MW	molecular weight
M_s	molecular weight of stack gas; wet basis, lb/lb-mole
MW	molecular weight or megawatt
n	number of data points
ng	nanogram
nm	nanometer
Nm^3	normal cubic meter
P_{bar}	barometric pressure, inches Hg
pg	picogram
P_g	stack static pressure, inches H_2O
P_m	barometric pressure of dry gas meter, inches Hg
ppb	parts per billion
ppbv	parts per billion, by volume
ppbvd	parts per billion by volume, dry basis
ppm	parts per million
ppmv	parts per million, by volume
ppmvd	parts per million by volume, dry basis
ppmvw	parts per million by volume, wet basis
P_s	absolute stack gas pressure, inches Hg
psi	pounds per square inch
psia	pounds per square inch absolute

psig	pounds per square inch gauge
P_{std}	standard absolute pressure, 29.92 inches Hg
Q_a	volumetric flow rate, actual conditions, acfm
Q_s	volumetric flow rate, standard conditions, scfm
Q_{std}	volumetric flow rate, dry standard conditions, dscfm
R	ideal gas constant 21.85 ((in. Hg) $(ft^{3)})/((°R)$ (lbmole))
SB_{final}	post-run system bias check, % of span
SB_i	pre-run system bias check, % of span
scf	standard cubic feet
scfh	standard cubic feet per hour
scfm	standard cubic feet per minute
scm	standard cubic meters
scmh	standard cubic meters per hour
sec	second
sf, sq. ft., or ft^2	square feet
std	standard
t	metric ton (1000 kg)
$T_{0.975}$	t-value
T_a	absolute average ambient temperature, ºR (+459.67 for English)
T_m	absolute average dry gas meter temperature, ºR (+459.67 for English)
ton or t	ton = 2000 pounds
tph or tons/hr	tons per hour
tpy or tons/yr	tons per year
T_s	absolute average stack gas meter temperature, ºR (+459.67 for English)
T_{std}	absolute temperature at standard conditions
V	volt
V_a	volume of acetone blank, ml
V_{aw}	volume of acetone used in wash, ml
V_{lc}	total volume H_2O collected in impingers and silica gel, grams
V_m	volume of gas sampled through dry gas meter, ft^3
$V_{m(std)}$	volume of gas measured by the dry gas meter, corrected to standard conditions, dscf
V_{ma}	stack gas volume sampled, acf
V_n	volume collected at stack conditions through nozzle, acf
V_s	average stack gas velocity, feet per second
$V_{wc(std)}$	volume of water vapor condensed, corrected to standard conditions, scf
$V_{wi(std)}$	volume of water vapor in gas sampled from impingers, scf
$V_{wsg(std)}$	volume of water vapor in gas sampled from silica gel, scf
W	watt
W_a	weight of residue in acetone wash, mg
W_{imp}	total weight of impingers, grams
W_{sg}	total weight of silica gel, grams
Y	dry gas meter calibration factor, dimensionless

ABBREVIATIONS

AAS	atomic absorption spectroscopy
ACDP	air contaminant discharge permit
ACE	analyzer calibration error, percent of span
AD	absolute difference
ADL	above detection limit
AETB	Air Emissions Testing Body
AS	applicable standard (emission limit)
ASTM	American Society for Testing and Materials
BACT	best achievable control technology
BDL	below detection limit
BHP	brake horsepower
BIF	boiler and industrial furnace
BLS	black liquor solids
CC	confidence coefficient
CD	calibration drift
CE	calibration error
CEM	continuous emissions monitor
CEMS	continuous emissions monitoring system
CERMS	continuous emissions rate monitoring system
CET	calibration error test
CFR	Code of Federal Regulations
CGA	cylinder gas audit
CHNOS	elemental analysis for determination of C, H, N, O, and S content in fuels
CNCG	concentrated non-condensable gas
CO	catalytic oxidizer
COC	chain of custody
COMS	continuous opacity monitoring system
CPM	condensable particulate matter
CPMS	continuous parameter monitoring system
CT	combustion turbine
CTM	conditional test method
CTO	catalytic thermal oxidizer
CVAAS	cold vapor atomic absorption spectroscopy
D_e	equivalent diameter
DE	destruction efficiency
Dioxins	polychlorinated dibenzo-p-dioxins (PCDDs)
DLL	detection level limited
DNCG	dilute non-condensable gas
ECD	electron capture detector
EIT	Engineer in Training
ELCD	electrolytic conductivity detector (hall detector)
EMPC	estimated maximum possible concentration
EPA	US Environmental Protection Agency
EPRI	Electric Power Research Institute
ES	emission standard (applicable limit)
ESP	electrostatic precipitator
EU	emission unit
FCCU	fluid catalytic cracking unit
FGD	flue gas desulfurization

FI	flame ionization
FIA	flame ionization analyzer
FID	flame ionization detector
FPD	flame photometric detector
FPM	filterable particulate matter
FTIR	Fourier-transform infrared spectroscopy
FTPB	field train proof blank
FTRB	field train recovery blank
Furans	polychlorinated dibenzofurans (PCDFs)
GC	gas chromatography
GC/MS	gas chromatography/mass spectroscopy
GFAAS	graphite furnace atomic absorption spectroscopy
GFC	gas filter correlation
GHG	greenhouse gas
HAP	hazardous air pollutant
HC	hydrocarbons
HHV	higher heating value
HPLC	high performance liquid chromatography
HRGC/HRMS	high-resolution gas chromatography/high-resolution mass spectroscopy
HRSG	heat recovery steam generator
IC	ion chromatography
ICAP	inductively-coupled argon plasma emission spectroscopy
ICPCR	ion chromatography with a post-column reactor
ICP-MS	inductively coupled plasma-mass spectroscopy
IR	infrared radiation
ISO	International Standards Organization
kW	kilowatts
LFG	landfill gas
LHV	lower heating value
LPG	liquified petroleum gas
MACT	maximum achievable control technology
MDI	methylene diphenyl diisocyanate
MDL	method detection limit
MNOC	maximum normal operating conditions
MRL	method reporting limit
MS	mass spectrometry
NA	not applicable or not available
NCASI	National Council for Air and Steam Improvement
NCG	non-condensable gases
ND	not detected
NDIR	non-dispersive infrared
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NG	natural gas
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NMC	non-methane cutter
NMOC	non-methane organic compounds
NMVOC	non-methane volatile organic compounds
NPD	nitrogen phosphorus detector
NSPS	New Source Performance Standards

OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl compounds
PCWP	plywood and composite wood products
PE	Professional Engineer
PFAS	per- and polyfluoroalkyl substances (PFAS)
PI	photoionization
PID	photoionization detector
PM	particulate matter
PM_{10}	particulate matter less than 10 microns in aerodynamic diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in aerodynamic diameter
POM	polycyclic organic matter
PS	performance specification
PSD	particle size distribution
PSEL	plant site emission limits
PST	performance specification test
PTE	permanent total enclosure
PTM	performance test method
QA/QC	quality assurance and quality control
QI	Qualified Individual
QSTI	Qualified Source Testing Individual
RA	relative accuracy
RAA	relative accuracy audit
RACT	reasonably available control technology
RATA	relative accuracy test audit
RCTO	rotary concentrator thermal oxidizer
RICE	stationary reciprocating internal combustion engine
RM	reference method
RTO	regenerative thermal oxidizer
SAM	sulfuric acid mist
SCD	sulfur chemiluminescent detector
SCR	selective catalytic reduction system
SD	standard deviation
Semi-VOST	semi-volatile organic compounds sample train
SRM	standard reference material
TAP	toxic air pollutant
TBD	to be determined
TCA	thermal conductivity analyzer
TCD	thermal conductivity detector
TGNENMOC	total gaseous non-ethane non-methane organic compounds
TGNMOC	total gaseous non-methane organic compounds
TGOC	total gaseous organic compounds
THC	total hydrocarbons
TIC	tentatively identified compound
TO	thermal oxidizer
TO	toxic organic (as in EPA Method TO-15)
TPM	total particulate matter
TSP	total suspended particulate matter
TTE	temporary total enclosure
ULSD	ultra-low sulfur diesel

UV	ultraviolet radiation range
VE	visible emissions
VOC	volatile organic compounds
VOST	volatile organic sample train
WC	water column
WWTP	waste water treatment plant

CHEMICAL NOMENCLATURE

Ag	silver
As	arsenic
Ba	barium
Be	beryllium
C	carbon
Cd	cadmium
CdS	cadmium sulfide
CH_2O	formaldehyde
CH_3CHO	acetaldehyde
CH_3OH	methanol
CH_4	methane
C_2H_4O	ethylene oxide
C_2H_6	ethane
C_3H_4O	acrolein
C_3H_6O	propionaldehyde
C_3H_8	propane
C_6H_5OH	phenol
Cl_2	chlorine
ClO_2	chlorine dioxide
CO	carbon monoxide
Co	cobalt
CO_2	carbon dioxide
Cr	chromium
Cu	copper
EtO	ethylene oxide
EtOH	ethyl alcohol (ethanol)
H_2	hydrogen
H_2O	water
H_2O_2	hydrogen peroxide
H_2S	hydrogen sulfide
H_2SO_4	sulfuric acid
HCl	hydrogen chloride
Hg	mercury
IPA	isopropyl alcohol
MDI	methylene diphenyl diisocyanate
$MeCl_2$	methylene chloride
MEK	methyl ethyl ketone
MeOH	methanol
Mn	manganese
N_2	nitrogen
NH_3	ammonia
Ni	nickel
NO	nitric oxide
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
O_2	oxygen
P	phosphorus
Pb	lead
PCDD	polychlorinated dibenzo-p-dioxins
PCDF	polychlorinated dibenzofurans
Sb	antimony
SO_2	sulfur dioxide
SO_3	sulfur trioxide
SO_x	sulfur oxides
TCDD	tetrachlorodibenzodioxin
TCDF	tetrachlorodibenzofuran
TGOC	total gaseous organic concentration
THC	total hydrocarbons
Tl	thallium
TRS	total reduced sulfur compounds
Zn	zinc

Appendix A.2
Accreditation Information/Certifications

STAC STACK TESTING ACCREDITATION COUNCIL A2LA American Association for Laboratory Accreditation

Accredited Air Emission Testing Body

A2LA has accredited

MONTROSE AIR QUALITY SERVICES

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 27th day of February 2024.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3925.01
Valid to February 28, 2026

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

Appendix "S"
Field Work Safety Plan

SITE SAFETY PLAN BOOKLET

Project: _____

Customer: _____

Location: _____

Units: _____

Client Project Manager: _____

Revision Date: June 29th, 2023

Site Safety Plan and JHA Purpose and Instructions

Purpose

Employee safety is the top priority of Montrose Environmental Group. All employees must be trained to assess and mitigate hazards. The District Manager and Project Manager are responsible to ensure all hazards have been properly identified and managed. All employees have Stop Work Authority in all situations where an employee feels they or their co-worker cannot perform a job safely or if there is a task for which they have not been adequately trained.

The Site Safety Plan (SSP) has been developed to help assist Montrose test crews with identifying physical and health hazards and determining how the hazards will be managed. Additionally, the SSP will help each crew manage the safety of the employees by providing emergency procedures and information. The booklet contains a several safety forms that may be required in the field.

Instructions

The SSP consists of the following:

1. A Pre-Mobilization Test Plan – To be completed in it's entirety by the client project Manager prior to the test.

2. A Job Hazard Analysis is a standardized, two-page, fillable form that is used to evaluated the task/site's particular hazards and controls. The form also includes a daily toolbox topic and daily hazard review with sign off by the team. The client Project Manager is responsible to complete the JHA form through section 8. Upon arrival at the test site, the team will review the form for accuracy, making any corrections required and complete the remainder of the JHA. Section 9 will require at least three tasks, hazards and controls be identified for the project. Each team member has the option to discuss making changes or adding to the JHA and must sign on the Job Hazard Analysis form in agreement and sign in Section 10. The JHA is to be modified when conditions change. A toolbox meeting with a daily topic in addition to a review of the hazard analysis is required daily for the duration of the test. An additional sheet of paper with the toolbox topic and signatures can be added to the SSP packet.

3. Hazard Control Matrix - contains useful information on both engineering and administrative controls that a crew can use to reduce or eliminate the hazards they have observed plus applicable PPE that may be required.

4. Emergency Action Plan - The Job Supervisor/ Client Project Manager (CPM) will complete the Emergency Action Plan form and ensure that all employees are familiar with the facility emergency and evacuation procedures, assembly/ rally points, alert systems, and signals prior to work commencing. In the event of an emergency situation/ evacuation, the Job Supervisor/ CPM will maintain a roster and be responsible for accounting for all employees. The Job Supervisor/ CPM will ensure that this Emergency Action Plan Form is completed, communicated to all employees, signed, and posted.

5. Additional Forms, as applicable

   a. MEWP Lift Inspection Form

   b. Heat Stress Prevention Form Based on Heat Index

   c. Extended Hours Form

Site Safety Plan and JHA Purpose and Instructions

The SSP is a living document. The Project Manager should continually update their SSPs as new information and conditions change or if new hazards are presented.

Each completed SSP should be maintained with the Test Plan in the office for a period of 3 years. There will be an audit process developed for the Site Safety Plans.

PRE-MOBILIZATION TEST INFORMATION

PROJECT NAME/LOCATION: _____ PROJECT #: _____

TEST DATE: _____ PROJECT MANAGER: _____

TEST SCOPE: _____

SITE CONTACT: Name: _____ Contact Phone: _____

Source Type: New Source: ____ Revisit: ____ Prj#/Date/Tech: _____

Coal Fired Electric Utility: ____ Ethanol Plant: ____ Chemical Mfg. of _____

Cement/Lime Kiln Plant: ____ Specialty Mfg. of: _____ Other: _____

Anticipated Effluent Composition – check all that apply and fill in expected concentration in ppm/%

☐ CO ☐ NO_X ☐ SO_2 ☐ VOC ☐ other

If other, explain: _____

Flammable: _____ **Toxic:** _____ **Corrosive:** _____ **Dust:** _____

Engineering Controls to be Implemented:

_____

_____

Additional Safety Equipment Required:

Personal gas monitors: ____

Respiratory Protection:

Half Face____ Full Face____ HEPA Filters____ Supplied Air: _____ (Safety Dept. Approval)

Approximate Flue Gas Temperatures, (F)

☐ below 210 ☐ 210 to 450 ☐ 450 to 950 ☐ above 950 ☐ other

If other, explain: _____

Approximate Duct Pressure, (iwg):

☐ below -3 ☐ -3 to +3 ☐ +3 to +7 ☐ above +7 ☐ other

If other, explain: _____

AQS-FRM-1.17

PRE-MOBILIZATION TEST INFORMATION

Sampling Location: **Stack Port ____** **Duct Port ____**

Approximate Sampling Platform Height, (ft)

☐ below 6 ☐ 6 to 50 ☐ 50 to 100 ☐ above 100 ☐ other

If other, explain: _____

Access and Protection:

Elevators: ____ Ladders: ____ MEWP Lift: ____ Scaffold: ____ Equipment Hoist: ____

Guardrails: ____ Toe plate: ____ Engineered Tie Off Points: ____ Heat Shield: ____

Other:_____

Describe how equipment will be mobilized to the sampling location:

_____

_____

Additional Information:

_____

_____

Effluent Chemical Regulatory Limits

Gas Name	Chemical Formula	Cal OSHA PEL[1] (ppm)	Cal OSHA STEL[2] (ppm)	NIOSH REL TWA[3] (ppm)	Cal OSHA Ceiling (ppm)	IDLH[4] (ppm)
Carbon Monoxide	CO	25	200	35	200	1,200
Nitric Oxide	NO_x	25	ND[5]	25	ND	100
Sulfur Dioxide	SO_2	2	5	2	ND	100
Hydrogen Chloride	HCl	0.3	2	ND	2	50
Hydrogen Sulfide	H_2S	10	15	10 (10 min.)[C]	50	100

California Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) based on an 8-hour shift;
2: Cal OSHA Short-term Exposure Limit (STEL) based on a 15-minute period;
3: National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) Time-weighted Average (TWA) based on an 8-hour shift;
4: Immediately Dangerous to Life or Health (IDLH);
5: Not Defined (ND);
C: Ceiling Limit - Maximum allowable human exposure limit for an airborne or gaseous substance, which is not to be exceeded, even momentarily.

Prepared by: _____ Date: _____

Reviewed by: _____ Date: _____

1.

Client		Contact Name		Date	
Facility		SSP Writer		PM	
Client Rep					

Job Preparation

☐ Job Site Walk Through Completed ☐ Site Specific Training Complete

☐ Safe Work Permit Received from Client

All hazards and mitigation steps must be documented. If this JHA does not cover all the hazards identified, use Section 9 to document that information.

If the heat index is expected to be above 91°, fill out the Heat Stress Prevention Form.

2. **Facility Information/Emergency Preparedness**

If non-emergency medical attention is needed, call: AXIOM #: 877-502-9466.

Plant Emergency # _____ Certified First Aid Person: _____

EMS Location Evacuation Routes Rally Point

Severe Weather Shelter Location Eye Wash & Safety Shower Location

Operational: ☐ Yes ☐ No

Source Information: (list type): _____

Stack Gas Temp. (^{o}F) _____ Stack Gas Press. ("H_2O) _____ Stack Gas Components: _____

Stack Gas Inhalation Potential? ☐ Yes ☐ No If yes, see List of Hazard Chemicals.

3. **Error Risk**

☐ Time Pressure	☐ Remote Work Location	☐ > 12 hr shift	☐ Working > 8 consecutive days
☐ Lack of procedures	☐ Extreme temps, wind >30mph	☐ Personal illness/fatigue	☐ Vague work guidance
☐ Monotonous Activity	☐ First day back after time off	☐ Multiple job locations	☐ Other:

4.

Physical Hazards	**Hazard Controls**
Dust Hazards	☐ Dust Mask ☐ Goggles ☐ Other: _____
Thermal Burn	☐ Hot Gloves ☐ Heat Shields ☐ Other Protective Clothing: _____
Electrical Hazards	☐ Connections Protected from Elements ☐ External GFCI ☐ Other: _____ ☐ XP Rating Requirement ☐ Intrinsically Safe Requirement
Inadequate Lighting	☐ Install Temporary Lighting ☐ Headlamps
Slip and Trip	☐ Housekeeping ☐ Barricade Area ☐ Other: _____
Hand Protection	☐ Cut Resistant Gloves ☐ Pinch Pts. ☐ General ☐ Electrical ☐ Impact Resistant ☐ Other: _____

Potential Hazards for Consideration

Secondary Permits	☐ Hot Work ☐ Confined Space ☐ Excavation
Working from Heights **See also Sect. 7**	☐ Falling objects ☐ Fall protection ☐ Drop zone protection ☐ Platform load ratings ☐ Scaffold inspection ☐ Ladder inspection ☐ Barricades for equipment
Electrical	☐ Exposed wire/connector ☐ Verify equipment grounding ☐ Arc Flash
Lifting	☐ Crane lift plan ☐ Rigging inspection ☐ Tag lines used ☐ Hoists in place
Respiratory **See also Sect. 8**	☐ Unexpected exposure ☐ Chemical ☐ Dust (combustible) ☐ PEL provided ☐ Cartridges or supplied air available ☐ Gas detection equipment

5. **Required PPE** ☐ Hard Hats ☐ Safety Glasses ☐ Safety Toe Shoe/Boot ☐ Hearing Protection ☐ Safety Spotter

☐ Hi-Vis Vests	☐ Harness/Lanyard*	☐ Goggles	☐ Personal Monitor Type: _____
☐ Metatarsal Guards	☐ Hot Gloves	☐ Face Shield	☐ Respirator Type: _____
☐ Nomex/FRC	☐ Other PPE:		

Additional Work Place Hazards

6. Critical Procedures – check all that apply – *****indicates additional form must be completed or collected from client

☐ Heat Stress Prevention* ☐ Confined Space* ☐ MEWP* ☐ Roof Work ☐ Scaffold

☐ Cold Weather Work ☐ Hazardous Energy Control* ☐ Exposure Monitoring ☐ Other: _____

7. Working From Heights

Fall Protection	☐ Fixed Guardrails/Toe boards	☐ Fall Prevention PPE	Warning Line System		
Falling Objects Protection	☐ Barricading	☐ Netting	☐ House Keeping	☐ Tethered Tools	☐ Catch Blanket or Tarp
Fall Hazard Communication	☐ Adjacent/Overhead Workers	☐ Contractor Contact	☐ Client Contact		

8. Other Considerations

Environmental Hazards - Weather Forecast

☐ Heat/Cold ☐ Lightning ☐ Rain ☐ Snow ☐ Ice ☐ Tornado ☐ Wind Speed

Steps for Mitigation:

Electrical Safety Planning

Plant Hook up: ☐ 110V ☐ 220/240V ☐ 480V ☐ Generator ☐ Hard wired into panel

Electrical Classified Area: ☐ Yes ☐ No Trailer Grounded: ☐ Yes ☐ No Plug Type _____

Electrical Hook Up Responsibility: _____

List of Hazardous Chemicals

				Other Chemicals:
☐ Acetone	☐ Nitric Acid	☐ Hydrogen Peroxide	☐ Compressed Gases	
☐ Hexane	☐ Sulfuric Acid	☐ Isopropyl Alcohol	☐ Flammable Gas	
☐ Toluene	☐ Hydrochloric Acid	☐ Liquid Nitrogen	☐ Non-Flammable Gas	
☐ H2S	☐ Carbon Monoxide			

Steps for Mitigation:

Wildlife/Fauna in Area

☐ Poison Ivy ☐ Poison Oak ☐ Insects: _____ ☐ Wildlife: _____

Personnel w/ known allergies to bees stings or other allergens? ☐ Yes _____ ☐ No

9. Observed Hazards and Mitigation Steps

Task	Potential Hazard(s)	Steps for Mitigation
•	1	1
	2	2
	3	3
•	1	1
	2	2
	3	3
•	1	1
	2	2
	3	3
•	1	1
	2	2
	3	3

10. JHA REVIEW: Crew Names & Signatures

Printed Name	Signature	Date	Printed Name	Signature	Date

11. Daily JHA Meeting & Review

Items to review:

- Change in conditions
- Extended work hours
- Daily Safety Topic
- New workers or contractors
- Occurrence of near misses or injuries

Initialing demonstrates that site conditions and hazards have not changed from the original SSP. If changes did occur, make the necessary updates to this JHA and add notes as applicable in Section 9.

Day	Discussion Topic	Initials
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		

EMERGENCY ACTION PLAN FORM

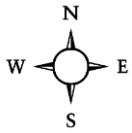
The Job Supervisor/ Client Project Manager (CPM) will ensure that all employees are familiar with the facility emergency and evacuation procedures, assembly/ rally points, alert systems, and signals prior to work commencing. In the event of an emergency situation/ evacuation, the Job Supervisor/ CPM will maintain a roster and be responsible for accounting for all employees. The Job Supervisor/ CPM will ensure that this Emergency Action Plan Form is completed, communicated to all employees, and posted.

- **You must follow the client's emergency action plan first, and notify your Supervisor immediately.**
- **If incident is life threatening, CALL 911 IMMEDIATELLY**
- **If non-emergency medical attention is needed, call AXIOM Medical number: 877-502-9466.**

1	MEG Job Supervisor/ CPM's Name:	
2	MEG Job Supervisor/ CPM's Telephone Number:	
3	MEG Job Safety Supervisor (if applicable):	
4	MEG Job Safety Supervisor's Telephone Number:	
5	Plant's Emergency Telephone Number:	
6	Local Hospital/ Clinic Telephone Number:	
7	Emergency Ops Radio Channel:	
8	Plant's #1 Contact Person's Name:	
9	Plant's #1 Contact Person's Telephone Number:	
10	Plant's #2 Contact Person's Name:	
11	Plant's #2 Contact Person's Telephone Number:	
12	Designated Assembly Point Location:	
13	Evacuation Routes:	
14	Severe Weather Shelter Location:	
15	Eye Wash and Safety Shower Location:	
16	The First Aid Kit is Located:	
17	The Fire Extinguisher is Located:	

EMERGENCY EVACUATION AND ASSEMBLY MAP

1	**Facility Name:**	
2	**Facility Alarm (Circle):**	**YES or NO**
3	**Alarm Tones:**	***FIRE:_____;*** ***CHEMICAL/ GAS:_____;*** ***SHELTER-IN-PLACE:_____;*** ***EVACUATE:_____;*** ***OTHER:_____;***
4	**Designated Shelter(s) Description:**	
5	**Designated Assembly Point(s) Description:**	



Draw the evacuation and assembly map here

EMERGENCY ACTION PLAN FORM AND EVACUATION ASSEMBLY MAP REVIEW: Crew Names and Signatures

Printed Name:	*Signature:*	*Date:*	*Printed Name:*	*Signature:*	*Date:*

Daily MEWP Lift Inspection Form

All checks must be completed prior to each work shift, before operation of the MEWP lift. This checklist must be used atthe beginning of each shift or following 6 to 8 hours of use.

MEWP Lift Model #:	**Serial Number:**
Make:	**Rented or Owned:**

- Check “Yes” if an item is adequate, operational, and safe.
- Check “No” to indicate that a repair or other corrective action is required prior to use.
- Check “N/A” to indicate “Not Applicable.”

Items to be Inspected	Yes	No	N/A
1. All MEWP lift components are in working condition (i.e. no loose or missing parts, torn or loose hoses, etc.) – if something can be easily loosened by hand then it is not sufficient.	☐	☐	☐
2. Hydraulic fluid level is sufficient, with the platform fully lowered	☐	☐	☐
3. Hydraulic system pressure (see manufacturer specs) is acceptable. If the pressure is low, determine cause and repair in accordance with accepted procedures as outlined in service manual.	☐	☐	☐
4. Tires and wheel lug nuts (for tightness)	☐	☐	☐
5. Hoses and cables (i.e. worn areas or chafing)	☐	☐	☐
6. Platform rails and safety gate (no damage present)	☐	☐	☐
7. Pivot pins secure	☐	☐	☐
8. Welds are not cracked and structural members are not bent or broken	☐	☐	☐
9. Warning and instructional labels are legible and secure, and load capacity is clearly marked.	☐	☐	☐
10. Manufacturer’s Instruction Manual is present inside the bucket	☐	☐	☐
11. Base controls (switches and push buttons) can be properly operated	☐	☐	☐
12. Platform conditions are safe (i.e. not slippery)	☐	☐	☐
13. Fire extinguisher is present, mounted and fully charged, located inside the bucket	☐	☐	☐
14. Headlights, safety strobe light and back-up alarm are functional	☐	☐	☐
15. Workplace is free of hazards (overhead powerlines, obstructions, level surface, high winds, etc.) ***Do not operate if winds are 20 mph, unless otherwise specified by manufacturer recommendations.**	☐	☐	☐

Operator Name & Signature | Location | Date

Ground Control Name & Signature | Location | Date

Harness Inspections:

Printed Name | Signature | Date

Printed Name | Signature | Date

Printed Name | Signature | Date

Extended Hours Safety Audit

Project Number: _____ Date: _____ Time: _____

When a project is expected to extend past a 14-hour work day, this form must be completed to evaluate the condition of the crew, and the safety of the work environment.

Permission to proceed into extended work hours must come from a District Manager (DM) or Regional Vice President (RVP). Technical RVPs can authorize moving forward, if they are in the field or if they are managing the project.

1. Hold test crew meeting **Test crew initials:** _____

The test leader should look for signs of the following in their crews:

- Irritability
- Lack of motivation
- Headaches
- Giddiness
- Fatigue
- Depression
- Reduced alertness, lack of concentration and memory

The test leader should assess the environmental and hazardous concerns:

- Temperature and weather
- Lighting
- Working from Heights
- Hoisting
- PPE (i.e. respirators, etc.)
- Pollutant concentration in ambient air (SO_2, H_2S, ect.)

2. Notify DM or RVP

The PM must contact either the DM or RVP to discuss the safety issues that may arise due to the extended work period. If the DM is the acting PM on the job site, they must contact the RVP. During this time, they can come to an agreement on how to proceed. Itemsto discuss include:

- Reason for extended hours
- Reason for delay
- Production limitations
- Impending Weather

3. Contact the client

The PM, DM or RVP must discuss with client any identified safety concerns, the client's needs and mutually agree on how to proceed. Discussion should also include the appropriate rest period needed before the next day's work shift can begin. The DM and/or a RVP must be informed on the final decision.

Final Outcome:	
Approver:	

Heat Stress Prevention Form

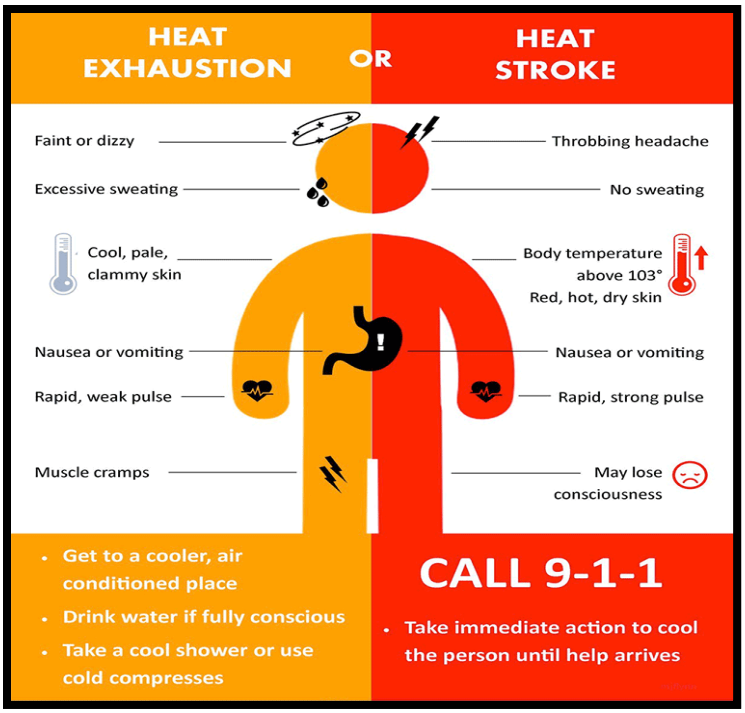
This form is to be used when the Expected Heat Index is above 91° F, and is to be kept with project documentation.

Project Manager (PM):	**Expected High Temp:**
Date(s):	**Expected Heat Index:**

1. Review the signs of Heat Exhaustion and Heat Stroke

2. <u>If Heat Index is above 91° F:</u>
   - Provide cold water and/or sports drinks to all field staff (avoid caffeinated drinks and energy drinks which can increase core temperature).
     - Bring no less than one gallon of water per employee
   - If employee(s) are dehydrated, on blood pressure medication or not acclimated to heat, ensure they are aware of the heightened risk for heat illness
   - Provide cool head bands/vests/etc.
   - Have ice available to employees
   - Implement work shift rotations and breaks, particularly for employees working in direct sunlight.
   - Provide as much shade at the jobsite as possible, including tarps, tents or other acceptable temporary structures.
   - PM should interview each field staff periodically to evaluate for signs of heat illness

3. <u>If Heat Index is above 103° F:</u>
   - Employees must stop for drinks and breaks every hour (about 4 cups/hour)
   - Employees are not permitted to work alone for more than one hour at a time without a break offering shade and drinks
   - Employees should wear cool bands and vests if working outside more than one hour at a time
   - PM should interview each field staff every 2 hours to evaluate for signs of heat illness



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