SOURCE TEST PLAN
2020 COMPLIANCE TESTING
OWENS BROCKWAY GLASS CONTAINER INC.
FURNACE D COLOR CHANGE COMPLIANCE
AMBER GLASS
PORTLAND, OR

Prepared For:

Owens-Brockway Glass Container Inc.
9710 NE Glass Plant Road
Portland, OR 97220

For Submittal To:

Oregon Department of Environmental Quality
4026 Fairview Industrial Drive SE
Salem, OR 97302

Prepared By:

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ACCREDITED TO ASTM D7036 ONLY CERT #3925.01

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1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

Montrose Air Quality Services, LLC (Montrose) has been contracted by Owens-Brockway Glass Container (Owens-Brockway) to perform a series of air emission tests at the facility located in Portland, Oregon. The tests will be conducted to determine compliance with the source testing limitations of the Oregon Department of Environmental Quality Permit # 26-1876-TV-01. Tests are scheduled to be conducted on August 18-19, 2020. The specific objectives are to:

- Measure O_2, CO_2, SO_2, NOx, PM (total) as PM10, Antimony (Sb), Arsenic (As), Beryllium (Be), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Selenium (Se), Hexavalent Chromium (Cr^{+6}) at the outlet of Furnace D while making amber glass
- 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)
August 18, 2020	Furnace D	Velocity/Volumetric Flow Rate, Moisture	EPA 1, 2 and 4	3	60
		O_2, CO_2	EPA 3A	3	60
		PM (total) as PM10	EPA 5/202	3	60
		SO_2	EPA 6C	3	60
		NO_x	EPA 7E	3	60
		Post-test thermocouple calibration check	EPA ALT-011	--	--

August 19, 2020	Furnace D	Velocity/Volumetric Flow Rate, Moisture	EPA 1, 2 and 4	3	120
		O_2, CO_2	EPA 3A	3	60
		Sb, As, Be, Cd, Cr, Co, Cu, Pb, Mn, Hg, Ni, Se	EPA 29	3	120
		Cr^{+6}	EPA 0061	3	120
		Post-test thermocouple calibration check	EPA ALT-011	--	--

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 / FACTORS

Unit ID/ Source Name	Parameter	Reporting Units	Emission Limit / Factors	Emission Limit Reference
Furnace D	SO_2	lbs/ton of glass	2.1	Permit 33.b.ii
	NO_x	lbs/ton of glass	3.7	Permit 33.b.ii
	Pb	lbs/ton of glass	$1.65*10^{-3}$	Permit 33.b.ii
	Cr	lbs/ton of glass	.02	40 CFR 63.11451 & Table 1 to Subpart SSSSSS of 40 CFR 63
	PM & PM_{10}	gr/dscf lbs/ton of glass lbs/ton of glass	.10 1 .6	Permit table II Permit table II Permit 33.b.ii

1.3 KEY PERSONNEL

A list of project participants is included below:

Facility Information

Source Location:	Owens-Brockway Glass Container 9710 NE Glass Plant Road Portland, OR 97220	
Project Contact:	Dennis Buenger, CHMM	Andrew Stewart MBA, CHMM
Role:	Global Environmental Technical Leader	Regional EHS Manager
Telephone:	567-336-7519	419-554-4017
Email:	Dennis.buenger@o-i.com	Andrew.Stewart@o-i.com

Agency Information

Regulatory Agency:	Oregon Department of Environmental Quality
Agency Contact:	Suzanne Blackburn
Telephone:	503-378-5034
Email:	Suzanne.blackburn@state.or.us

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC (Montrose)	
Contact:	Joe Heffernan III	Jeremiah Hicks
Title:	Client Project Manager	Client Account Manager
Telephone:	503-702-8683	440-340-8189
Email:	jheffernan@montrose-env.com	jhicks@montrose-env.com

Laboratory Information

Laboratory:	Chesterlabnet
City, State:	Tigard, OR

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 Operate mobile lab	Post-test follow-up Facility interface, test crew coordination
Field Technicians	Execute stack platform responsibilities	Preparation, support PM

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION, OPERATION, AND CONTROL EQUIPMENT

The Portland facility is located at 9710 NE Glass Plant Road Portland, Oregon. Owens-Brockway Glass Container Inc. - Plant No. 21 in Portland, Oregon, produces a variety of glass bottles and jars from post-consumer recycled glass with other essential raw materials. The glass manufacturing comprises of the following areas of operations: raw material and cullet receiving and storage, materials blending and transport, glass melting furnaces, glass forming, final bottle treatment, and the maintenance and support systems such as boiler and storage tanks. The plant has four glass melting furnaces (EU4) at their Portland, Oregon, facility (Plant No. 21), but Furnaces B (GM2) and C (GM3) are no longer in operation. The furnace to be tested is Glass Melting Furnaces D (GM4) with an estimated maximum capacity of 190 tons per day.

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 LOCATION

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
Furnace D	29	60/≥2	348/12	Isokinetic: 24 (12/port); Gaseous: 3

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.

2.3 OPERATING CONDITIONS AND PROCESS DATA

Emission tests will be performed while the Furnace D runs at greater than or equal to 174.6 US tons per day, which represents the 90th percentile of amber production over the past 12 months. There was a total of 85 days of amber production over the last 12-months. In addition, no more than 45.2% cullet will be used which represents the no more than 2 standard deviation from the minimum cullet usage of 30% over the past five years.

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

- Hourly production data and all glass colors for the previous 12 months
- Glass production rate
- Type of glass produced

- Recycled-to-raw material ratios (% cullet)
- % of each cullet type used
- Raw material addition rates
- Natural gas usage
- Electric boost rate
- Bridgewall temperature
- COMS data

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 and FMCSA
- 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 were presented previously 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 Sources

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.

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

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:

  - 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.
- Target and/or Minimum Required Sample Duration: 60 minutes

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:
  - Condensed water is measured gravimetrically
  - Moisture sampling is performed as part of the pollutant sample trains

3.1.5 EPA Methods 5 and 202, Determination of Particulate Matter from Stationary Sources and Dry Impinger Method for Determining Condensable Particulate Emissions from Stationary Sources

EPA Methods 5 and 202 are manual, isokinetic methods used to measure FPM and CPM emissions. The methods are performed in conjunction with EPA Methods 1 through 4. The stack gas is sampled through a nozzle, probe, heated filter, unheated CPM filter, condenser, and impinger train. FPM is collected from the probe and heater filter. CPM is collected from the unheated CPM filter and the impinger train. The samples are analyzed gravimetrically. The sum of FPM and CPM represents TPM. The FPM, CPM, and TPM results are reported in emission concentration and emission rate units. Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - Stainless steel sample nozzles and glass probe liners are used
  - Condensed water is measured gravimetrically
  - TFE or Polyethylene wash bottles and glass sample bottles are used
  - The post-test nitrogen purge is performed by passing nitrogen through the train under pressure
- Minimum Required Sample Duration: 60 minutes
- Minimum Required Sample Volume: 31.8 dscf
- Method 5 Detection Limit: 3 mg
- Method 202 Detection Limit: 4 mg
- Analytical Laboratory: Chesterlabnet Tigard, OR

3.1.6 EPA Method 6C, Determination of Sulfur Dioxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)

EPA Method 6C is an instrumental test method used to continuously measure emissions of SO_2. Conditioned gas is sent to an ultraviolet (UV) absorption analyzer to measure the concentration of SO_2. The performance requirements of the method must be met to validate the data.

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

- Method Exceptions:
  - For gaseous emissions sampling, MDL are calculated for each analyzer. The ISDL is equal to the sensitivity of the instrumentation, which is 2% of the span value.
- Target and/or Minimum Required Sample Duration: 60 minutes

3.1.7 EPA Method 7E, Determination of Nitrogen Oxides Emissions from Stationary Source (Instrumental Analyzer Procedure)

EPA Method 7E is an instrumental test method used to continuously measure emissions of NO_x as NO_2. Conditioned gas is sent to a chemiluminescent analyzer to measure the concentration of NO_x. NO and NO_2 can be measured separately or simultaneously together but, for the purposes of this method, NO_x is the sum of NO and NO_2. The performance requirements of the method must be met to validate the data.

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

- Method Exceptions:
  - For gaseous emissions sampling, MDL are calculated for each analyzer. The ISDL is equal to the sensitivity of the instrumentation, which is 2% of the span value.
- Target and/or Minimum Required Sample Duration: 60 minutes

3.1.8 EPA Method 29, Determination of Metals Emissions from Stationary Sources

EPA Method 29 is a manual, isokinetic test method to measure a variety of metals using inductively coupled argon plasma emission spectroscopy (ICAP) and cold vapor atomic absorption (CVAA) spectroscopy. This method is performed in conjunction with EPA Methods 1-4. A stack sample is withdrawn isokinetically from the source, filterable emissions are collected in the probe and on a heated filter, and condensable emissions are collected in an aqueous acidic solution of hydrogen peroxide (analyzed for all target analytes) and an optional aqueous acidic solution of potassium permanganate (required only when Hg is a target analyte). The recovered samples are digested, and appropriate fractions are analyzed for the target analytes which may include Hg by CVAAS and for Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, P, Se, Ag, Tl, and Zn by ICAP or atomic absorption spectroscopy (AAS). Graphite furnace atomic absorption spectroscopy (GFAAS) is used for analysis of Sb, As, Cd, Co, Pb, Se, and Tl if these elements require greater analytical sensitivity than can be obtained using ICAP. AAS may be used for analysis of all target analytes if the resulting in-stack method detection limits meet the goal of the testing program. Similarly, inductively coupled plasma-mass spectroscopy (ICP-MS) may be used for analysis of Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, Ag, Tl and Zn. The results from analysis

of individual fractions of the sample train are summed to obtain the total concentration of each metal per sample train.

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

- Method Options:
  - The method is performed for the following target analytes: Antimony (Sb), Arsenic (As), Beryllium (Be), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Selenium (Se)
  - Based on the testing results from 2019 it is anticipated that some metals may be below the detection limit of the test method. If a concentration is below the minimum detection limit of the applicable analytical method then the mass emission rates will be calculated using the applicable minimum detection limit as the concentration value in lieu of a measured concentration.
- Sampling Manual Target and/or Minimum Required Sample Duration: 120 minutes
- Target and/or Minimum Required Sample Volume: 60 dscf
- Analytical Laboratory: Chester Labnet Tigard, OR.

TABLE 3-1
EPA METHOD 29 DETECTION LIMITS

Metal	Detection Limit (µg/L)	Front Half Detection Limit (µg)	Back Half Detection Limit (µg)
Antimony (Sb)	5	1.25	.53
Arsenic (As)	7	1.75	0.70
Beryllium (Be)	0.2	0.05	0.02
Cadmium (Cd)	0.5	0.13	0.05
Chromium (Cr)	0.5	0.13	0.05
Cobalt (Co)	0.5	0.13	0.05
Copper (Cu)	5.0	1.25	0.50
Lead (Pb)	5.0	1.25	0.50
Manganese (Mn)	0.30	0.08	0.03
Mercury (Hg)	0.007	0.022	0.009
Nickel (Ni)	1.00	0.25	0.10
Selenium (Se)	10.00	2.50	1.00

3.1.9 EPA Method SW-846 0061, Determination of Hexavalent Chromium Emissions from Stationary Sources

EPA Method SW-846 0061 is a manual method used to measure hexavalent chromium (Cr^{+6}) emissions. This method is performed in conjunction with EPA Methods 1, 2, 3A, and 4. For incinerators and combustors, the Cr emissions are collected isokinetically from the source. To eliminate the possibility of Cr^{+6} reduction between the nozzle and impinger, the emission samples are collected with a recirculatory train where the impinger reagent is continuously recirculated to the nozzle. Recovery procedures include a post-sampling purge and filtration. The impinger train samples are analyzed for Cr^{+6} by an ion chromatograph equipped with a post-column reactor and a visible wavelength detector. The IC/PCR separates the Cr^{+6} as chromate (CrO_4) from other diphenylcarbazide reactions that occur in the post-column reactor. To increase sensitivity for trace levels of chromium, a preconcentration system may also be used in conjunction with the IC/PCR.

- Method Options:
  - An air-cooled probe will be used due to elevated stack temperatures above 300F
- Method Exceptions:
  - We request that NaOH be used as the impinger solution in lieu of KOH. We've found that NaOH has much lower background contamination and is Chester Labnets recommended reagent for this sampling as it doesn't melt their IC column
- Target and/or Minimum Required Sample Duration: 120 minutes
- Target and/or Minimum Required Sample Volume: 60 dscf
- Detection Limit: 0.02 µg/L
- Based on the testing results from 2019 120 minutes of total sample time shall be enough to satisfy the detection limit requirements of Section 2.7.a of the ODEQ Source Sampling Manual. If a concentration is below the minimum detection limit of the applicable analytical method then the mass emission rates will be calculated using the applicable minimum detection limit as the concentration value in lieu of a measured concentration
- Analytical Laboratory: Chester Labnet, Tigard, OR

3.1.10 EPA Method ALT-011, Alternative Method 2 Thermocouple Calibration

EPA Approved Alternative Method 011 (ALT-011) is used as an alternative to the EPA Method 2 two-point thermocouple calibration. This procedure involves a single-point in-field check using a reference thermometer to confirm that the thermocouple system is operating properly. The temperatures of the thermocouple and reference thermometers shall agree to within ±2 °F.

3.2 PROCESS TEST METHODS

The applicable regulations do not require process samples to be collected during this test program.

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 45 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. Table 4-1 presents a typical Table of Contents for the final report.

TABLE 4-1
TYPICAL REPORT FORMAT

Cover Page	
Certification of Report	
Table of Contents	
Section	
1.0	INTRODUCTION
2.0	PLANT AND SAMPLING LOCATION DESCRIPTIONS
3.0	SAMPLING AND ANALYTICAL PROCEDURES
4.0	TEST DISCUSSION AND RESULTS
5.0	INTERNAL QA/QC ACTIVITIES
Appendices	
A	FIELD DATA AND CALCULATIONS
B	FACILITY PROCESS DATA
C	LABORATORY ANALYSIS DATA
D	QUALITY ASSURANCE/QUALITY CONTROL
E	REGULATORY INFORMATION

4.6.2 Example Presentation of Test Results

Table 4-2 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 4-2
EXAMPLE EMISSIONS RESULTS -
FURNACE D

Run Number	1	2	3	Average
Date	X	X	X	--
Time	X	X	X	--
Process Data				
Hourly production data and all glass colors for the previous 12 months				
Glass production	X	X	X	X
% cullet	X	X	X	X
Natural gas usage	X	X	X	X
Electric boost rate	X	X	X	X
Bridgewall temperature	X	X	X	X
Flue Gas Parameters				
O_2, % volume dry	X	X	X	X
CO_2, % volume dry	X	X	X	X
flue gas temperature, °F	X	X	X	X
moisture content, % volume	X	X	X	X
volumetric flow rate, dscfm	X	X	X	X
Species Emissions: PM as PM_{10}				
gr/dscf	X	X	X	X
lb/hr	X	X	X	X
tons/yr	X	X	X	X
lbs/ton of glass	X	X	X	X
g/kg glass	X	X	X	X
Species Emissions: SO_2, NO_x				
ppm	X	X	X	X
lb/hr	X	X	X	X
lbs/ton of glass	X	X	X	X
tons/yr	X	X	X	X
	X	X	X	X
Species Emissions: Multi-metals				
µg/dscm	X	X	X	X
lb/hr	X	X	X	X
tons/yr	X	X	X	X
lbs/ton of glass	X	X	X	X
g/kg glass	X	X	X	X

APPENDIX A
SUPPORTING INFORMATION

Appendix A.1
Units and Abbreviations

MONTROSE
AIR QUALITY SERVICES

UNITS AND ABBREVIATIONS

@ 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
ºC	degrees Celsius (centrigade)
ºF	degrees Fahrenheit
ºR	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)

UNITS AND ABBREVIATIONS

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 0.002669 ((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
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
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

UNITS AND ABBREVIATIONS

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 (+460 for English)
T_m	absolute average dry gas meter temperature, ºR (+460 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 (+460 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

ACRONYMS

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	condensible 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 (pcdd's)
DLL	detection level limited
DNCG	dilute non-condensable gas
ECD	electron capture detector
EIT	Engineer In Training
ELCD	electoconductivity 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

ACRONYMS

FTIR	Fourier-transform infrared spectroscopy
FTPB	field train proof blank
FTRB	field train recovery blank
Furans	polychlorinated dibenzofurans (pcdf's)
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 plasmography
ICPCR	ion chromatography with a post-column reactor
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 diphyenyl 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
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

ACRONYMS

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	semivolatile 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

MONTROSE
AIR QUALITY SERVICES

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 diphyenyl diisocyanate
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
Se	selenium
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 11th day of February 2020.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3925.01
Valid to February 28, 2022

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: _____

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. Additional Forms, as applicable

   a. Aerial Lift Inspection Form

   b. Heat Stress Prevention Form Based on Heat Index

   c. Extended Hours Form

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: _____

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: ____ Aerial 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* ☐ Aerial Work Platform* ☐ 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		

Daily Aerial Lift Inspection Form

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

Aerial 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 aerial 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. During this time, they can come to an agreement on how to proceed. Items to 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

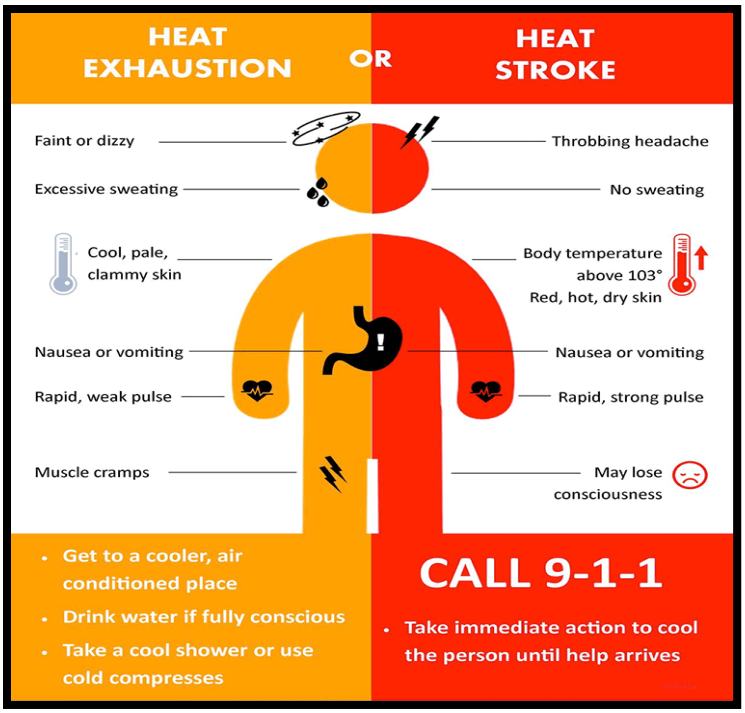
This form is to be used when the Expected Heat Index is above 91° F, and is to be kept with project documentation.

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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If you have any questions, please contact one of the following individuals by email or phone.

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