10/01/2026

No	TOXIC REVIEW
No	SYNTHETIC MINOR TO AVOID MAJOR NSR
No	CEMS
No	MACT/GACT
No	NSPS
No	NESHAPS
No	NETTING
No	MODELING SUBMITTED
Yes	SYNTHETIC MINOR TO AVOID TITLE V
Yes	FEDERALLY ENFORCABLE PTIO (FEPTIO)
No	SYNTHETIC MINOR TO AVOID MAJOR GHG

LG Chem Ohio Petrochemical
6800 N. Chestnut Street
Ravenna, OH 44266

RE: DRAFT AIR POLLUTION PERMIT-TO-INSTALL AND OPERATE

Facility ID: 1667060181
Permit Number: P0141148
Permit Type: Administrative Modification
County: Portage

Dear Permit Holder:

A draft of the Ohio Administrative Code (OAC) Chapter 3745-31 Air Pollution Permit-to-Install and Operate (PTIO) for the referenced facility has been issued for the emissions unit(s) listed in the Authorization section of the enclosed draft permit. This draft action is not an authorization to begin construction or modification of your emissions unit(s). The purpose of this draft is to solicit public comments on the permit. A public notice will appear in the Ohio Environmental Protection Agency Weekly Review and Public Notices website, ***Weekly Review and Public Notices***. A copy of the public notice and the draft permit are enclosed. This permit can be accessed electronically on the Ohio EPA document search webpage: ***eDocument Search | Ohio Environmental Protection Agency***. Comments will be accepted as a marked-up copy of the draft permit or in narrative format. Any comments must be sent to the following:

Andrea Moore
Permit Review/Development Section
Ohio EPA, DAPC
50 West Town Street Suite 700
PO Box 1049
Columbus, Ohio 43216-1049

and

Akron Regional Air Quality Management District
1867 West Market St.
Akron, OH 44313

Comments and/or a request for a public hearing will be accepted within 30 days of the date the notice appears on the Ohio EPA Weekly Review and Public Notices website, ***Weekly Review and Public Notices | Ohio Environmental Protection Agency***. You will be notified if a public hearing is scheduled. A decision on issuing a final permit-to-install will be made after consideration of comments received and oral testimony if a public hearing is conducted. Any permit fee that will be due upon issuance of a final Permit-to-Install is indicated in the Authorization section. Please do not submit any payment now. If you have any questions, please contact Akron Regional Air Quality Management District at (330)375-2480.

Sincerely,

Robert Hodanbosi
Chief, Division of Air Pollution Control

cc: U.S. EPA Region 5 Via E-Mail Notification
ARAQMD; Pennsylvania; West Virginia; Canada

PUBLIC NOTICE

The following matters are the subject of this public notice by the Ohio Environmental Protection Agency. The complete public notice, including any additional instructions for submitting comments, requesting information, a public hearing, or filing an appeal may be obtained at: ***Weekly Review and Public Notices | Ohio Environmental Protection Agency*** or Hearing Clerk, Ohio EPA, 50 W. Town St., Columbus, Ohio 43215. Ph: 614-644-3037 email: ***HClerk@epa.ohio.gov***

Draft Air Pollution Permit-to-Install and Operate Administrative Modification

LG Chem Ohio Petrochemical
310 Rayann Parkway
Ravenna, OH 44266

ID#: P0141148
Date of Action: 10/01/2026
Permit Desc: Facility-initiated administrative modification to incorporate RACT standards. Pursuant to Part D of Title I of the Clean Air Act (CAA), Ohio EPA is required to establish a State Implementation Plan (SIP) for the attainment and maintenance of the NAAQS. The above-mentioned permit is a part of Ohio's SIP for attainment and maintenance of the 2015 ozone NAAQS and will be submitted to United States Environmental Protection Agency (U.S. EPA) as a modification of the SIP.

The permit and complete instructions for requesting information or submitting comments may be obtained at: https://ohioepa.commentinput.com - Search by entering permit #P0141148 in the "Search Projects" search box.

The public comment period will run until 11/02/2026 at 11:59 PM.

Permit Strategy Write-Up

1. Check all that apply:

   ☐ Synthetic Minor Determination **N/A**

   ☐ Netting Determination **N/A**

2. Source Description:

   Emissions unit P004 – Plastic extrusion process including: cooling, pelletizing, and screening for five individual lines. As required by the reclassification to serious nonattainment for ozone under the 2015 ozone National Ambient Air Quality Standards (NAAQS) promulgated by U.S. EPA, this facility has submitted a VOC Reasonably Available Control Technology (RACT) study on June 1, 2026 (subsequently revised on September 16, 2026 and September 24, 2026) to address the feasibility of controlling VOC emissions from their plastic extrusion operations. LG Chem Ohio Petrochemical does not have any prior source-specific VOC RACT established under OAC rule 3745-21-09. This permit modification includes the implementation of the proposed RACT limits in the September 24, 2026 revision of the RACT study. Section B of this permit cites the RACT limits under OAC rule 3745-21-11(B). The RACT limits are implemented under an OAC rule 3745-31-05(D) synthetic minor restriction for the affected emissions units in section C of this permit.

   Pursuant to Part D of Title I of the Clean Air Act (CAA), Ohio EPA is required to establish a State Implementation Plan (SIP) for the attainment and maintenance of the NAAQS. This permit is part of Ohio's SIP for attainment and maintenance of the 2015 ozone NAAQS and will be submitted to U.S. EPA as a modification of the SIP.

3. Facility Emissions and Attainment Status:

   LG Chem Ohio Petrochemical currently operates as a non-Title V facility and will transition to synthetic minor permitting classification upon final issuance of this permit. Portage County was designated as serious nonattainment for the 2015 ozone NAAQS but is now a maintenance county. The county is currently designated attainment for all NAAQS (criteria) pollutants which include ozone, $PM_{2.5}$, PM_{10}, CO, NO_2, lead, and SO_2.

4. Source Emissions:

   Emissions unit P004 has VOC emissions that are subject to the VOC RACT requirements. Off-gases from the extruders are controlled by a regenerative thermal oxidizer (RTO). The VOC RACT determination for this emissions unit is venting VOC emissions to an RTO with an overall control efficiency of at least 96%, by weight, or an outlet concentration of 7 ppmvd, as propane, and includes associated monitoring, record keeping, reporting, and testing requirements.

5. Conclusion:

   This permit modification establishes VOC RACT limits as proposed by LG Chem Ohio Petrochemical in their VOC RACT study as part of the requirements for the 2015 ozone NAAQS nonattainment and maintenance areas under the reclassification to serious nonattainment for the Cleveland area. The VOC RACT requirements established in this permit are based on existing control equipment and will be implemented upon final issuance of this permit.

6. Please provide additional notes or comments as necessary:

   None.

7. Total Permit Allowable Emissions Summary (for informational purposes only):

Pollutant	Tons Per Year
VOC	4.56
PE	6.06

DRAFT

Division of Air Pollution Control
Permit-to-Install and Operate

for

LG Chem Ohio Petrochemical

Facility ID:	1667060181
Permit Number:	P0141148
Permit Type:	Administrative Modification
Issued:	10/01/2026
Effective:	To be entered upon final issuance
Expiration:	To be entered upon final issuance

Division of Air Pollution Control

Permit-to-Install and Operate

for

LG Chem Ohio Petrochemical

Table of Contents

Authorization 7

List of Commonly Used Abbreviations 9

A. Standard Terms and Conditions 10

B. Facility-Wide Terms and Conditions 15

C. Emissions Unit Terms and Conditions 20

1. P004, Extrusion Process 21

Authorization

Facility ID:	1667060181
Application Number(s):	M0008862M0008862
Permit Number:	P0141148
Permit Description:	Facility-initiated administrative modification to incorporate RACT standards. Pursuant to Part D of Title I of the Clean Air Act (CAA), Ohio EPA is required to establish a State Implementation Plan (SIP) for the attainment and maintenance of the NAAQS. The above-mentioned permit is a part of Ohio's SIP for attainment and maintenance of the 2015 ozone NAAQS and will be submitted to United States Environmental Protection Agency (U.S. EPA) as a modification of the SIP.
Permit Type:	Administrative Modification
Permit Fee:	$0.00 *DO NOT send payment at this time, subject to change before final issuance*
Issue Date:	10/01/2026
Effective Date:	To be entered upon final issuance
Expiration Date:	To be entered upon final issuance
Permit Evaluation Report (PER) Annual Date:	To be entered upon final issuance

This document constitutes issuance of a Permit-to-Install and Operate for the emissions unit(s) identified on the following page to:

LG Chem Ohio Petrochemical
310 Rayann Parkway
Ravenna, OH 44266

Ohio Environmental Protection Agency (EPA) District Office or local air agency responsible for processing and administering your permit:

Akron Regional Air Quality Management District
1867 West Market St.
Akron, OH 44313
(330)375-2480

The above-named entity is hereby granted this Permit-to-Install and Operate for the air contaminant source(s) (emissions unit(s)) listed in this section pursuant to Chapter 3745-31 of the Ohio Administrative Code. Issuance of this permit does not constitute expressed or implied approval or agreement that, if constructed or modified in accordance with the plans included in the application, the described emissions unit(s) will operate in compliance with applicable State and Federal laws and regulations.

This permit is granted subject to the conditions attached hereto.

Ohio Environmental Protection Agency

John Logue
Director

Authorization (continued)

Permit Number: P0141148

Permit Description: Facility-initiated administrative modification to incorporate RACT standards. Pursuant to Part D of Title I of the Clean Air Act (CAA), Ohio EPA is required to establish a State Implementation Plan (SIP) for the attainment and maintenance of the NAAQS. The above-mentioned permit is a part of Ohio's SIP for attainment and maintenance of the 2015 ozone NAAQS and will be submitted to United States Environmental Protection Agency (U.S. EPA) as a modification of the SIP.

Permits for the following Emissions Unit(s) or groups of Emissions Units are in this document as indicated below:

Emissions Unit ID:	**P004**
Company Equipment ID:	Extrusion Process
Superseded Permit Number:	P0132055
General Permit Category and Type:	Not Applicable

List of Commonly Used Abbreviations

AP-42 = U.S. EPA's Compilation of Air Pollution Emissions Factors	HVLP = high volume, low pressure	PER = Permit Evaluation Report
ASTM = American Society for Testing and Materials	LAER = lowest achievable emission rate	PM = particulate matter
BACT = Best Available Control Technology	lb(s)/hr = pound(s) per hour	PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns
BAT = Best Available Technology	LDAR = leak detection and repair	$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
CAA = Clean Air Act	LPG = liquefied petroleum gas/propane	ppb = parts per billion
CAM = compliance assurance monitoring	MACT = maximum achievable control technology	ppm = parts per million
CEMS = continuous emissions monitoring system	MAGLC = maximum acceptable ground level concentration	PSD = Prevention of Significant Deterioration
CFC = chlorofluorocarbon	mg/m3 = milligrams per cubic meter	psi = pounds per square inch
CFR = Code of Federal Regulations	MM = million	psia = pounds per square inch absolute
CH_4 = methane	MMBtu = million British Thermal Units	PTE = potential-to-emit
CI = compression ignition	MSDS = material safety data sheet	PTI = Permit-to-Install
CO = carbon monoxide	MSW = municipal solid waste	PTIO = Permit-to-Install and Operate
CO_2 = carbon dioxide	NAAQS = National Ambient Air Quality Standard	PTO = Permit-to-Operate
COM = continuous opacity monitor	NESHAP = National Emission Standard for Hazardous Air Pollutants	PWR = process weight rate
DAPC = Division of Air Pollution Control	NG = natural gas	RACM = reasonably available control measures
DO/LAA = District Office/Local Air Agency	ng/m3 = nanograms per cubic meter	RACT = reasonably available control technology
dscf = dry standard cubic foot	NH_3 = ammonia	RATA = relative accuracy test audit
EAC = emissions activity category	NMHC = non-methane hydrocarbons	RTO = regenerative thermal oxidizer
eDocs = electronic documents database	NMOC = non-methane organic compound	SB265 = Senate Bill 265
ERAC = Environmental Review Appeals Commission	NO = nitrogen oxide	scfm = standard cubic feet per minute
ESP = electrostatic precipitator	NO_2 = nitrogen dioxide	SI = spark ignition
EU = emissions unit	NO_x = nitrogen oxides	SIP = State Implementation Plan
FEPTIO = Federally Enforceable Permit-to-Install and Operate	NSPS = New Source Performance Standard	SO_2 = sulfur dioxide
FER = Fee Emissions Report	NSR = New Source Review	SSMP = startup, shutdown, and malfunction plan
FR = Federal Register	NTV = Non-Title V	TDS = total dissolved solids
GACT = generally achievable control technology	O&M = operation and maintenance	TLV = threshold limit value
GHG = greenhouse gases	OAC = Ohio Administrative Code	TO = thermal oxidizer
gr/dscf = grains per dry standard cubic foot	OC = organic compound	TPH = ton(s) per hour
H_2S = hydrogen sulfide	Ohio EPA = Ohio Environmental Protection Agency	TPY = ton(s) per year
H_2SO_4 = sulfuric acid	ORC = Ohio Revised Code	TSP = total suspended particulates
HAP = hazardous air pollutant	Pb = lead	VE = visible emissions
HCl = hydrogen chloride	PBR = Permit-By-Rule	VMT = vehicle miles traveled
HF = hydrogen fluoride	PCB = polychlorinated biphenyl	VOC = volatile organic compound
Hg = mercury	PE = particulate emissions	WPP = work practice plan
hp = horsepower	PEMS = predictive emissions monitoring system	µg/m3 = micrograms per cubic meter

A. Standard Terms and Conditions

1. What does this permit-to-install and operate (PTIO) allow me to do?

This permit allows you to install and operate the emissions unit(s) identified in this PTIO. You must install and operate the unit(s) in accordance with the application you submitted and all the terms and conditions contained in this PTIO, including emission limits and those terms that ensure compliance with the emission limits (for example, operating, recordkeeping and monitoring requirements).

2. Who is responsible for complying with this permit?

The person identified on the "Authorization" page, above, is responsible for complying with this permit until the permit is revoked, terminated, or transferred. "Person" means a person, firm, corporation, association, or partnership. The words "you," "your," or "permittee" refer to the "person" identified on the "Authorization" page above.

The permit applies only to the emissions unit(s) identified in the permit. If you install or modify any other equipment that requires an air permit, you must apply for an additional PTIO(s) for these sources.

3. What records must I keep under this permit?

You must keep all records required by this permit, including monitoring data, test results, strip-chart recordings, calibration data, maintenance records, and any other record required by this permit for five years from the date the record was created. You can keep these records electronically, provided they can be made available to Ohio EPA during an inspection at the facility. Failure to make requested records available to Ohio EPA upon request is a violation of this permit requirement.

4. What are my permit fees and when do I pay them?

There are two fees associated with permitted air contaminant sources in Ohio:

a) PTIO fee. This one-time fee is based on a fee schedule in accordance with Ohio Revised Code (ORC) section 3745.11 or based on a time and materials charge for permit application review and permit processing if required by the Director.

You will be sent an invoice for this fee after you receive this PTIO and payment is due within 30 days of the invoice date. You are required to pay the fee for this PTIO even if you do not install or modify your operations as authorized by this permit.

b) Annual emissions fee. Ohio EPA will assess a separate fee based on the total annual emissions from your facility. You self-report your emissions in accordance with Ohio Administrative Code (OAC) Chapter 3745-78. This fee assessed is based on a fee schedule in ORC section 3745.11 and funds Ohio EPA's permit compliance oversight activities. For facilities that are permitted as synthetic minor sources, the fee schedule is adjusted annually for inflation. Ohio EPA will notify you when it is time to report your emissions and to pay your annual emission fees.

5. When does my PTIO expire, and when do I need to submit my renewal application?

This permit expires on the date identified at the beginning of this permit document (see "Authorization" page above) and you must submit a renewal application to renew the permit. Ohio EPA will send a renewal notice to you approximately six months prior to the expiration date of this permit. However, it is very important that you submit a complete renewal permit application (either electronically through Ohio EPA's eBusiness Center: Air Services web service or postmarked prior to expiration of this permit) even if you do not receive the renewal notice.

If a complete renewal application is submitted before the expiration date, Ohio EPA considers this a timely application for purposes of ORC section 119.06, and you are authorized to continue operating the emissions unit(s) covered by this permit beyond the expiration date of this permit until final action is taken by Ohio EPA on the renewal application.

6. What happens to this permit if my project is delayed or I do not install or modify my source?

This PTIO expires 18 months after the issue date identified on the "Authorization" page above unless otherwise specified if you have not (1) started constructing the new or modified emission sources identified in this permit, or (2) entered into a binding contract to undertake such construction. This deadline can be extended once by 12 months, provided you apply to Ohio EPA for this extension within a reasonable time before the 18-month period has ended and you can show good cause for any such extension.

7. What reports must I submit under this permit?

An annual permit evaluation report (PER) is required in addition to any malfunction reporting required by OAC rule 3745-15-06 or other specific rule-based reporting requirement identified in this permit. Your PER due date is identified in the Authorization section of this permit.

8. If I am required to obtain a Title V operating permit in the future, what happens to the operating provisions and permit evaluation report (PER) obligations under this permit?

If you are required to obtain a Title V permit under OAC Chapter 3745-77 in the future, the permit-to-operate portion of this permit will be superseded by the issued Title V permit. From the effective date of the Title V permit forward, this PTIO will effectively become a PTI (permit-to-install) in accordance with OAC rule 3745-31-02(B). The following terms and conditions of this permit will no longer be applicable after issuance of the Title V permit: Section B, Term 1.b) and Section C, for each emissions unit, Term a)(2).

The PER requirements in this permit remain effective until the date the Title V permit is issued and is effective and cease to apply after the effective date of the Title V permit. The final PER obligation will cover operations up to the effective date of the Title V permit and must be submitted on or before the submission deadline identified in this permit on the last day prior to the effective date of the Title V permit.

9. What are my obligations when I perform scheduled maintenance on air pollution control equipment?

You must perform scheduled maintenance of air pollution control equipment in accordance with OAC rule 3745-15-06(A). If scheduled maintenance requires shutting down or bypassing any air pollution control equipment, you must also shut down the emissions unit(s) served by the air pollution control equipment during maintenance, unless the conditions of OAC rule 3745-15-06(A)(3) are met. Any emissions that exceed permitted amount(s) under this permit (unless specifically exempted by rule) must be reported as deviations in the annual permit evaluation report (PER), including nonexempt excess emissions that occur during approved scheduled maintenance.

10. Do I have to report malfunctions of emissions units or air pollution control equipment? If so, how must I report?

If you have a reportable malfunction of any emissions unit(s) or any associated air pollution control system, you must report this to the Akron Regional Air Quality Management District in accordance with OAC rule 3745-15-06(B). Malfunctions that must be reported are those that result in emissions that exceed permitted emission levels. It is your responsibility to evaluate control equipment breakdowns and operational upsets to determine if a reportable malfunction has occurred.

If you have a malfunction but determine that it is not a reportable malfunction under OAC rule 3745-15-06(B), it is recommended that you maintain records associated with control equipment breakdown or process upsets. Although it is not a requirement of this permit, Ohio EPA recommends that you maintain records for non-reportable malfunctions.

11. Can Ohio EPA or my local air agency inspect the facility where the emission unit(s) is/are located?

Yes. Under Ohio law, the Director or his/her authorized representative may inspect the facility, conduct tests, examine records or reports to determine compliance with air pollution laws and regulations and the terms and conditions of this permit. You must provide, within a reasonable time, any information Ohio EPA requests either verbally or in writing.

12. What happens if one or more emissions units operated under this permit is/are shut down permanently?

Ohio EPA can terminate the permit terms associated with any permanently shut down emissions unit. "Shut down" means the emissions unit has been physically removed from service or has been altered in such a way that it can no longer operate without a subsequent "modification" or "installation" as defined in OAC Chapter 3745-31.

You should notify Ohio EPA of any emissions unit that is permanently shut down by submitting a certification that identifies the date on which the emissions unit was permanently shut down. The certification must be submitted by an authorized official from the facility. You cannot continue to operate an emission unit once the certification has been submitted to Ohio EPA by the authorized official.

You must comply with all recordkeeping and reporting for any permanently shut down emissions unit in accordance with the provisions of the permit, regulations or laws that were enforceable during the period of operation, such as the requirement to submit a PER, air fee emission report, or malfunction report. You must also keep all records relating to any permanently shut down emissions unit, generated while the emissions unit was in operation, for at least five years from the date the record was generated.

Again, you cannot resume operation of any emissions unit certified by the authorized official as being permanently shut down without first applying for and obtaining a permit pursuant to OAC Chapter 3745-31.

13. Can I transfer this permit to a new owner or operator?

You can transfer this permit to a new owner or operator. If you transfer the permit, the new owner or operator must follow the procedures in OAC Chapter 3745-31-07, including notifying Ohio EPA or the local air agency of the change in ownership or operator within thirty days of the transfer date. Any transferee of this permit shall assume the responsibilities of the transferor permit holder.

14. Does compliance with this permit constitute compliance with OAC rule 3745-15-07, "air pollution nuisance"?

This permit and OAC rule 3745-15-07 prohibit operation of the air contaminant source(s) regulated under this permit in a manner that causes a nuisance. Ohio EPA can require additional controls or modification of the requirements of this permit through enforcement orders or judicial enforcement action if, upon investigation, Ohio EPA determines existing operations are causing a nuisance.

15. What happens if a portion of this permit is determined to be invalid?

If a portion of this permit is determined to be invalid, the remainder of the terms and conditions remain valid and enforceable. The exception is where the enforceability of terms and conditions are dependent on the term or condition that was declared invalid.

B. Facility-Wide Terms and Conditions

1. This permit document constitutes a PTI issued in accordance with ORC 3704.03(F) and a PTO issued in accordance with ORC 3704.03(G).

   a) For the purpose of a PTI document, the facility-wide T&C identified below are federally enforceable with the exception of those listed below which are enforceable under state law only.

      (1) None.

   b) For the purpose of a PTO document, the facility-wide T&C identified below are enforceable under state law only with the exception of those listed below which are federally enforceable.

      (1) See B.2. through B.5.

2. OAC rule 3745-21-11(B) VOC RACT Requirements

   As required by the reclassification to serious nonattainment for ozone under the 2015 ozone National Ambient Air Quality Standards promulgated by U.S. EPA, and pursuant to OAC rule 3745-21-11(B) and the VOC Reasonable Available Control Technology (RACT) Study submitted by LG Chem Ohio Petrochemical on June 1, 2026 (subsequently revised on September 16, 2026 and September 24, 2026):

   "LG Chem Ohio Petrochemical" (facility ID: 1667060181) or any subsequent owner or operator of the "LG Chem Ohio Petrochemical" facility located at 310 Rayann Parkway, Ravenna, Ohio shall comply with the following requirements:

   a) The VOC emissions from emissions unit P004 shall be vented to a regenerative thermal oxidizer (RTO) with an overall control efficiency of at least 96%, by weight, or an outlet concentration of 7 ppmvd, as propane.

3. Monitoring and/or Recordkeeping Requirements

   a) In order to maintain compliance with the applicable emission limitation(s) contained in this permit, the acceptable average combustion temperature within the RTO, for any 3-hour block of time when emissions unit P004 is in operation, shall not be more than 50°F below the average temperature measured during the most recent performance test that demonstrated the emissions unit was in compliance.

   b) The permittee shall properly install, operate, and maintain a continuous temperature monitor and recorder that measures and records the combustion temperature within the RTO when emissions unit P004 is in operation, including periods of startup and shutdown. Units shall be in degrees Fahrenheit (°F). The accuracy for each thermocouple, monitor, and recorder shall be guaranteed by the manufacturer to be within ±1% of the temperature being measured or ±5°F, whichever is greater. The temperature monitor and recorder shall be installed, calibrated, operated, and maintained in accordance with the manufacturer's recommendations, instructions, and the operating manuals, with any modifications deemed necessary by the permittee.

   c) The permittee shall collect and record the following information each day when emissions unit P004 is in operation for the RTO:

      (1) any 3-hour block of time, when emissions unit P004 was in operation, during which the average combustion temperature within the RTO was more than 50°F below the average temperature

measured during the most recent performance test that demonstrated the emissions unit was in compliance; and

(2) a log or record of the operating time for the capture (collection) system, the thermal oxidizer, the monitoring equipment, and the associated emissions unit.

d) Whenever the monitored average combustion temperature within the RTO deviates from the range or limit established in accordance with this permit, the permittee shall promptly investigate the cause of the deviation. The permittee shall maintain records of the following information for each investigation:

(1) the date and time the deviation began;

(2) the magnitude of the deviation at that time;

(3) the date the investigation was conducted;

(4) the name(s) of the personnel who conducted the investigation; and

(5) the findings and recommendations.

In response to each required investigation to determine the cause of a deviation, the permittee shall take prompt corrective action to bring the operation of the control equipment within the acceptable range/limit specified in this permit, unless the permittee determines that corrective action is not necessary and documents the reasons for that determination and the date and time the deviation ended. The permittee shall maintain records of the following information for each corrective action taken:

(6) a description of the corrective action;

(7) the date corrective action was completed;

(8) the date and time the deviation ended;

(9) the total period of time (in minutes) during which there was a deviation;

(10) the temperature readings immediately after the corrective action was implemented; and

(11) the name(s) of the personnel who performed the work.

e) Investigation and records required by this paragraph do not eliminate the need to comply with the requirements of OAC rule 3745-15-06 if it is determined that a malfunction has occurred.

4. Reporting Requirements

a) The permittee shall submit quarterly summaries of the following records for the RTO:

(1) any 3-hour block of time when emissions unit P004 was in operation during which the average combustion temperature within the RTO was more than 50°F below the average temperature

maintained during the most recent performance test that demonstrated the emissions unit was in compliance; and

(2) a log of the operating time for the capture system, the thermal oxidizer, the monitoring equipment, and the emissions unit.

The quarterly reports shall be submitted in accordance with the reporting requirements of the Standard Terms and Conditions in Section A of this permit.

5. Testing Requirements

a) The permittee shall conduct, or have conducted, emissions testing for emissions unit P004 per the following requirements:

(1) The emissions testing shall be conducted within 1 year after permit issuance to demonstrate compliance with the VOC capture efficiency. The emissions testing shall be conducted within six months prior to the permit expiration to demonstrate compliance with the VOC destruction efficiency or the VOC ppmvd outlet concentration.

Note that adjustments to the VOC overall control efficiency limitation might be necessary based on the results of the emissions test that will be performed for emissions unit P004 after implementation of the VOC RACT control measures.

a. The capture efficiency shall be determined using Methods 204 through 204F, as specified in 40 CFR Part 51, Appendix M, or the permittee may request to use an alternative method or procedure for the determination of capture efficiency per U.S. EPA's "Guidelines for Determining Capture Efficiency," dated January 9, 1995. (Ohio EPA will consider the request, including an evaluation of the applicability, necessity and validity of the alternative, and may approve the use of the alternative if such approval does not contravene any other applicable requirement.)

b. The destruction efficiency (that is, the percent reduction in mass emissions between the inlet and outlet of the control system) shall be determined per the test methods and procedures specified in OAC rule 3745-21-10 or an alternative test protocol approved by Ohio EPA. The test methods and procedures selected shall be based on a consideration of the diversity of the organic species present and the total concentration, and on a consideration of the potential presence of interfering gases.

c. The outlet concentration shall be determined based on the results of emission testing conducted in accordance with Methods 1-4 and 18, 25 or 25A, as appropriate, of 40 CFR Part 60, Appendix A.

(2) During the emissions testing, the EUs shall be operated under operational conditions approved in advance by the appropriate Ohio DO/LAA. Operational conditions that may need to be approved include, but are not limited to, the production rate, the type of material processed, material make-up (solvent content, etc.) or control equipment operational limitations (burner temperature, precipitator voltage, etc.). In general, testing shall be done under worst-case conditions expected during the life of the permit. As part of the information provided in the

Intent-to-Test (ITT) notification form described below, the permittee shall provide a description of the EU operational conditions they will meet during the emissions testing and describe why they believe worst-case operating conditions will be met. Prior to conducting the test(s), the permittee shall confirm with the appropriate Ohio EPA DO/LAA that the proposed operating conditions constitute worst-case. Failure to test under the approved conditions may result in Ohio EPA not accepting the test results as a demonstration of compliance.

(3) Not later than 30 days prior to the proposed test date(s), the permittee shall submit an ITT notification to the appropriate Ohio EPA DO/LAA. The ITT notification shall describe in detail the proposed test methods and procedures, the EU operating parameters, the time(s) and date(s) of the test(s) and the person(s) who will be conducting the test(s). Failure to submit such notification for review and approval prior to the test(s) may result in the Ohio EPA DO/LAA's refusal to accept the results of the emission test(s).

(4) Personnel from the appropriate Ohio EPA DO/LAA shall be permitted to witness the test(s), examine the testing equipment and acquire data and information necessary to ensure that the operation of the EUs and the testing procedures provide a valid characterization of the emissions from the EUs and/or the performance of the control equipment.

(5) A comprehensive written report on the results of the emissions test(s) shall be signed by the person(s) responsible for the tests and submitted to the appropriate Ohio EPA DO/LAA within 30 days following completion of the test(s). The permittee may request additional time for the submittal of the written report, where warranted, with prior approval from the appropriate Ohio EPA DO/LAA.

C. Emissions Unit Terms and Conditions

1. P004, Extrusion Process

Operations, Property and/or Equipment Description:

Extrusion process including cooling, pelletizing, and screening. The various particulate emission sources are controlled by Dust Collector DC-1701, while the off-gases from the extruders are controlled by a regenerative thermal oxidizer (RTO).

a) This permit document constitutes a PTI issued in accordance with ORC 3704.03(F) and a PTO issued in accordance with ORC 3704.03(G).

(1) For the purpose of a PTI document, the EU T&C identified below are federally enforceable with the exception of those listed below which are enforceable under state law only.

a. None.

(2) For the purposes of a PTO document, the EU T&C identified below are enforceable under state law only with the exception of those listed below which are federally enforceable.

a. See b)(1)b.

b) Applicable Emissions Limitations and/or Control Requirements

(1) The specific operation(s), property, and/or equipment that constitute each emissions unit along with the applicable rules and/or requirements and with the applicable emissions limitations and/or control measures are identified below. Emissions from each unit shall not exceed the listed limitations, and the listed control measures shall be specified in narrative form following the table.

	Applicable Rules/Requirements	Applicable Emissions Limitations/Control Measures
a.	OAC rule 3745-31-05(A)(3)(a)(ii)	The BAT requirements under OAC rule 3745-31-05(A)(3) do not apply to the VOC and PE from this air contaminant source since the calculated annual emission rates are less than 10 tpy taking into account the federally enforceable restriction from OAC rule 3745-31-05(D) for VOC and the voluntary restriction from OAC rule 3745-31-05(F) for PE.
b.	OAC rule 3745-31-05(D) [Federally enforceable requirements to comply with OAC rule 3745-21-11(B) and to avoid Title V]	VOC emissions shall be vented to a thermal oxidizer with an overall control efficiency of at least 96%, by weight, or an outlet concentration of 7 ppmvd, as propane. See Facility-Wide Terms and Conditions B.2. through B.5. above and b)(2)a. below.
c.	OAC rule 3745-31-05(F)	PE from Dust Collector DC-1701 shall not exceed 0.01 gr/dscf, or Dust Collector DC-1701

	[Voluntary restriction to avoid BAT and Title V]	shall control PE with a control efficiency of at least 99%, by weight. See b)(2)b. below.
d.	OAC rule 3745-17-07(A)(1)	Visible PE from the stacks of Dust Collector DC-1701 and the RTO shall not exceed 20% opacity, as a 6-minute average, except as provided by rule.
e.	OAC rule 3745-17-11(B)(1)	The PE limitation required by this rule is less stringent than the voluntary restriction established per OAC rule 3745-31-05(F).

(2) Additional Terms and Conditions

a. The VOC emissions from this emissions unit shall be vented to the RTO at all times the emissions unit is in operation.

b. The particulate emissions from this emissions unit shall be vented to Dust Collector DC-1701 at all times the emissions unit is in operation.

c) Operational Restrictions

(1) None.

d) Monitoring and/or Recordkeeping Requirements

(1) See Facility-Wide Terms and Conditions B.3. above.

(2) The permittee shall record any period of time (start time and date, and end time and date) when the emissions unit was in operation and the process emissions were not vented to Dust Collector and/or the RTO.

(3) The acceptable range for the pressure drop across Dust Collector DC-1701 shall be based upon the manufacturer's specifications, until such time as any required performance testing is conducted and an alternative pressure drop range and/or limit is established to demonstrate compliance.

(4) The permittee shall properly install, operate, and maintain equipment to continuously monitor the pressure drop, in inches of water, across Dust Collector DC-1701 when the controlled emissions unit is in operation, including periods of startup and shutdown. The permittee shall record the pressure drop across the dust collector on daily basis. The monitoring equipment shall be installed, calibrated, operated, and maintained in accordance with the manufacturer's recommendations, instructions, and operating manuals, with any modifications deemed necessary by the permittee.

(5) Whenever the monitored value for the pressure drop deviates from the limit or range established in accordance with this permit, the permittee shall promptly investigate the cause

of the deviation. The permittee shall maintain records of the following information for each investigation:

a. the date and time the deviation began;

b. the magnitude of the deviation at that time;

c. the date the investigation was conducted;

d. the name(s) of the personnel who conducted the investigation; and

e. the findings and recommendations.

In response to each required investigation to determine the cause of a deviation, the permittee shall take prompt corrective action to bring the operation of the control equipment within the acceptable range specified in this permit, unless the permittee determines that corrective action is not necessary and documents the reasons for that determination and the date and time the deviation ended. The permittee shall maintain records of the following information for each corrective action taken:

f. a description of the corrective action;

g. the date corrective action was completed;

h. the date and time the deviation ended;

i. the total period of time (in minutes) during which there was a deviation;

j. the pressure drop readings immediately after the corrective action was implemented; and

k. the name(s) of the personnel who performed the work.

Investigation and records required by this paragraph do not eliminate the need to comply with the requirements of OAC rule 3745-15-06 if it is determined that a malfunction has occurred.

(6) This range or limit on the pressure drop across Dust Collector DC-1701 is effective for the duration of this permit, unless revisions are requested by the permittee and approved in writing by the appropriate Ohio EPA DO/LAA. The permittee may request revisions to the permitted limit or range for the pressure drop based upon information obtained during future testing that demonstrate compliance with the allowable particulate emission rate for the controlled emissions unit. In addition, approved revisions to the range or limit will not constitute a relaxation of the monitoring requirements of this permit and may be incorporated into this permit by means of an administrative modification.

(7) The permittee shall perform daily checks, when the emissions unit is in operation and when the weather conditions allow, for any visible particulate emissions from the stacks of DC-1701 and the RTO. The presence or absence of any visible emissions shall be noted in an operations log.

If visible emissions are observed, the permittee shall also note the following in the operations log:

a. the color of the emissions;

b. whether the emissions are representative of normal operations;

c. if the emissions are not representative of normal operations, the cause of the abnormal emissions;

d. the total duration of any visible emissions incident; and

e. any corrective actions taken to minimize or eliminate the visible emissions.

If visible emissions are present, a visible emissions incident has occurred. The observer does not have to document the exact start and end times for the visible emissions incident under item d)(7)d. above or continue the daily check until the incident has ended. The observer may indicate that the visible emissions incident was continuous during the observation period (or, if known, continuous during the operation of the emissions unit). With respect to the documentation of corrective actions, the observer may indicate that no corrective actions were taken if the visible emissions were representative of normal operations, or specify the minor corrective actions that were taken to ensure that the emissions unit continued to operate under normal conditions, or specify the corrective actions that were taken to eliminate abnormal visible emissions.

(8) Modeling to demonstrate compliance with, the "Toxic Air Contaminant Statute", ORC 3704.03(F)(4)(b), was not necessary because the emissions unit's maximum annual emissions for each toxic air contaminant, as defined in OAC rule 3745-114-01, will be less than 1.0 tpy. OAC Chapter 3745-31 requires a permittee to apply for and obtain a new or modified PTIO prior to making a "modification" as defined by OAC rule 3745-31-01. The permittee is hereby advised that changes in the composition of the materials, or use of new materials, that would cause the emissions of any toxic air contaminant to increase to above 1.0 tpy may require the permittee to apply for and obtain a new PTIO.

e) Reporting Requirements

(1) See Facility-Wide Terms and Conditions B.4. above.

(2) The reports required by this permit may be submitted through Ohio EPA's eBusiness Center: Air Services online web portal; or they may be mailed as a hard copy to the appropriate Ohio EPA DO/LAA.

(3) The permittee shall submit an annual Permit Evaluation Report (PER) to the appropriate Ohio EPA DO/LAA by the due date identified in the Authorization section of this permit. The PER shall cover a reporting period of no more than 12 months for each air contaminant source identified in this permit.

(4) The permittee shall identify in the annual PER the following information concerning the operations of the dust collector during the 12-month reporting period for this emissions unit:

a. each day when the pressure drop across Dust Collector DC-1701 was outside of the range specified by the manufacturer and outside of the acceptable range following any required compliance demonstration;

b. any period of time (start time and date, and end time and date) when the emissions unit was in operation and the process emissions were not vented to Dust Collector DC-1701;

c. each incident of deviation described in e)(4)a. where a prompt investigation was not conducted;

d. each incident of deviation described in e)(4)a. where prompt corrective action, that would bring the pressure drop into compliance with the acceptable range, was determined to be necessary and was not taken; and

e. each incident of deviation described in e)(4)a. where proper records were not maintained for the investigation and/or the corrective action(s), as identified in the monitoring and record keeping requirements of this permit.

(5) The permittee shall identify the following information in the annual PER in accordance with the monitoring requirements for visible emissions in term d)(7):

a. all days during which any visible particulate emissions were observed from the stack of Dust Collector DC-1701 and/or the RTO; and

b. any corrective actions taken to minimize or eliminate the visible particulate emissions.

f) Testing Requirements

(1) Compliance with the Emissions Limitations and/or Control Requirements specified in section b) of these terms and conditions shall be determined in accordance with the following methods:

a. <u>Emissions Limitation</u>

VOC emissions shall be vented to a thermal oxidizer with an overall control efficiency of at least 96%, by weight, or an outlet concentration of 7 ppmvd, as propane.

<u>Applicable Compliance Method</u>

See Facility-Wide Terms and Conditions B.5. above.

b. <u>Emissions Limitation</u>

PE shall not exceed 0.01 gr/dscf from Dust Collector DC-1701, or Dust Collector DC-1701 shall control PE with a control efficiency of at least 99%, by weight.

<u>Applicable Compliance Method</u>

Compliance with the PE limitation and control efficiency requirements identified above shall be based on the company-supplied design estimates as supplied in PTIO

application #A0071510 received May 6, 2022, or the manufacturer's specifications and/or guarantees.

c. Emissions Limitation

Visible PE from stacks of Dust Collector DC-1701 and the RTO shall not exceed 20% opacity, as a 6-minute average, except as provided by rule.

Applicable Compliance Method

If required, compliance with the stack visible PE limitation identified above shall be determined through visible emissions observations performed in accordance with Method 9 of 40 CFR Part 60, Appendix A.

g) Miscellaneous Requirements

(1) None.

VOC RACT STUDY

LG Chem America Inc.

Prepared By:

TRINITY CONSULTANTS
29425 Chagrin Blvd.
Suite 360
Pepper Pike, OH 44124
(216) 278-0500

Revision 2- September 2026

Project 263602.0072

TABLE OF CONTENTS

1. BACKGROUND 1-1

2. FACILITY OVERVIEW 2-1
   2.1 General Facility Information 2-1
   2.2 Source Overview 2-2

3. RACT DETERMINATION 3-1

APPENDIX A. EMISSION CALCULATIONS A-1

APPENDIX B. SOURCE INFORMATION B-1

APPENDIX C. RTO SPECIFICATIONS C-1

APPENDIX D. PRELIMINARY CAPTURE EFFICIENCY ESTIMATE D-1

APPENDIX E. PERFORMANCE TEST E-1

LIST OF FIGURES

Figure 2-1. Area Map for LG Chem 2-1

LIST OF TABLES

Table 2-1. P004 Source Overview 2-3

Table 3-1. Proposed RACT Determination for P004 3-2

APPENDIX: LIST OF FIGURES

Appendix Figure B-1. Plot Plan B-3

APPENDIX: LIST OF TABLES

Appendix Table B-1. General Source Information B-1

Appendix Table B-2. Annual Production Rates for 2023-2025 B-1

Appendix Table B-3. Average and Maximum Daily and Annual Actual VOC Emissions [a] B-2

1. BACKGROUND

On March 25, 2022, the Ohio Environmental Protection Agency (Ohio EPA) promulgated revisions to the volatile organic compound (VOC) regulations in Chapter 3745-21 of the Ohio Administrative Code (OAC). These revisions were adopted following the reclassification of the Cleveland area to moderate nonattainment and the Cincinnati area to marginal nonattainment for the 2015 8-hour Ozone National Ambient Air Quality Standard (NAAQS).

Among other changes, OAC 3745-21-11 requires facilities located in Butler, Clermont, Cuyahoga, Geauga, Hamilton, Lake, Lorain, Medina, Portage, Summit, or Warren County with potential VOC emissions greater than 100 tons per year (tpy) from non-Control Technique Guideline (non-CTG) sources to conduct a detailed engineering study. The purpose of this study is to evaluate the technical and economic feasibility of reducing VOC emissions and to establish Reasonably Available Control Technology (RACT) for affected sources.

On April 1, 2025, Ohio EPA promulgated additional revisions to Chapter 3745-21 following the reclassification of the Cleveland area to serious nonattainment for the 2015 8-hour Ozone NAAQS. As part of these revisions, the applicability threshold in OAC 3745-21-11(A) for non-CTG sources located in Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, and Summit counties was lowered from 100 tpy to 50 tpy of potential VOC emissions.

On June 29, 2026, the U.S. Environmental Protection Agency redesignated the Cleveland area, including Portage County, to attainment for the 2015 ozone NAAQS and approved Ohio's maintenance plan through 2038. The redesignation does not, however, rescind or otherwise alter the applicability provisions of OAC 3745-21-11.

The LG Chem America Inc. (LG Chem) Ravenna Facility, located in Portage County, has the potential to emit VOC greater than 50 tpy from non-CTG sources. Accordingly, the facility is subject to the requirements of OAC 3745-21-11 and must submit a VOC RACT engineering study. The following sections present the VOC RACT study prepared for the LG Chem Ravenna Facility.

2. FACILITY OVERVIEW

2.1 General Facility Information

LG Chem owns and operates a plastic pellet manufacturing facility located in Portage County. The facility is located at 310 Rayann Parkway, Ravenna, OH 44266. The facility is an Acrylonitrile Butadiene Styrene (ABS) compound plant that produces ABS colored pellets for use in various industrial applications, including car and home appliance parts and construction materials.

Figure 2-1 is an area map that shows the site location relative to predominant geographical features such as highways and railroads.

Figure 2-1. Area Map for LG Chem

Facility information required by sections (1) through (4) of OAC 3745-21-11(B) is provided as follows:

a) The complete facility name, Ohio EPA air program facility identification number, and address:

LG Chem America Inc.
Facility ID 1667060181
310 Rayann Parkway
Ravenna, OH 44266

b) The name, title, address and telephone number of the owner or operator's representative within the company who is the contact person for this facility regarding the engineering study and affected sources, and

Richard Schubert
EHS Manager
310 Rayann Parkway
Ravenna, OH 44266
404.862.7534
rschubert@lgchem.com

c) The name, title, address, and telephone number of the official who is responsible for approval of the engineering study:

Doohyung Lee
Project Manager, CEO of LGCOP
310 Rayann Parkway
Ravenna, OH 44266
470.792.5680
leoldh@lgchem.com

d) The standard industrial classification code and source classification code numbers which are applicable to the facility's operation:

SIC Code: 3087
SCC Codes: 30101821

2.2 Source Overview

Emission Unit P004 consists of the extrusion process used to manufacture ABS plastic pellets. The process blends and melts ABS dry powder resin, styrene-acrylonitrile (SAN) pellets, colorants, stabilizers, additives, and recycled off-spec pellets to produce finished plastic pellets for industrial applications. Raw materials are transferred from storage and feed hoppers to the extrusion lines where screw feeders convey the materials through heated extruder barrels, creating a homogeneous molten plastic mixture. The molten material is then forced through die nozzles to form strands, which are subsequently cooled in a water bath, dried, pelletized, screened, and conveyed to storage or packaging operations. The source does not use any coating materials or clean-up solvents.

Potential emissions from the extrusion process include particulate matter from dry material handling and screening operations, and VOC/HAP emissions from extruder off-gassing during the heating and melting of polymer materials and additives. The extrusion process off-gassing emissions are controlled by a regenerative thermal oxidizer (RTO).

The extrusion process is the only permitted source of VOC emissions at the facility. Therefore, it is the only emission source included in this RACT study. Table 2-1 below summarizes the PTE, controls, and existing emission limits for P004.

Table 2-1. P004 Source Overview

Emission Unit ID	Emission Unit Description	Current VOC Control	Uncontrolled VOC PTE (tpy)	VOC Limits[a]	VOC RACT Applicability
P004	Extrusion Process	Regenerative Thermal Oxidizer	252.14[b]	RTO Achieving 99% VOC Control, or 7 parts per million by volume (ppmvd) for VOC	RACT Study

a. The 99% VOC control limit reflects the RTO manufacturer's original design performance guarantee. Recent stack testing conducted in July 2026 demonstrated an actual VOC destruction efficiency of 98% (see Appendix E). This demonstrated destruction efficiency, together with a conservatively selected capture efficiency of 98% (Appendix D), forms the basis for the overall control efficiency proposed as RACT for P004 in Table 3-1.

b. Uncontrolled PTE is presented because the existing voluntary VOC limitation established under OAC 3745-31-05(F) is not federally enforceable and therefore cannot be relied upon for applicability determinations under OAC 3745-21-11.

Appendix B provides the source specific information required by OAC 3745-21-11(B)(1) through (7).

3. RACT DETERMINATION

As discussed in Section 1, LG Chem's Ravenna Facility is subject to the requirements of OAC 3745-21-11 because the facility has the potential to emit greater than 50 tons per year of VOC emissions from non-CTG sources. The extrusion process (i.e., P004) is the only VOC-emitting source at the facility subject to this RACT evaluation.

VOC emissions are generated during the heating and melting of polymer resins, additives, and colorants within the extrusion equipment. These emissions are routed to an RTO for control. The Ravenna Facility operates a regenerative thermal oxidizer which controls emissions from P004. The RTO was installed in 2024 and achieves a VOC destruction efficiency of at least 98%, as shown in Appendix E. Continuous monitoring of combustion temperature is conducted to ensure proper operation of the control device.

Facility-specific VOC speciation information indicates that the primary constituents of the controlled VOC stream are styrene and other aromatic compounds associated with ABS compounding operations. Based on the emissions profile and process design, the current control approach is representative of commonly applied technologies within the plastics compounding industry.

LG Chem reviewed relevant determinations in the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC) for similar extrusion and plastics compounding operations. The review indicated that regenerative thermal oxidizers (RTOs) achieving VOC destruction efficiencies ranging from approximately 95% to 98% are commonly identified as Best Available Control Technology (BACT) for comparable VOC emission units. The existing RTO at the Ravenna Facility achieves a VOC destruction efficiency of at least 98%, which equals or exceeds the level of control identified as BACT for similar operations. Because RACT is generally considered a less stringent standard than BACT, the existing RTO control system represents a level of control that satisfies RACT requirements for the P004 extrusion process.

As shown in Appendix B, actual annual VOC emissions from P004 are very low, under 10 tons per year during representative operation. The existing RTO achieves a minimum VOC destruction efficiency of 98%, leaving only a minimal quantity of residual VOC emissions after control. Because the source is already controlled using a high-efficiency thermal oxidation system, there are no technically feasible add-on control technologies that would provide meaningful additional VOC reductions beyond those currently achieved.

Implementation of additional controls or replacement of the existing RTO would therefore result in negligible incremental VOC reduction at a disproportionate cost per ton of VOC removed. Accordingly, additional controls would not be economically reasonable for this source and would not represent further reasonably available control technology.

Based on the technical and economic considerations evaluated for this source, LG Chem proposes that RACT for P004 consist of the continued operation of the existing RTO. OAC 3745-21-01(B)(16)(a)(ii) defines one form of source-specific RACT as "[a] control system requirement with an overall control efficiency, expressed as an overall per cent reduction." Accordingly, LG Chem proposes an overall control efficiency of 96%, based on a capture efficiency of 98% and an RTO destruction efficiency of 98%.

Based on process-area VOC concentration measurements provided by LG Chem and summarized in Appendix D, the existing capture system is preliminarily estimated to achieve approximately 99% capture efficiency. Because these measurements were not obtained through a formal capture-efficiency test, LG Chem has conservatively selected a capture efficiency of 98% as the basis for the proposed RACT

requirement. Combined with an RTO destruction efficiency of 98%, this capture efficiency corresponds to an overall VOC control efficiency of approximately 96%. LG Chem therefore proposes an overall VOC control efficiency of at least 96% as RACT for P004. LG Chem will conduct a capture-efficiency study in accordance with U.S. EPA Method 204, or another method approved by Ohio EPA, to demonstrate compliance with the approved RACT requirement. In the interim, LG Chem will continue to operate and maintain the existing RTO and capture system in accordance with applicable operating requirements.

The proposed RACT determination for P004 is summarized in Table 3-1.

Table 3-1. Proposed RACT Determination for P004

Emission Unit ID	Emission Unit Description	Proposed RACT Determination
P004	Extrusion Process	• Operation of an RTO with an overall control efficiency of at least 96%, by weight for VOC, or • 7 ppmvd VOC at the outlet of the RTO

APPENDIX A. EMISSION CALCULATIONS

Table 1. Potential Emissions Inventory, Summary of Potential Emissions
LG Chem America, Inc., ABS Compound Plant, Portage County, Ohio

Pollutant	RTO (tons/yr)	Bag Filters (tons/yr)	Dust Collector DC-1701 (tons/yr)	Vacuum Cleaner (tons/yr)	Emergency Generator	Cooling Towers (tons/yr)	Paved Roadways (tons/yr)	R&D Customer Solution Center	TOTAL (tons/yr)
PM filterable	0.021	7.604	5.691	0.285	0.008	0.290	2.188	0.500	16.586
PM10 filterable	0.021	7.604	5.691	0.285	0.008	0.290	0.437	0.500	14.835
PM2.5 filterable	0.021	7.604	5.691	0.285	0.008	0.290	0.108	0.500	14.506
PM condensable	0.062				0.009				0.071
SO2	0.007				0.443				0.450
NOx	14.175				0.886				15.061
CO	11.435				0.001				11.435
VOC	4.618				0.239			0.500	5.357
Styrene	0.432								0.432
Toluene	0.180								0.180
Ethylbenzene	0.175								0.175
Acrylonitrile	0.015								0.015
Aceptophenone	0.009								0.009
Hexane	0.020								0.020
Formaldehyde	0.001				0.018				0.019
Total HAP	0.831				0.028				0.859
CO2	1314.000				95.073				1409.073
CH4	0.025				0.199				0.224
N2O	0.024				0.0002				0.024

Customer Solution Center potential emissions are based on engineering knowledge and will be validated through recordkeeping.

Table 2. Potential Emissions Inventory, Regenerative Thermal Oxidizer (RTO) Process and Pilot Emissions
LG Chem, ABS Compounding Plant, Ohio

Input Data

1. Maximum RTO Exhaust Flow Rate	12,000	scfm
2. RTO Burner Capacity	2.5	MMBtu/hr
3. Natural Gas/Waste Gas (HHV)	1,000	Btu/scf
4. Maximum Operating Hours	8,760	hrs/yr
5. Waste Gas/Natural Gas Consumption:	2,500	scf/hr
	21,900,000	scf/yr

Emissions Methodology

1. NOx, CO, VOC potential emissions from RTO outlet are calculated using manufacturer performance guarantees.
2. HAP emissions (styrene, toluene, ethylbenzene, acrylonitrile, and acetophenone) calculated using inlet concentration based on process knowledge of the gas stream.
   HAP destruction efficiency: 99 %, manufacturer
3. Emissions of other pollutants are calculated using AP-42, Section 1.4, *Natural Gas Combustion* , July 1998.
4. VOC control efficiency: 96 %, calculated

Emission Calculations

Pollutant	Emission Factor/Rate	Units	Potential Emissions (lbs/hr)	Potential Emissions (tons/yr)
PM filterable	1.9	lb/mmscf	0.005	0.021
PM condensable	5.7	lb/mmscf	0.014	0.062
SO2	0.6	lb/mmscf	0.002	0.007
NOx	72	mg/m3	3.236	14.175
CO	3.63E-06	lb/dscf	2.611	11.435
Process VOC	578.8	mg/m3	1.041	4.558
Natural Gas Combustion VOC	5.5	lb/mmscf	0.014	0.060
Total VOC	-		1.054	4.618
Styrene	219.4	mg/m3	0.099	0.432
Toluene	91.5	mg/m3	0.041	0.180
Ethylbenzene	88.9	mg/m3	0.040	0.175
Acrylonitrile	7.4	mg/m3	0.003	0.015
Acetophenone	4.7	mg/m3	0.002	0.009
Hexane	1.8	lb/mmscf	0.005	0.020
Formaldehyde	0.075	lb/mmscf	0.000	0.001
Total HAP			0.190	0.831
CO2	120,000	lb/mmscf	300.000	1314.000
CH4	2.3	lb/mmscf	0.006	0.025
N2O	2.2	lb/mmscf	0.006	0.024

CO Performance Guarantee:	50.0	ppmv
	28.0	lb/lb-mole (Molecular weight CO)
	3.63E-06	lbs/dscf

Requested Allowable Limits
LG Chem requests the following limits to allow for flexibility in their operations.

Pollutant	Requested Emissions Limit (lbs/hr)	Requested Emissions Limit (tons/yr)	
NOx	3.236	14.175	Manufacturer Performance Guarantee
CO	2.611	11.435	Manufacturer Performance Guarantee
Total VOC	1.054	4.618	Manufacturer Performance Guarantee
Styrene	0.205	0.9	PTE with added flexibility and variability
Toluene	0.114	0.5	PTE with added flexibility and variability
Ethylbenzene	0.114	0.5	PTE with added flexibility and variability
Acrylonitrile	0.023	0.1	PTE with added flexibility and variability
Acetophenone	0.023	0.1	PTE with added flexibility and variability
Hexane	0.023	0.1	PTE with added flexibility and variability
Formaldehyde	0.002	0.010	PTE with added flexibility and variability
Total HAP	0.505	2.210	

© 2026 LG Chem, Ltd. All rights reserved.

Table 3. Potential Emissions Inventory, Bag Filters, Dust Collector and Vacuum Cleaner Filter Particulate Emissions
LG Chem America, Inc., ABS Compound Plant, Portage County, Ohio

Input Data

Air Flow Rates

Bag Filters BF-1011A-F & BF-1012A-F	633	scfm
Bag Filter BF-1211A	633	scfm
Bag Filter BF-1001A-F & BF-1002A-F	633	scfm
Bag Filter BF-1211B	633	scfm
Bag Filter BF-1511 through BF-1516	633	scfm
Dust Collector DC-1701	15,159	scfm
Vacuum Cleaner Filter VC-1711	758	
Maximum Operating Hours	8,760	hrs/yr

Emissions Methodology

Outlet (controlled) emissions calculated using an expected outlet grain loading that is expected to be guaranteed by the manufacturer, once chosen.
Uncontrolled emissions are calculated by back-calculating the controlled emissions using the grain loading and the expected filtering efficiency of the filter.

Expected Outlet Grain Loading:	0.01	gr/dscf, per each dust collector, bag filter or vacuum cleaner filter.
Expected Filtering Efficiency:	99	% (a higher efficiency may be guaranteed)

Emission Calculations

Emissions Unit	Emissions Source	Control Device	Number of Filters	Maximum Operating Hours	Filtering Efficiency (%)	Expected Outlet Grain Loading (gr/dscf per bag filter)	Flow Rate (scfm per bag filter)	Controlled Potential PM Emissions (lbs/hr)	Controlled Potential PM Emissions (tons/yr)	Uncontrolled Potential PM Emissions (lbs/hr)	Uncontrolled Potential PM Emissions (tons/yr)
ABS Dry Powder Raw Material Handling	ABS Storage Silos HP-1011A-F (6 units) HP-1012A-F (6 units)	Bag Filters BF-1011A-F (6 units) BF-1012A-F (6 units)	12	8,760	99	0.01	633	0.651	2.851	65.099	285.134
ABS Dry Powder Raw Material Handling	Drain Hopper HP-1211A	Bag Filter BF-1211A	1	8,760	99	0.01	633	0.054	0.238	5.425	23.761
SAN Pellets Raw Material Handling	SAN Storage Silos HP-1001A-F (6 units) HP-1002A-F (6 units)	Bag Filters BF-1001A-F (6 units) BF-1002A-F (6 units)	12	8,760	99	0.01	633	0.651	2.851	65.099	285.134
SAN Pellets Raw Material Handling	Drain Hopper HP-1211B	Bag Filter BF-1211B	1	8,760	99	0.01	633	0.054	0.238	5.425	23.761
Product Packaging	Product Storage Silos (6 units) HP-1511 through HP-1516	Bag Filter (6 units) BF-1511 through BF-1516	6	8,760	99	0.01	633	0.325	1.426	32.550	142.567
ABS Dry Powder Material Handling SAN Pellets Raw Material Handling Additional Additives Raw Material Handling Extrusion Process Product Packaging	Discharge Hoppers BBD-1011/1012 Weighing Scale Hoppers WS-1111/1112 Mixers MX-1111/1112 Conveying Hoppers HP-1111/1112 Extrusion Line Receiving Hoppers HP-1201A-1205A Mixture Feeders FD-1301A-1305A Discharge Hoppers BBD-1001/1002 Weighing Scale Hoppers WS-1101/1102 Mixers MX-1101/1102 Conveying Hoppers HP-1101/1102 Extrusion Line Receiving Hoppers HP-1201B-1205B Mixture Feeders FD-1301B-1305B Additive Material Weighing AWM-1201 DP Weighing Hoppers HP-1201E-1205E Mixers MX-1201D-1205D ADD Mixture Hoppers HP-1201D-1205D Mixture Feeders FD-1301D-1305D Extrusion Line Recycle Hoppers HP-1201C-1205C Extruders EX 1401-1405 Vibrating Screens VS-1401-1405 Pellet Receiving Cyclones CY-1501A-1505A Pellet Receiving Hoppers HP-1501A-1505A Loading Chutes LC-1511-1516	Dust Collector DC-1701	1	8,760	99	0.01	15,159	1.299	5.691	129.938	569.130
Facility-Wide	Vacuum Cleaner VC-1711: Equipment/floor cleanup during product grade changes	Vacuum Cleaner Filter VC-1711	1	8,760	99	0.01	758	0.065	0.285	6.497	28.457
TOTAL								3.10	13.58	310.03	1,357.94

Table 4. Potential Emissions Inventory, Natural Gas-Fired Emergency Generator
LG Chem America, Inc., ABS Compound Plant, Portage County, Ohio

Input Data

Manufacturer	TBD
Engine Make/Model	TBD
Engine Type	4SRB
Engine Power (bhp)	402
BSFC HHV (Btu/bhp-hr)	8,600
HHV (Btu/scf)	1,000
Annual Hours of Operation	500
Fuel Use Rate (SCF/hr)	3,457.20
Heat Input (MMBtu/hr)	3.46
Annual Fuel (MMSCF/yr)	1.73

Emissions Methodology

1. NOx, CO and NMNEHC emission factors represent the emission standards in 40 CFR Part 60, Subpart JJJJ.
2. All other emission factors are from AP-42, Section 3.2, *Natural Gas-fired Reciprocating Engines,* 7/2000.
3. VOC emissions equal NMNEHC plus formaldehyde.

Emission Calculations

Pollutants	Emission Factor	Units	Potential Emissions (lbs/hr)	Potential Emissions (tons/yr)
PM Filterable	9.50E-03	lb/MMBtu	0.033	0.008
PM Condensable	9.91E-03	lb/MMBtu	0.034	0.009
NOx	2.00	g/bhp-hr	1.772	0.443
CO	4.00	g/bhp-hr	3.545	0.886
SO2	5.88E-04	lb/MMBtu	0.002	0.001
VOC			0.957	0.239
NMNEHC	1.00	g/bhp-hr	0.886	0.222
Formaldehyde	2.05E-02	lb/MMBtu	0.071	0.018
Benzene	1.58E-03	lb/MMBtu	0.005	0.001
Toluene	5.58E-04	lb/MMBtu	0.002	0.000
Ethylbenzene	2.48E-05	lb/MMBtu	0.000	0.000
Xylenes	1.95E-04	lb/MMBtu	0.001	0.000
Total HAPS less Formaldehyde	1.19E-02	lb/MMBtu	0.041	0.010
Total HAPS			0.112	0.028
CO2	110.00	lb/MMBtu	380.292	95.073
CH4	0.23	lb/MMBtu	0.795	0.199
N2O	1.00E-04	kg/MMBtu	0.001	0.000

Table 5. Potential Emissions Inventory, Cooling Towers
LG Chem America, Inc., ABS Compound Plant, Portage County, Ohio

Input Data

CT-1601 Cooling Tower Recirculation Rate:	660	gal/min
CT-1602 Cooling Tower Recirculation Rate:	660	gal/min
Total Dissolved Solids (TDS) Concentration:	500	mg/l; South Korea facility TDS is shown at approximately 151 mg/l.
Maximum Operating Hours:	8,760	hrs/yr

Emissions Methodology

Emission factor contained in AP-42, Section 13.4, Wet Cooling Towers, 1/95. The factor is the total liquid drift, based on a drift rate of 0.02%.
PM is assumed equal to PM-10 and PM-2.5.

Emission Calculations

Cooling Tower Description	Recirculation Rate (gal/min)	Recirculation Rate (gal/yr)	Operating Hours	TDS Concentration (mg/l)	Drift Factor (% of circulation)	Potential Emissions (lbs/hr) PM	Potential Emissions (lbs/day) PM	Potential Emissions (tons/yr) PM
CT-1601 Cooling Tower	660	3.47E+08	8,760	500	0.02	0.0331	0.7936	0.1448
CT-1602 Cooling Tower	660	3.47E+08	8,760	500	0.02	0.0331	0.7936	0.1448
TOTAL						0.0661	1.5871	0.2897

Table 6. Potential Emissions Inventory, Paved Plant Roadways
LG Chem America, Inc., ABS Compound Plant, Portage County, Ohio

Input Data

Trip Description	Paved or Unpaved	Round Trip Mileage	Empty Weight of Vehicle (tons)	Filled Weight of Vehicle (tons)	Average Weight of Vehicle	Estimated Trips per Day	Estimated Trips per Year	Vehicle Miles Traveled per Day	Vehicle Miles Traveled per Year
Incoming Raw Material Trucks	Paved	0.08	52.5	75	63.75	15	5,475	1.25	456
Outgoing Product Trucks	Paved	0.08	52.5	75	63.75	15	5,475	1.25	456
Employee Vehicles	Paved	0.08	3.5	3.5	3.5	75	27,375	5.68	2,074
TOTAL									2,986

Emissions Calculations Methodology

Emission factors are derived using the equations and constants contained in AP-42, Section 13.2.1, "*Paved Roads* ", 1/2011, as follows:

$E = [k*(sL)^{0.91}*(W)^{1.02}] * (1-P/4N)$ (Equation 2)

Where:
E = Emission factor (lb/VMT) Miles Traveled
k = empirical constant (lb/VMT)
sL = Road surface Silt loading (g/m^3) - Used 'Landfill' silt content
W = mean vehicle weight, tons
P = number of days in a year with at least 0.01 in of precipitation
N = Averaging Period (365 for annual, 91 for seasonal, and 30 for monthly)

Emissions Calculations

Trip Description	Pollutant	k	sL	W	P	N	Emission Factor (lb/VMT)	Vehicle Miles Traveled per Day	Vehicle Miles Traveled per Year	Potential Emissions (lbs/day)	Potential Emissions (tons/yr)
Incoming Raw Material Trucks	PM (Filt)	0.011	7.4	63.75	130	365	4.29	1.25	456	5.363	0.979
	PM10 (Filt)	0.0022	7.4	63.75	130	365	0.858	1.25	456	1.073	0.196
	PM2.5 (Filt)	0.00054	7.4	63.75	130	365	0.211	1.25	456	0.264	0.048
Outgoing Product Trucks	PM (Filt)	0.011	7.4	63.75	130	365	4.29	1.25	456	5.363	0.979
	PM10 (Filt)	0.0022	7.4	63.75	130	365	0.858	1.25	456	1.073	0.196
	PM2.5 (Filt)	0.00054	7.4	63.75	130	365	0.211	1.25	456	0.264	0.048
Employee Vehicles	PM (Filt)	0.011	7.4	3.5	130	365	0.222	5.68	2,074	1.261	0.230
	PM10 (Filt)	0.0022	7.4	3.5	130	365	0.044	5.68	2,074	0.250	0.046
	PM2.5 (Filt)	0.00054	7.4	3.5	130	365	0.011	5.68	2,074	0.063	0.011
TOTAL	PM (Filt)									11.986	2.188
	PM10 (Filt)									2.395	0.437
	PM2.5 (Filt)									0.590	0.108

Table 7 Potential Emissions Inventory, Various Input Data
LG Chem America, Inc., ABS Compound Plant, Portage County, Ohio

Maximum Operating Hours:	8,760	

Maximum Raw Materials/Production

Raw Materials	ABS Dry Powder:	2,750	lb/hr
	SAN Pellets:	6,400	lb/hr
	Dry Additive/Color Master Blend:	720	lbs/hr
	Additional ABS Dry Powder:	440	lbs/hr
	Recycle Material	275	lbs/hr

Maximum Production	4.2	MT/hr	4.630	tons/hr	Provided by LG Chem
			9,260	lbs/hr	
	36,800	MT/yr	40,560	tons/yr	8760 hrs/yr
Expected Production	30,000	MT/yr	33,070	tons/yr	Provided by LG Chem

RTO Manufacturer Data

Manufacturer	Durr Systems, Inc. (or similar)	
Model	Oxi X RM 12	
Design Flow Rate	12,000	scfm
RTO Burner Capacity	2.5	MMBtu/hr
Natural Gas/Waste Gas (HHV)	1,000	Btu/scf
Temperature Sensor Location	TBD	
Minimum Temperature	TBD	
Combustion Chamber Residence Time	TBD	
Inlet Gas Temperature	100	F
Outlet Gas Temperature	TBD	

RTO Inlet Concentration Estmated for HAP Speciation

Pollutant	Inlet Concentration (mg/m3)	Inlet Mass Rate (lb/hr)	Weight percent of VOC
Total VOC	578.8	26.02	100.00
Styrene	219.4	9.86	37.91
Toluene	91.5	4.11	15.81
Ethylbenzene	88.9	4.00	15.36
Acrylonitrile	7.4	0.33	1.28
Aceptophenone	4.7	0.21	0.81
Non-HAP VOC	166.9	7.50	28.84

Inlet Concentrations provided by LG Chem in file entitled *PM Cal._ Basis_R2_20220407.xlsx*

Table 7 Potential Emissions Inventory, Various Input Data
LG Chem America, Inc., ABS Compound Plant, Portage County, Ohio

Bag Filters Design Data		
Manufacturer	Not yet chosen	
Model	Not yet chosen	
Design Flow Rate	16.7	Nm3/min
	18	sm3/min
	633	scfm
Filter Type	Cartridge	
Pressure Type	Negative	
Fabric Cleaning Mechanism	Pulse Jet	
Operating Pressure Drop Range	TBD	
Dust Collector DC-1701 Design Data		
Manufacturer	Not yet chosen	
Model	Not yet chosen	
Design Flow Rate	400	Nm3/min
	429	sm3/min
	15,159	scfm
Filter Type	Cartridge	
Pressure Type	Negative	
Fabric Cleaning Mechanism	Pulse Jet	
Operating Pressure Drop Range	TBD	
Vacuum Cleaner Design Data		
Manufacturer	Not yet chosen	
Model	Not yet chosen	
Design Flow Rate	20	Nm3/min
	21	sm3/min
	758	scfm
Filter Type	Cartridge	
Pressure Type	Negative	
Fabric Cleaning Mechanism	Pulse Jet	
Operating Pressure Drop Range	TBD	
Cooling Towers		
CT-1601 and CT-1602 Recirculation Rate:	150	m3/hr, each
	5,297	scf/hr, each
	39,626	gal/hr, each
	660	gpm, each
Miscellaneous Conversion Data		
Normal Temperature	32	F
	492	R
Normal Pressure	14.696	psia
Standard Temperature	68	F
	528	R
	14.696	psia

Table 8. Potential Emissions Inventory, Summary of Particulate Emissions by Emission Unit in the PTIO Application
LG Chem America, Inc., ABS Compound Plant, Portage County, Ohio

The values in the table below are provided in the PTIO forms on an emissions unit basis. These values over-estimates particulate emissions because DC-1701 and Vacuum Cleaner Filter are listed in each emission unit and not parsed.

Emissions Unit	PM PTE (lb/hr)	PM PTE (tpy)	PM Uncontrolled lb/hr)
ABS Dry Powder Raw Material Handling	2.07	9.06	206.96
SAN Pellets Raw Material Handling	2.07	9.06	206.96
Additional Additives Raw Material Handling	1.36	5.98	136.44
Extrusion Process	1.38	6.06	136.45
Product Packaging	1.69	7.40	168.98

Appendix Table B-1. General Source Information

Emission Unit ID	Emission Unit Description	Current Ohio EPA Application Number	Installation Date (Month and Year)	Operating Schedule (hrs/day / days/week/ weeks/yr)	Control Equipment	Control Device Installation Date	Most Recent Emissions Test
P004	Extrusion Process	A0071510	5/2024	24/7/52	Regenerative Thermal Oxidizer	5/1/2024	July 30, 2026

Appendix Table B-2. Annual Production Rates for 2023-2025

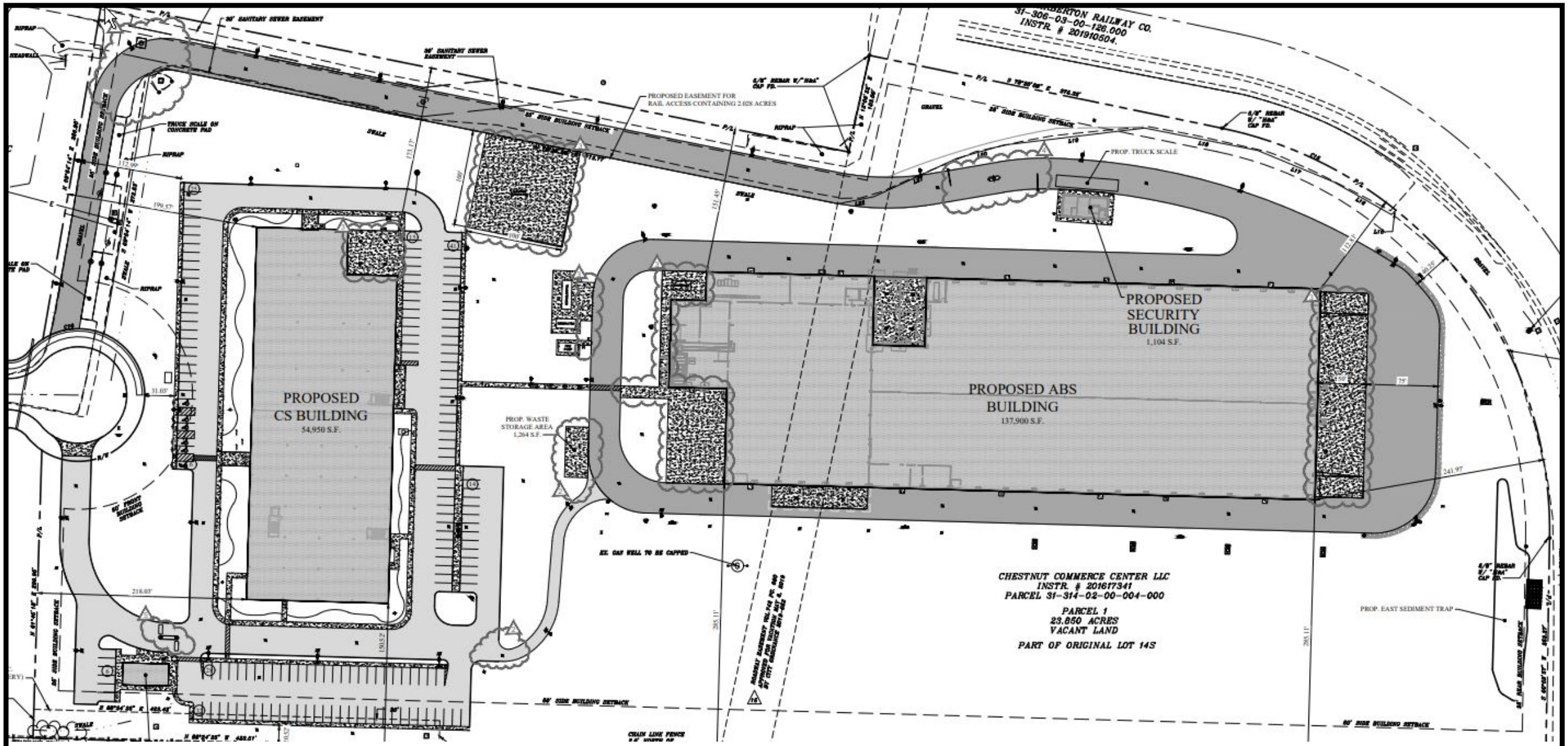
Emission Unit ID	Production Units	Average Daily Production Rates (lbs)			Maximum Daily Production Rates (lbs)			Annual Production Rates (lbs)		
		2023	2024	2025	2023	2024	2025	2023	2024	2025
P004	lbs	Did Not Operate	43,096	76,476	Did Not Operate	368,538	301,312	Did Not Operate	2,025,532	16,748,321

Appendix Table B-3. Average and Maximum Daily and Annual Actual VOC Emissions [a]

OEPA Emission Unit ID	Emission Unit Description	Average Daily VOC Emissions (lb/day)	Maximum Daily VOC Emissions (lb/day)	Annual VOC Emissions (tpy)
P004	Extrusion Process	12.61	12.61	2.30

a. Given that the facility started in 2024 and therefore does not have 3 full years of production data, the values shown in this table are based on the July 30, 2026 performance test results, provided in Appendix E.

Appendix Figure B-1. Plot Plan



LG Chem

VOC RACT STUDY

APPENDIX B-1: PLOT PLAN

LG CHEM OHIO PETROCHEMICAL
310 RAYANN PARKWAY
RAVENNA, OHIO 44266
MAY 2026

APPENDIX C. RTO SPECIFICATIONS

LEADING IN
PRODUCTION
EFFICIENCY

www.durr.com

DY PNF for LG Chemical ABS Compounding

Portage County, Ohio

Dürr Proposal # US04-140577.6

Your contact
Nina Zerman

Dürr Systems, Inc.
Clean Technology Systems
26801 Northwestern Highway
Southfield, MI 48033
USA

Phone +1 248-921-2804
Email nina.zerman@durrusa.com

Dürr Systems, Inc. • Southfield, MI | De Pere, WI

Your reference:	LG Chemical ABS Compounding
Our reference:	US04-140577.6
Your contact person:	Nina Zerman
Department:	Sales
Phone:	+1 248-921-2804
E-mail:	nina.zerman @durrusa.com
Date:	3/23/2022

DY PNF
Mr. Min Jae Kim
Gasun Digital 1-ro
Geumcheon-gu
Seoul
Korea

Subject: Oxi.X RM 12 Regenerative Thermal Oxidizer & Auxiliaries

Dear Mr. Min Jae Kim,

Pursuant to LG Chemical's request, we are presenting this updated proposal that includes only the items that LGC specified. This is as the result of Durr's recent meeting to LGC facility in Ravenna, Ohio and our recent project discussions/communications with LGC team members. This proposal contains the description and price of Oxi.X RM12 RTO system, with VOC Entrapment Chamber, two Process Fans each with an Aluminum Inlet Cone and Graphite Coated Wheels, one Combustion Blower, one Control Panel for the Oxi.X RM and one Process Fan VFD, Explosion Proof Instruments and Exhaust Stack including Ladder, Platform, and Personnel Protection, Gas Train with Enclosure, Ductwork for both Process Fans and ISBL for the RTO. This complete Dürr system is designed to operate 24/7 providing reliable performance allowing the production facility to operate without interruptions.

Regarding LGC's request pursuant to the traffic study for avoiding potential damages during shipment, Durr's protocol is as follows: Durr's Freight Carrier will order the permits and perform a traffic study on the optimum route to ensure safe delivery of the equipment from De Pere, WI to the jobsite in Ravenna, OH. The respective traffic study will take into consideration all bridges, road construction or any other potential hazard. In addition, the equipment will be fully tarped. Please refer to Section 4.1.1 for a complete explanation regarding this topic. The cost of the above referenced traffic study is included in the freight costs.

LG companies have been among Dürr's valued clients for years in the U.S. and Asia. It would be our pleasure to add the Portage County project to the list of our successful installations at an LG plant.

We strongly believe that Durr is positioned to be an optimum partner to LGC for the VOC treatment, RTO system. Durr is a financially stable, strong international company that is technically advanced, and quality control-driven with in-depth knowledge of VOC treatment systems among other emission control products.

As a Single Source Supplier for this multicomponent system, Dürr has optimized the equipment selection and layout of the entire system, taking responsibility for the performance of each component and coordination of the operations of the entire system. This complete Dürr multi-VOC Abatement System is compact and modularized for quick installation. Dürr design and scope is in compliance with the stated requirements providing the emission guarantees of 99% for the RTO system.

Working with Dürr you can expect the following:

1 Years of successful installation in hybrid systems that include Dürr RTOs with other Dürr Pollution Control Equipment including Carbon Adsorption Systems, Acid Gas Scrubbers, Wet Electrostatic Precipitators, SCRs with full Integration.

2 Professional, brilliant, committed, and excited team of engineers devoted to diligently working with LGC through and post-project execution

3 State-of-the-art, technologically advanced, patented Air Pollution Control (APC) equipment that offers reliable, automated, modern operations.

4 Optimum design and construction that will significantly increase the life expectancy of the equipment.

5 Reliable performance of the complete system due to the design features of our equipment.

6 Superior quality control protocols.

7 Dürr Systems has been in business for over 125 years with annual revenues that are in the range of $4.75 billion which translates into a financially sound and stable partner for LGC.

8 The passionate team of field service personnel, who will adeptly guide you through the installation, start-up process and offer support for continued operations of the Complete Pollution Control System.

Please review this detailed proposal with attachments and let me know if you have any questions or comments. I am planning to visit your facility in Ohio, in the next couple of weeks. In the meantime, I will gladly set up a virtual proposal review meeting to go over the proposal and answer any questions that you might have.

Our mission is to contribute to the success of this very exciting VOC abatement project.

Best regards,

Nina Zerman
Key Account Manager

Kevin D. Kennard Sr., P.E.
Senior Applications Engineer

Update status

The table below lists all versions of the document.

Version	Date	Change/Reason
1.0	11.18.2021	Initial Budget
1.1	01.21.2022	Firm
1.2	02.21.2022	Firm
1.3	03.07.2022	Firm
1.4	03.21.2022	Firm
1.5	03.23.2022	Firm
1.6	03.23.2022	Firm

The reproduction, distribution and utilization of this document as well as the communication of its contents to others without explicit authorization is prohibited. Offenders will be held liable for the payment of damages. All rights reserved in the event of the grant of a patent, utility model or design.

Table of Contents

1 Dürr – in Brief 7
2 Equipment Recommendation 11
3 Industry References 12
4 Pricing and Commercial Summary 13
5 Design Basis and Utilities 16
6 Warranty and Guarantee 18
7 Scope and Detailed Description 21
8 Product Operation, Features, and Expanded Details 28
9 Exceptions and Clarifications 29
10 Attachments 31

1 Dürr – in Brief

The DÜRR Group, headquartered in Bietigheim-Bissingen, Germany, is a global mechanical and plant engineering firm. Products, systems and services offered by DÜRR enable highly efficient manufacturing processes in various industries. DÜRR operations are worldwide including +16,000 employees with company-owned production and assembly facilities and a global sales and service network spread across 112 locations in 33 countries.

The DÜRR Group consists of five operating divisions:

Paint & Final Assembly Systems (PFS)
Application Technology (APT)
Measuring & Process Systems (MPS)
Woodworking Machinery & Systems (WMS)
Clean Technology Systems (CTS)

- **DÜRR – Clean Technology Systems (CTS) Group** – **Americas** - has offices and/or plants in Southfield, Michigan, De Pere, Wisconsin, Vero Beach, Florida, Waterloo, Ontario, Canada, and Sao Paulo, Brazil.

Southfield, Michigan

De Pere, Wisconsin

The primary focus of DÜRR's Clean Technology Systems Division is engineering and supply of innovative environmental control technologies, industrial dryers and ovens, coating lines, and aftermarket services. Our global presence, distinct culture of innovation, and customer-focused employees offer distinct advantages to our customers.

1.1 Dürr CTS Solutions – Why we do, What we do…

- We help our customers thrive by ensuring compliance with environmental regulations and projecting a positive public image. Dürr understands emission requirements, globally and in each region.
- We produce dryers and coating lines with innovative features that technically differentiates us while providing reliable and energy efficient operation.
- We provide new equipment and rebuild services to our customers supported by our exemplary parts and service business.
- We contribute to a clean environment and public health through delivering the most innovative environmental solutions while minimizing energy consumption.
- **We let you focus on your business while we handle the business of air pollution control.**

1.2 Business Platforms

Our products and technologies are installed in a wide range of markets and applications. As an OEM, we offer a strong heritage of technical solutions and innovation from three business platforms:

1.2.1 Environmental Solutions–Air Exhaust Treatment

- Systems to control VOCs, CO, NOx, SOx, HAPs, odor and particulate matter
- Solvent recovery and distillation
- Gas cleaning and conditioning
- Liquid purification systems
- Energy recovery

1.2.2 Engineered Products–Coating, Drying & Web Handling

- Custom designed ovens and dryers
- Specialized coating lines and material handling systems for battery electrode production
- Digital printing drying solutions

1.2.3 Aftermarket Services–Equipment Upgrades & Technical Service

- Rebuilds/refurbishing of existing equipment
- Process energy optimization services
- Installation services/equipment moves
- RTO heat recovery bed replacements
- Heat recovery and re-use
- Dryer upgrades
- Parts and Service

1.3 Technology / Engineering / Equipment

R&D and Innovation

We possess 100+ patents in our technical portfolio. We've pioneered advances that remain the foundation of industry applications. This is our heritage, and our future.

Broad Range of Customized Solutions

Our experience covers a wide spectrum of industrial applications in the following major market segments:

Chemical Production	Odor	Wood Products
Surface Treatment	Automotive	Metals & Mining
Lithium Ion Battery Production	Semiconductor	Pharmaceutical

We design and engineer to meet specific customer needs. Our solutions portfolio ensures we objectively select and engineer the best solution for your application.

1.4 Product and System Quality / Technical and Process Knowledge

Quality

As an OEM, lean manufacturing practices such as Six Sigma are integral across the shop floor across our fabrication plants. Our commitment to quality control ensures every unit and system delivers unmatched reliability. We are an ISO 9001 certified company and we encourage our customers to visit any of our offices or manufacturing facilities at any time.

Turnkey Installations

Whatever solution you require and however complex it may be, our engineers and cross-discipline teams will work to find the solution that meets your business goals. We provide

anything from site assistance personnel up to and including total turnkey installation services.

1.5 Resources and Customer Support

Industry-Recognized Experts

In addition to the functional disciplines of engineering, our team is deep in applications and process knowhow. From drying and coating lines, distillation systems to gas purification; adsorption with zeolites or carbon beds; wet, dry or semi-dry absorbers for acid gas removal; electrostatic precipitators for particulate capture and removal, our staff of engineers possess expertise in a variety of applications spanning a large array of markets.

Maintenance Made Easy

Preventive maintenance services, coupled with reliable components and construction, provide maximum operational performance and system uptime for the life of the equipment. With more than 150 service professionals located worldwide, we are available when you need us for equipment maintenance, upgrades, and performance optimization; operating cost reduction services; and regulatory compliance assistance.

Project Management

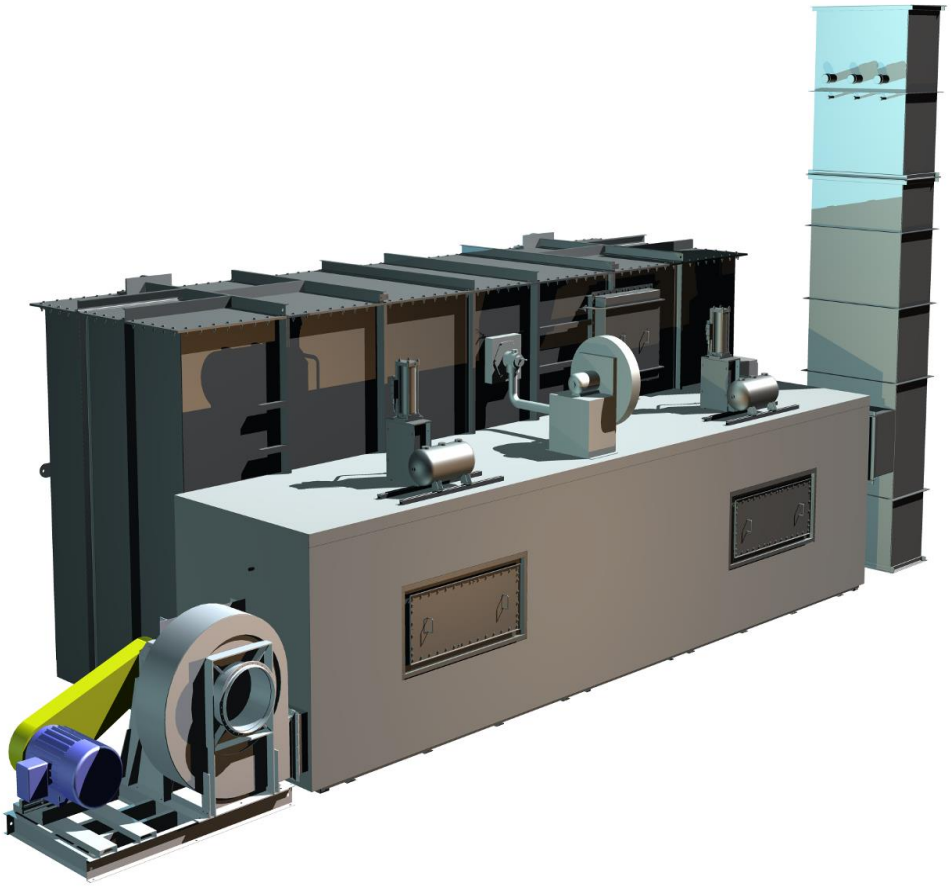
Along with providing technology solutions, we also help implement them through our dedicated project management teams. Our experience is exemplified by the execution of thousands of projects and meeting performance objectives on time and within budget for every project, large or small.

Aftermarket Services

Our team of engineers and technical support representatives bring decades of engineering, manufacturing and service experience to your application – upgrades and rebuilds; parts and technical support; process and energy optimization services; catalyst and carbon testing; environmental monitoring and reporting systems; and thermal air management.

2 Equipment Recommendation

2.1 Oxi.X RM Details & Advantages



Reliable Dürr Systems design poppet style valves
Media beds – simple, twin bed design
Media chamber – positive separation of media beds without metal divider walls
Modular construction – 99% factory complete, simple and economical installation
Proven design – over 1000 installations since 1992
Industry references – success in challenging applications containing particulates, aerosols, corrosive compounds, high temperature air streams and silicone

3 Industry References

Location: Michigan
Unit Size: Oxi**.X** 08

Location: Missouri
Unit Size: Oxi**.X** 10

Location: Texas
Unit Size: Oxi**.X** 15

Location: Canada
Unit Size: Oxi**.X** 15

Location: New Jersey
Unit Size: Oxi**.X** 15

Location: New Zealand
Unit Size: Oxi**.X** 12

4 Pricing and Commercial Summary

4.1 Pricing

Base Equipment Offering	Pricing
One (1) Oxi**.X** RM 12 System	$690,900
– Oxi.X RM 12 RTO	Included
– VOC Entrapment Chamber	Included
– Ductwork from VOC Entrapment Chamber to upstream of Process Fans	Included
– Gas Train Enclosure	Included
– Exhaust Stack	Included
– 1 Control Panel for 1 Process Fan VFD • Please note that the above control panel does **NOT** have the ability to operate both fans in the current scope of supply after removing the second control panel and second VFD. During the project execution phase, the control panel modification will be designed to operate both fans (one at a time) and Durr will submit a change order (for the additional equipment and electrical engineering) to DY PNF to have the ability to operate both fans in a "one at a time" mode. Durr has already discussed with LGC that this respective mode could lend itself to RTO shutdowns and LGC stated that this mode of operation was acceptable.	Included
– Adder for Allen Bradley Price Increases	Included
– Adder for Aluminum Inlet Cone for 2 Process Fans	Included
– Adder for Graphite Coated Wheel for 2 Process Fans	Included
– Adder for Explosion Proof Instruments	Included
– Adder for Exhaust Stack Ladder, Platform and Personnel Protection	Included
– Painting of the following 4 areas from Durr Standard Color Pallet: • RTO Unit Proper (Oxi.X RM 12 and VOC Entrapment Chamber • Guarding • Natural Gas Piping • Compressed Air Piping (NOTE: if colors are not from Durr Standard Color Pallet and/or if more areas of equipment require painting than what is listed above, there will be a price adder)	Included
– Steel Price Escalation and Supplier Surcharges	Included

All pricing in USD unless otherwise specified.

Due to the volatility of the steel market, this price will remain valid for 15 days.

Note: Due to the current instability of steel and transportation markets, price and delivery for the stated work is based upon costs and availability of materials and freight services at the time of this proposal. Dürr Systems, Inc. reserves the right to review price and availability of materials and services and pass on additional surcharges or make delivery revisions as required
.

4.1.1 Shipment

- Shipment Terms: **FOB** De Pere, WI / Pre-paid and billed back to customer
- Estimated Freight to City of Ravenna, OH… $ TBD
- Total contract does not include freight. Actual freight charges plus a 10% handling fee will be billed back at time of shipment.
- Durr's Freight Carrier will order the permits and perform a traffic study on the optimum route to ensure safe delivery of the equipment from De Pere, WI to the jobsite in Ravenna, OH. The respective traffic study will take into consideration all bridges, road construction or any other potential hazard. In addition, the equipment will be fully tarped.

Note: For customer arranged Full Truckload Open/Oversized Trailer (flatbed, drop deck) Freight Pickups, Dürr Systems will charge an additional handling fee of 0.3% of equipment sales value. Equipment value does not include accessorial fees such as installation, startup, etc. This fee shall not apply to enclosed/dock loadable trailers, cargo vans, LTL, and parcel shipments.

4.1.2 Delivery

Oxi**.X** RM Manufacture and delivery	28-30 weeks*
Oxi**.X** RM Installation	2-3 additional weeks*
Oxi**.X** RM System start-up	1-2 additional weeks*

*Equipment delivery to be confirmed at the time a purchase order is issued by buyer and accepted by Dürr. All stated delivery and performance dates are subject to revision in the event of a delay outside the control of Dürr, including, but not limited to, delays related to the current supply chain unpredictability, material and labor shortages and material and equipment delivery delays being experienced globally by the Dürr group and its vendors and subcontractors.

4.2 Dürr Payment Terms

All payments due net 30 from invoice unless otherwise noted.

Standards Payment Conditions are as follows.

1) Advance Payment: 15% by T/T within 30 Days after PO date against the Advance Payment Bond and the Performance Bond with Payment Bond terminating upon completion of Milestone 2.
2) Key Vendor Documents approval: 15% by T/T within 30 Days after approval of key Vendor Documents.
3) After Purchase Order of Main Material: 30% by T/T within 30 Days after completion of Purchase Order for main material.
4) Upon Notification of equipment readiness to ship: 30% by T/T within 30 Days after submission of notification of readiness to ship and receiving Warranty Bond.
5) Completion of Acceptance Test: 5% by T/T within 30 Days after successful completion of the acceptance test not to exceed 90 days from notification of equipment readiness to ship.
6) Completion of Final V/P: 5% by T/T within 30 Days after completion of final data book not to exceed 120 days from notification of equipment readiness to ship

4.3 General Terms and Conditions of Sale

Please click **HERE** to view Dürr's Terms and Conditions, under the Dürr Systems North America General Terms and Conditions of Sale link.

4.4 Purchasing Information

Purchase orders should be made out to Dürr Systems, Inc.

For your convenience, purchase orders should be sent to our PO e-mail address or to our fax number provided below:

E-mail address: po@durrusa.com
Fax number: 734-459-5837

Using these two means of sending your Purchase Order will ensure timely response and processing of your order.

All prices exclude any taxes, duties, broker fees, value-added taxes, income taxes, withholding taxes or any other allowances.

Customer must supply tax-exemption certificate or resale certificate with purchase order.

5 Design Basis and Utilities

5.1 Customer Process Basis

Process Condition	Details and Comments
Description of Process	ABS Compounding
Process Exhaust Flow	11,413 SCFM
Process Exhaust Temperature	70 °F
Process Humidity	1.26 vol% (assumed, none specified)
VOC within Process Exhaust	Styrene, Toluene, Ethyl Benzene, BD Dimer (1,4 Butadiene), α-Methyl Styrene, AN (Acrylonitrile), C12 Hydrocarbons, Isopropyl Benzene, Propyl Benzene, Benzaldehyde, 2-Phenyl-2-Propanol, 2,2,4,6,6-pentamethyl Heptane, Acetophenone, sec-Butyl Benzene, Allyl Benzene, Acetone, iso-Butyl Benzene, BuOH (Butanol)
VOC Heat of Combustion	17,529 Btu/lb
VOC Loading	578.8 mg/m3 (approx. 148 ppmv)
Particulate Loading	None Specified

5.2 Equipment Sizing/Design

RTO Sizing and Design	Details and Comments
Maximum Air Flow	12,000 SCFM
Minimum Air Flow	2,400 SCFM
Maximum VOC Capacity	2,628,165 Btu/hr (149 lbs/hr @ 17,529 Btu/lb)
Maximum Process Exhaust Temperature	100 °F
Allowable Static Pressure at RTO Fan Inlet	2.0“ w.c.
Oxidizer Weight (approximate) Fan Weight (approximate) VOC Entrapment Chamber, Exhaust Stack	65,000 lbs 5,500 lbs 10,000 lbs
Oxidizer Length (approximate)	34’-4” including the VOC Entrapment Chamber and Exhaust Stack, excluding the Process Fans
Oxidizer Width (approximate)	13’-4”
Oxidizer Height (approximate)	11’-2” excluding the VOC Entrapment Chamber and Exhaust Stack
Sandblast, prime and finish paint	#15 Charcoal

5.3 Utility Connections

Utilities	Values subject to final engineering
Natural Gas Flow @ 1,000 Btu/ft^3	2,500 SCFH
Natural Gas Pressure	5 psig ± ¼ psig
Air Requirement[1]	5 CFM @ 80-100 psig, -40°F dew point
Power Requirement	460v/3Ø/60hz
Maximum Power Consumption[2]	85 KVA

5.4 Estimated Utility Consumption

Design Condition	Flow Rate (SCFM)	VOC Load (lbs/hr)	Fuel Required (Gross BTU/hr)	Electrical Use (kW)
Full Flow (Max VOCs)	11,413	24.5	1,600,000	42.0
Full Flow (No VOCs)	11,413	0	2,300,000	41.2

Operating costs are based on:

- 1,000 gross BTU/ft3 for Natural Gas
- The above fuel consumption values include burner efficiencies and radiant heat losses

[1] Dryer and pipe sizing should accommodate peak consumption of 15 CFM @ 80 psi(g)
[2] Reflects actual power usage, not component or line sizing for single, protected power feed

6 Warranty and Guarantee

6.1 Product Warranty

Equipment sold and commissioned by a Dürr Systems, Inc., or representative will be warranted as follows:

Twelve (12) months after the date of the successful completion of acceptance test at the Plant Site, or Eighteen (18) months after notification of readiness to ship of all Works pursuant to the Purchase Order, whichever is later - **Included in Cost of Unit**.

OR

Eighteen (18) months after the date of the successful completion of acceptance test at the Plant Site, or thirty (30) months after notification of readiness to ship of all Works pursuant to the Purchase Order, whichever is later - **USD $9,500**.

This warranty will provide service for one (1) year to repair or replace warranted parts at no charge for labor or material.

Only incurred airfare, car rental, living expenses (food and lodging) and overtime premiums (the difference between the applicable overtime rate and the standard straight time rate) will be billed to the customer.

Warranty service means remedying any defects in workmanship and material found in the equipment.

Expendable parts will not be included under warranty.

Note: Compounds such as, but not limited to, heavy metals, halogens, sulfur, and alkali compounds can degrade the ceramic fiber insulation and oxidizer internal components. These compounds will void the warranty if found in process stream. These can originate from chlorinated solvents, fluorides, etc.

For further data, see the **Dürr Systems, Inc. Terms and Conditions** sheet.

6.2 Performance Guarantees

Dürr Systems, Inc. offers the following Performance Guarantee relative to emissions. Any and all Performance Guarantees not listed below including but not limited to those that may be listed in any Buyer's specifications and/or permits are explicitly excluded.

6.2.1 Hydrocarbon (VOC)

If all of the performance conditions, as defined in section 5.1 Customer Process Basis, are satisfied, then the oxidation equipment will reduce the concentration of gaseous phase hydrocarbons measured at the inlet of the oxidizer as compared to the concentration of gaseous phase hydrocarbons measured at the outlet (i.e. discharge stack) of the oxidizer by 99% or to a lower limit of 7 ppmv average as C3 as verified by U.S. EPA test method 25A. Mutually agreed test methods will be used to measure and subtract Methane.

6.2.2 Oxides of Nitrogen (NOx)

Dürr guarantees that the outlet emission of NO_x will be <72 mg/m3 (uncorrected, expressed as nitrogen dioxide, NO_2) per U.S. EPA test method 7E. This guarantee is predicated upon only the Burner NOx contribution being considered and no Process NOx contribution from the thermal oxidation of Acrylonitrile contained in the process exhaust or any other nitrogen containing hydrocarbons or ammonia type compounds in the process exhaust.

6.2.3 Carbon Monoxide (CO)

Dürr guarantees that the outlet emission of CO will not exceed 50 ppm_v (uncorrected) per U.S. EPA test method 10. This guarantee is predicated upon an inlet CO concentration of 0 ppm_v in the process exhaust.

6.2.4 Thermal Efficiency

Dürr Systems, Inc. guarantees the oxidizer thermal efficiency at nominal 95% ± 2.0%. Thermal efficiency (TER) is defined as follows:

$$TER = \frac{M_0 C_0 (T_C - T_0)}{M_i C_i (T_C - T_i)} \times 100\%$$

Where:

1) TER = Thermal Efficiency, %
   M_o, M_i = Outlet, inlet mass flow rate, respectively
   C_o, C_i = Average outlet, inlet heat capacity, respectively
   T_c = RTO combustion chamber temperature
   T_o = Average exhaust temperature
   T_i = RTO inlet temperature

2) T_o and T_i are time averaged temperatures over several complete RTO regeneration cycles.

6.3 Criteria

- The equipment will be installed, operated and maintained by Buyer in accordance with Dürr instructions. This will include replacing of consumable or replaceable components by Buyer, as required.
- This performance guarantee is valid through the successful performance testing of the equipment as outlined in this proposal. Testing must be performed within (6) six months of commissioning, not to exceed (9) months from notification of equipment ready to ship.
- Should the equipment fail to meet the testing criteria, Dürr shall be given reasonable time and opportunity to adjust the system.
- Dürr Systems, Inc. reserves the right to adjust the oxidation temperature to achieve conformance.
- Owner shall perform any maintenance activities and make ready the equipment prior to testing as required by Dürr Systems, Inc.
- Performance warranties are based on steady-state production conditions and do not include data measured during operational transients, or during maintenance operation.
- All performance tests will be arranged and paid for by Buyer. Dürr will be notified in writing 14 days prior to the tests for scheduling purposes.

7 Scope and Detailed Description

7.1 Project Scope of Supply

Description of Services or Supply	I	N	O	Detail/Comments
				I = Included, N = Not Included, O = Optional
Specification Basis				
Specifications incorporated	X			Material Requisition – Job # PC2145, Requisition # PC2145-015, please refer to Section 9.1 for a listing of Exceptions and Clarifications
Diverter Technology				
Poppet Valves	X			Dürr designed and manufactured
Proximity Switches	X			Pepperl & Fuchs or equal
Regenerative Chamber				
Heat exchange media	X			Structured
Bed temperature monitoring	X			Three (3) thermocouples per media bed
Combustion chamber temperature monitoring	X			(2) dual-element thermocouples are included
Insulation	X			Ceramic Fiber Modules
Cold face construction	X			Carbon Steel
Chamber materials of construction	X			Carbon Steel
Burner and Gas Train				
Natural gas burner	X			North American or equivalent
UV Scanner	X			Honeywell or equivalent
Blocking Valves	X			Maxon or equivalent
Natural gas meter		X		
Combustion blower	X			New York Blower or equivalent with inlet filter, arrangement 4, 3600 rpm
Combustion blower motor	X			Baldor-Reliance or equal, 5 HP (motor size subject to final engineering)
Combustion blower materials of construction				Base Price – Carbon Steel;
Exhaust Fan(s)				
Process exhaust fan	X			New York Blower or equivalent Direct drive
Fan materials of construction				Base Price – Carbon Steel;

Description of Services or Supply	I	N	O	Detail/Comments
Fan motor	X			Baldor-Reliance or equal, 60 HP (motor size subject to final engineering)
Fan motor VFD	X			Mitsubishi
Fan inlet duct	X			Carbon Steel; refer to GA drawing for scope of supply
Fan outlet duct	X			Carbon Steel; refer to GA drawing for scope of supply
Fan expansion joints	X			Inlet and Outlet
Fan monitoring package		X		2) fan bearing thermocouples, (2) vibration sensors, (3) 100Ω platinum RTDs (one for each winding with a spare)
Bearing Fluting Protection		X		Insulated motor bearings
Fan inlet box		X		Carbon steel
Process Interface Equipment				
Isolation damper		X		
Fresh air damper	X			Electric
Barometric damper		X	X	
Process “T” damper(s)		X	X	
Process source ductwork		X	X	
Process instrumentation		X	X	
Exhaust Stack				
Exhaust stack	X			20 feet from grade, carbon steel
Access platform and ladder		X	X	
Personnel protection	X			Minimum 8 feet from grade
Test ports for emission testing	X			
Drain	X			
Interconnecting ductwork		X	X	
High VOC Control				
Hot-side bypass damper		X		
Insulated interconnection duct		X		
Self-Cleaning Operation				
Offline bakeout	X			
VOC Entrapment System				
Entrapment Chamber and Damper	X			See Design Features for details (refer to Section 8.2)
Flush return piping	X			
Chamber insulation and cladding	X			

Description of Services or Supply	I	N	O	Detail/Comments
Electrical Equipment				
Control room		X		
Equipment power feed		X		(1) required
Equipment power distribution	X			
Control panel	X			NEMA 4, 2 door
Programmable Logic Controller (PLC)	X			Allen-Bradley Compact Logix
Human Machine Interface (HMI)	X			Panel View Plus 1000 or equivalent
Digital data recorder	X			2 Hardware and 12 Software Channels
Burner Management System (BMS)	X			Honeywell
Duct pressure transmitter	X			Siemens
UL listed components	X			
Remote diagnostic capability		X		Via PROCESSMONITOR™ system
Wiring of oxidizer-mounted components	X			Completed at factory, including motors
Remote operator panel	X			Contains HMI and data recorder
Remote process interface panel		X		
Ethernet connection and protocol	X			
Programming and HMI screen development	X			Dürr standard
General Conditions				
Building Permits		X		
EPA Permits		X		
Adherence to Local Ordinances		X		
Bonding		X		
Insurance		X		
Taxes		X		
Temporary utilities		X		
Daily job site clean-up		X		
Building alterations, penetrations		X		
Temporary storage area on-site		X		
Area lighting		X		
Demolition and disposal work		X		
Footings and foundations		X		
Structural support steel		X		
Furnish Trash Receptacles/Dumpsters, Trash Removal Services		X		

7.2 Installation

Description of Services or Supply	I	N	O	Detail/Comments
				I = Included, N = Not Included, O = Optional
Turnkey Installation				
Building				
Demolition of Existing Equipment		X		
Disposal of Existing Equipment		X		
Disposal of any and all asbestos, lead paint, or other hazardous materials.		X		
Structural Review of Roof Load Capacity		X		
Roof/Building Modification		X		
Wall Penetrations and Flashing		X		
Roof Penetrations and Flashing		X		
Civil Requirements				
Soil Testing		X		
Underground Utility Marking		X		
Foundation Design/Structural Supports		X		
Excavation and Material Removal		X		
Foundation/Concrete Requirements		X		Includes supply and install of anchors
P.E. Stamped Drawings		X		
Landscaping / Pavement		X		Includes mishaps or disturbances caused by installation
Permanent Security Fencing		X		
Safety Bollards		X		
Oxidizer Mechanical Installation				
Ground or Platform Mounted		X		
Exterior or Interior Installation		X		
Installation Location				City of Ravenna, Ohio
Crane Rental		X		Price assumes 25 ft. from crane pin to center of RTO pad
Loading of Heat Exchange Media	X			Factory installed
Exhaust Fan		X		
Expansion Joints		X		
Insulation/Cladding		X		
Exhaust Fan Inlet and Outlet Ductwork		X		
Exhaust Fan Inlet Box		X		

Description of Services or Supply	I	N	O	Detail/Comments
Oxidizer Assembly		X		
Insulation	X			Factory Installed
Burner Access Platform and Ladder		X		
Exhaust Stack		X		Free-standing stack may require embedded anchors into concrete
Gas Train / Piping	X			Factory Installed / One connection point
Gas Connection at Source		X		Valve
Gas Piping from RTO to Source		X		
Gas Train Vent Piping		X		Pressure regulators/switches/block & bleed
Gas Meter Installation		X		w/bypass
Compressed Air Piping / Accumulator	X			Factory Installed / One connection point
Air Connection at Source		X		Valve
Compressed Air Piping from RTO to Source		X		
Heat Tracing of Piping		X		
Hot-side Bypass		X		Not Applicable
VOC Entrapment Chamber		X		
Flush return line		X		VOC entrapment chamber to the fan inlet
Ductwork from Process to Oxidizer		X		
Designed for -15" wc per SMACNA Class 1		X		Rolled, welded and flanged
Standard Rooftop Duct Supports		X		Excludes attaching duct support to bldg structure
Access Doors		X		Every 20' or change in direction
Insulation		X		4" mineral wool
Cladding		X		20 ga aluminum embossed
Total Length of Ductwork		X		
Supply/Install Ductwork Expansion Joints		X		
Supply/Install Explosion Vents		X		
Fire Detection/Suppression System		X		
Fresh Air Damper		X		
Installation of Instrumentation Tubing		X		Process inlet pressure transmitter & duct negative pressure switch
P.E. Stamped Drawings		X		

Description of Services or Supply	I	N	O	Detail/Comments
Oxidizer Electrical Installation				
Reconnection of Electrical Shipping Splits		X		
Gas Train Components and Valves	X			Factory installed and wired
RTO Mounted Devices, Switches, T/C	X			Factory installed and wired
Fresh Air Damper Connection		X		
Remote Control Panel		X		
Remote I/O		X		
Substation		X		
Bus Plug		X		
Transformer		X		
Line Reactors		X		
Input Power Conditioning		X		
Circuit Protection at Power Source		X		
Power run from source to RTO		X		
Process Interlocks		X		
Tee Damper Wiring		X		
Duct Pressure Transmitter		X		
Temporary Lighting		X		
Temporary Power		X		
Perimeter Lighting		X		
P.E. Stamped Drawings		X		
Ground Grid		X		
Lightning Protection		X		
Site Conditions				
Temporary use of Office Utilities		X		
Secured on-site Storage Area		X		
Clear & Unobstructed Work Area		X		Access to receive/stage/pre-assemble, duration of project
Fire Protection		X		
Temporary Site Security Fence		X		
On-Site Services				
Installation Site Assistance			X	
Daily Site Clean Up		X		
Heavy Equipment Rentals		X		
Equipment Start-up			X	
Equipment Integration w/Existing Equipment		X		
Performance Testing		X		
Compliance Testing		X		

7.2.1 Customer Responsibility

- The following items are the responsibility of the customer unless included in a Dürr Systems installation package offered with this document.
- Installation/assembly of all Dürr Systems-supplied components
- Procurement and/or costs associated with any applications, permits, licenses or inspections are borne by the Customer.
- Gas, air and power supply to comply with Dürr Systems specifications. Any input power conditioning required for proper operation of variable frequency drives
- Coordination of equipment delivery, installation and startup scheduling. It is recommended that a Dürr Systems technician be on site for the initial mechanical assembly of the oxidizer system and also the startup
- Confirm process flow rates, process conditions, and interface considerations
- Provide documentation, specifications, drawings and other technical information associated with the process equipment to be connected to the oxidizer system
- Review and approve drawings submitted by Dürr Systems

7.2.2 Safety

Customer is responsible to provide Dürr Systems with existing Safety Program documentation for the purpose of evaluating potential safety hazards for Dürr Systems personnel and knowing what PPE will be required for specific hazards.

Unless otherwise specified Dürr safety practices shall govern.

8 Product Operation, Features, and Expanded Details

8.1 Air / Gas Ratio Control

- Controls the ratio of combustion air to gas
- Patented design offers precise control of the ratio of combustion air to fuel
- Reduces gas consumption by minimizing combustion air
- Provides a more stable flame
  Minimizes the production of combustion by-products such as NOx and CO

8.2 VOC Entrapment System

- Allows for capturing VOCs that are released to atmosphere when a valve switch occurs. In some VOC processes – such as plasticizers, Magie oils and similar VOCs – the untreated air can condense causing an intermittent visible plume with potential opacity issues. A VOC entrapment system is recommended to eliminate the visible plume emissions. This option includes a holding chamber and diverter damper

- The skin temperature of the oxidizer VOC entrapment chamber typically exceeds OSHA requirements. The customer is responsible for restricting access to the area to provide personnel protection. Dürr Systems can provide insulation and cladding to the bottom eight feet (8') of the VOC entrapment chamber, which will be the financial responsibility of the customer. Please contact Dürr Systems for additional information

9 Exceptions and Clarifications

9.1 Specific Exceptions and Clarifications

Reference or Subject	Clarification
3	Durr has provided adder pricing for Explosion Proof Motors and Instruments, respectively. Durr is working on pricing for an Air Purged Control Panel rated for NEMA 4. Durr takes exception to any other Class 1, Division 2 equipment and/or appurtenances other than the above referenced items.
4	Take exception to 3-bed, supply 2-bed with VOC Entrapment Chamber.
7.1.1	Clarification – Durr agrees with this parameter based on the Burner NOx contribution only, not the process NOx contribution.
7.1.2	Take exception to SO2 requirement based on no Sulfur bearing compounds present.
7.1.3	Take exception to CO requirement based on not enough information provided to determine.
7.1.4	Take exception to Styrene requirement which is >99% DRE and there is no stopper value.
7.1.5	Take exception to Acrylonitrile requirement which is >99% DRE and there is no stopper value.
7.1.6	Take exception to Dust requirement based on not enough information provided to determine.
7.1.7	Take exception to TOC requirement until Acrylonitrile and Styrene are finalized.
7.3	Take exception to the 1.5 second Retention Time requirement.
8.1.1	Take exception to 3-bed, supply 2-bed with VOC Entrapment Chamber.
8.1.2	Take exception to the 1.5 second Retention Time requirement.
8.4	Take exception to the Quantity of 2, only providing 1 in the proposal scope.
8.5	Take exception based on the requirement being not applicable.
8.7	Providing a Allen Bradley CompactLogix PLC; Providing a Panelview Plus 1000 Touchscreen and MMI.
8.8	Taking exception to customer provided P&ID, Durr P&ID is provided and applicable for the proposal scope
8.9	Require clarification on the Duct with support; Take exception to Utility Piping.

	This proposal scope does not include any of the following:
	• SIL Considerations • Emergency Power Supply or UPS • Vent Piping on Gas (Fuel) Train • Emergency Vent Damper • Rupture Disk • LEL Detector • Flame Arrestor • Explosion Relief Vent on Combustion Chamber • Compliance with the Painting Specification • Fireye UV/IR Flame Scanners and respective Relay system • Stainless Steel Process Fans • Stainless Steel Combustion Blower • More than one (1) UV Flame Scanner

9.2 General Codes and Guidelines

Code guidelines that Dürr Systems follows, all or in part, in the design of the Oxi**.X** RM Regenerative Thermal Oxidizer:

Controls and Electrical Design

- National Fire Protection Association (NFPA) 70 - National Electric Code
- NFPA 79 – Electrical Standards for Industrial Machinery
- NFPA 86 – Industrial Ovens and Furnaces
- UL508A – Industrial Control Panels
- Dürr Systems UL File E56711 Industrial Control Panels
- FM Global Loss Prevention Data Sheets
- 6-9 – Industrial Ovens and Dryers
- 6-11 – Fume Incinerators

Mechanical Systems and Component Design

- Compressed Air Tanks – American Society of Mechanical Engineers (ASME) - Code for Pressure Vessels, Section VIII, Division 1, “U” Certificate of Authorization No. 16802
- Fixed Ladders – Occupational Health and Safety Administration (OSHA) Standard 29 CFR1910.23
- Walking and Working Surfaces – OSHA Standard 29 CFR1910 subpart D
- Mechanical Power Transmission Guards – OSHA Standard 29 CFR1910.219
- Ductwork – Sheet Metal and Air Conditioning Contractors’ National Association (SMACNA) – Round or Rectangular Industrial Duct Construction Standards
- Centrifugal Fans – American National Standards Institute (ANSI)/Air Movement & Control Association (AMCA) Standard 210-99 – “Laboratory Methods of Testing Fans”

10 Attachments

10.1 P&ID

10.2 GA

10.3 Field Rate Sheet

10.4 Brochure

10.5 Terms and Conditions

10.6 Technical Bid Evaluation

10.7 Durr High Temperature Paint Color Pallet

INSTRUMENTATION KEY
AE - ANALYSIS ELEMENT
AHC - ANALYSIS HAND CONTROLLER
AI - ANALYSIS INDICATOR
AIC - ANALYSIS INDICATING CONTROLLER
AIT - ANALYSIS INDICATING TRANSMITTER
AP - ANALYSIS POINT
AR - ANALYSIS RECORDER
AZ - ANALYSIS FINAL CONTROL
BE - BURNER ELEMENT
E - ELECTRIC MOTOR
FC - FAIL CLOSED
FO - FAIL OPEN
FS - FLOW SWITCH
FSL - FLOW SWITCH LOW
FSH - FLOW SWITCH HIGH
FZ - FLOW FINAL CONTROL
II - CURRENT INDICATOR
I/P - CURRENT TO PRESSURE TRANSMITTER
KC - TIME CONTROLER
LS - LEVEL SWITCH
MBV - MOTORIZED BLOCKING VALVES
PAH - PRESSURE ALARM,HIGH
PAL - PRESSURE ALARM,LOW
PDAH- PRESSURE DIFFERENTIAL ALARM HIGH
PDAL- PRESSURE DIFFERENTIAL ALARM LOW
PDIC- PRESSURE DIFFERENTIAL INDICATOR CONTROLLER
PDSH- PRESSURE DIFFERENTIAL SWITCH HIGH
PDSL- PRESSURE DIFFERENTIAL SWITCH LOW
PDT - PRESSURE DIFFERENTIAL TRANSMITTER
PHC - PRESSURE HAND CONTROLLER
PI - PRESSURE INDICATOR
PIC - PRESSURE INDICATING CONTROLLER
PSH - PRESSURE SWITCH, HIGH
PSL - PRESSURE SWITCH, LOW
PT - PRESSURE TRANSMITTER
PZ - PRESSURE FINAL CONTROL
R - MANUAL RESET
SI - SPEED INDICATOR
SSH - SPEED SETTIING HIGH
SIC - SPEED INDICATING CONTROLLER
SSL - SPEED SWITCH,LOW
SS - SELECTOR SWITCH
ST - SPEED TRANSMITTER
SV - SOLENOID
TDC - TEMPERATURE DIFFERENTIAL CONTROLLER
TE - TEMPERATURE ELEMENT
TI - TEMPERATURE INDICATOR
TIC - TEMPERATURE INDICATING CONTROLLER
TIR - TEMPERATURE INDICATOR RECORDER
TIS - TEMPERATURE INDICATOR SWITCH
TIT - TEMPERATURE INDICATING TRANSMITTER
TSHH- TEMPERATURE SWITCH, HIGH HIGH
TSH - TEMPERATURE SWITCH, HIGH
TSL - TEMPERATURE SWITCH, LOW
TT - TEMPERATURE TRANSMITTER
TZ - TEMPERATURE FINAL CONTROL
UV - ULTRAVIOLET SCANNER
VI - VIBRATION INDICATOR
VSH - VIBRATION SWITCH HIGH
VT - VIBRATION TRANSMITTER
ZI - POSITION INDICATOR
ZS - POSITION SWITCH
ZSH - POSITION SWITCH, HIGH
ZSL - POSITION SWITCH, LOW
ZZ - FINAL POSITIONER

MODE NO.	MODE DESCRIPTION	FRESH AIR DMPR	PROCESS FAN CONTROL	BURNER TEMP CONTROL	GAS CONTROL VALVE	CHAMBER POPPET VALVES	ANY PROCESS DAMPER OPEN TO OXIDIZER
1	SYSTEM OFF	OPEN	OFF	OFF	LOW FIRE	NOT CYCLING	NO
2	PURGING	OPEN	40% FLOW	OFF	HIGH FIRE	CYCLING	NO
3	HEAT UP	OPEN	40% FLOW	TEMP RAMP	MODULATE	CYCLING	NO
4	IDLE	OPEN	25% FLOW	OFF / SETPOINT 1600°F (871°C)	MODULATE	CYCLING	NO
5	STAND-BY	OPEN	25% FLOW	SETPOINT 1000°F (538°C)	MODULATE	CYCLING	NO
6	ONLINE (NOT SELF-SUSTAINING)	MODULATE (MAINTAIN MIN. FLOW)	VAR FAN SPEED (MAINTAIN DUCT PRESSURE SETPOINT)	SETPOINT 1600°F (871°C)	MODULATE	CYCLING	YES
7	ONLINE (SELF-SUSTAINING)	MODULATE (MIN FLOW. & TEMPERATURE CONTROL)	VAR FAN SPEED (MAINTAIN DUCT PRESSURE SETPOINT)	OFF	LOW FIRE	CYCLING	YES
8	BOTTLE-UP	OPEN	OFF	OFF	LOW FIRE	VALVES CLOSED TO INLET & OPEN TO EXHAUST	NO
9	SHUTDOWN > 200°F	OPEN	40% FLOW	OFF	LOW FIRE	CYCLING	NO

PRELIMINARY

DRAWING FOR PRELIMINARY APPROVAL
TO ALLOW FOR DURR DESIGN.
FINAL DRAWINGS WILL BE SUBMITTED
FOR APPROVAL PRIOR TO RELEASE.

INSTRUMENTATION LEGEND

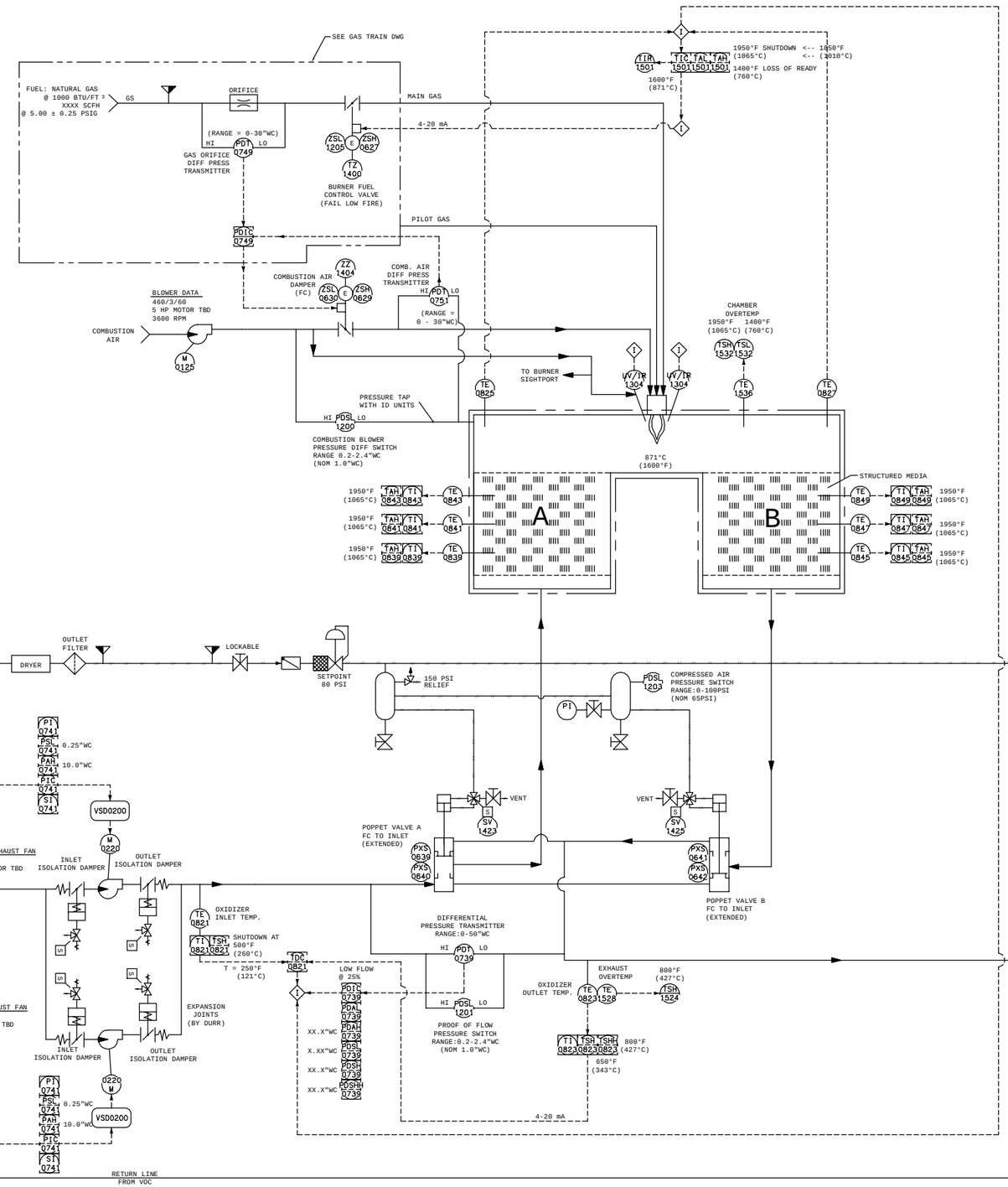
- PRIMARY PROCESS LINE
- SECONDARY AND UTILITY LINES
- ELECTRICAL SIGNALS
- COMPRESSED AIR
- FIELD MOUNTED
- PRIMARY LOCATION, ACCESSIBLE TO OPERATOR
- AUXILLARY LOCATION, ACCESSIBLE TO OPERATOR
- LOCATED IN MMI
- LOCATED IN PLC CONTROL SYSTEM
- OR FILTER
- MANUAL DAMPER
- BURNER
- FAN
- EXPANSION JOINT
- COMPLEX NODE OR INTERLOCK (I)
- VSD VARIABLE SPEED DRIVE
- E ELECTRIC ACTUATOR W/ POSITIONER
- CYLINDER OPERATED WITH SOLENOID W/SPRING RETURN
- CYLINDER OPERATED W/ ELECTRO-PNEUMATIC POSITIONER W/ SPRING RETURN
- CYLINDER OPERATED W/ ELECTRO-PNEUMATIC POSITIONER
- CYLINDER OPERATED WITH SOLENOID
- PANCAKE AIR CYLINDER
- PRESSURE REGULATOR

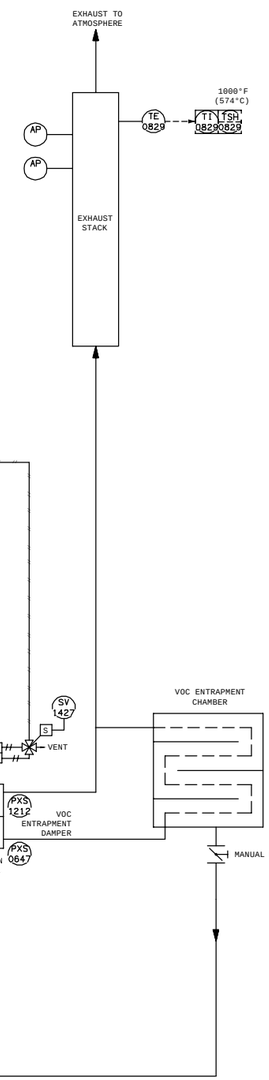
BY CUSTOMER / BY DURR

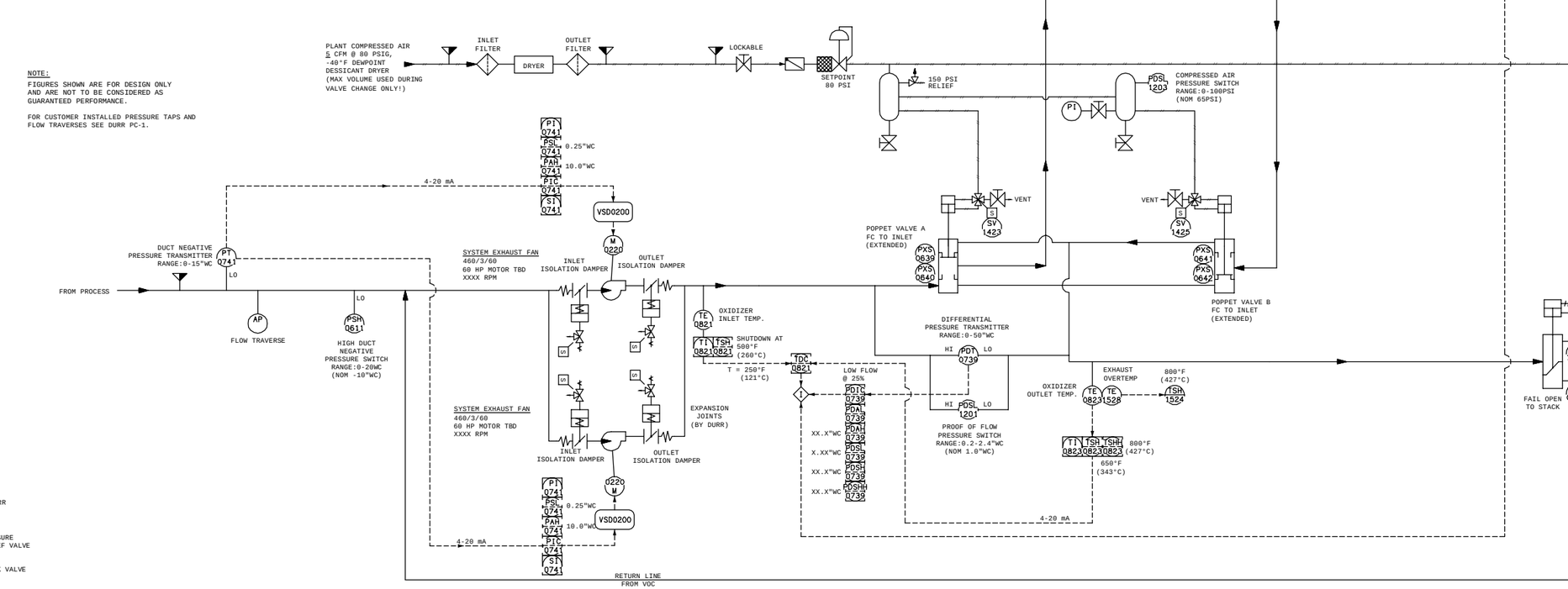
- PRESSURE RELIEF VALVE
- CHECK VALVE
- BALL VALVE
- PRESSURE REGULATOR W/ FILTER

NOTE:
FIGURES SHOWN ARE FOR DESIGN ONLY AND ARE NOT TO BE CONSIDERED AS GUARANTEED PERFORMANCE.

FOR CUSTOMER INSTALLED PRESSURE TAPS AND FLOW TRAVERSES SEE DURR PC-1.







APPROVED

THIS DRAWING REFLECTS THE SPECIFICATIONS AS DEFINED IN THE JOB PROPOSAL. APPROVAL OF THIS DRAWING RELEASES THIS DESIGN FOR CONSTRUCTION. ANY CHANGES AFTER THIS APPROVAL MAY RESULT IN ADDITIONAL COST TO THE CUSTOMER AND MAY DELAY DELIVERY.

☐ APPROVED
☐ APPROVED AS NOTED
☐ NOT APPROVED

SIGNED_____ DATE_____

REVISIONS				
ZONE	REV	DESCRIPTION	APVD	DATE

UNLESS OTHERWISE SPECIFIED: TOLERANCE DECIMALS X.X +/-.100 +/-30' X.XX +/-.050 X.XXX +/-.025 ANGULAR
DIMENSIONS ARE IN INCHES [MILLIMETERS]
THIRD ANGLE PROJECTION
DRAWN BY: USDEPLOV DATE: 1/20/2022
APPROVED BY: USDEPDLA DATE: 1/20/2022

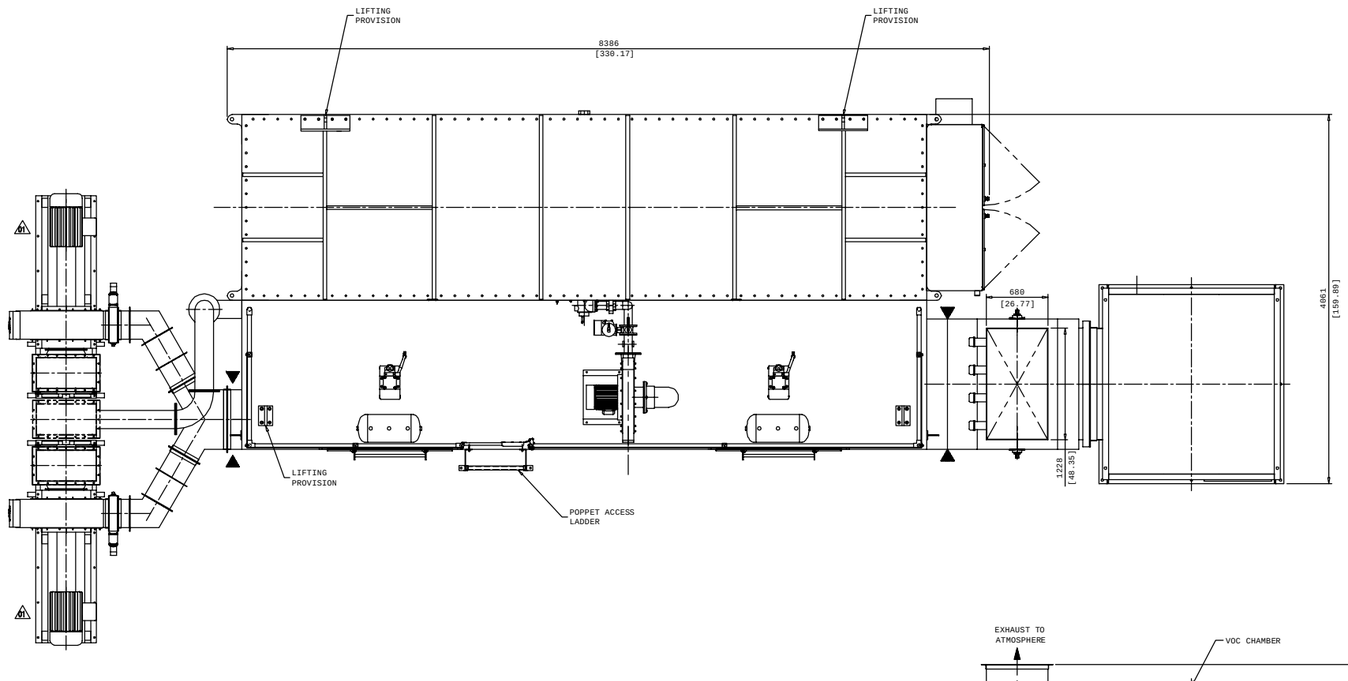
THIS DRAWING IS THE PROPERTY OF DÜRR TECHNOLOGIES. IT IS TO BE USED ONLY FOR DÜRR TECHNOLOGIES PROJECTS. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, WITHOUT THE WRITTEN PERMISSION OF DÜRR TECHNOLOGIES.

Dürr Megtec

TITLE DIAGRAM-FLOW, RM-12, LG CHEM ABS

DRAWING NUMBER P140577-0102 REV 00

SCALE 1:1 DO NOT SCALE DRAWING SHEET 1 OF 1 SIZE J



1. FUEL TYPE: NATURAL GAS 1,000 BTU/FT^3 [37,252 KJ/M^3]
2. GAS PRESSURE: 5.0 PSI MAX.[345 MBAR]
3. APPROXIMATE UNIT WEIGHT:69,000# [31,297 KG] EXCLUDING FAN AND STACK
4. EXHAUST VOLUME _____ SCFM. [_____ NM^3/HR]
5. DUCTWORK:NO DUCT RUN FROM PROCESS TO OXIDIZER SHALL EXCEED 2" W.C. [5 MBAR]STATIC PRESSURE LOSS
6. PLANT VOLTAGE IS 460/60/3
   MAXIMUM VOLTAGE VARIATION: +5% TO - 10%
7. DURR CONTROL VOLTAGE IS 24VDC
8. PAINT: #15 CHARCOAL GRAY

NOTES:

1. ALL FAN DIMENSIONS PRELIMINARY UNTIL CERTIFIED FAN DRAWINGS ARE RECEIVED FROM FAN VENDOR
2. ADEQUATE SUPPORT MUST BE SUPPLIED BY CUSTOMER AT THE ALL FOOT LOCATIONS. OXIDIZER MUST LAY FLAT AND LEVEL TO +/- 3 MM [+/- .125"] IN ORDER FOR DUCTWORK AND FIELD JOINTS TO FIT CORRECTLY.
3. ALL INTERCONNECTING DUCT WORK BY OTHERS. MUST BE DESIGNED FOR -20" WC OR HAVE ADEQUATE PRESSURE RELIEF.
4. ALL CUSTOMER DUCTWORK MUST HAVE ADEQUATE EXPANSION PROVISIONS AND MUST BE INDEPENDENTLY SUPPORTED.
5. CUSTOMER IS RESPONSIBLE TO ENSURE:
   5.1. DUCT RUNS FROM PROCESS TO OXIDIZER SHALL BE PROTECTED FROM THE FORMATION OF CONDENSATION.
   5.2. DUCT RUNS FROM PROCESS TO OXIDIZER TO BE OF AIRTIGHT CONSTRUCTION.
6. WEIGHTS -- SEE FOUNDATION PLAN.

SHIPPING SPLITS

PRELIMINARY

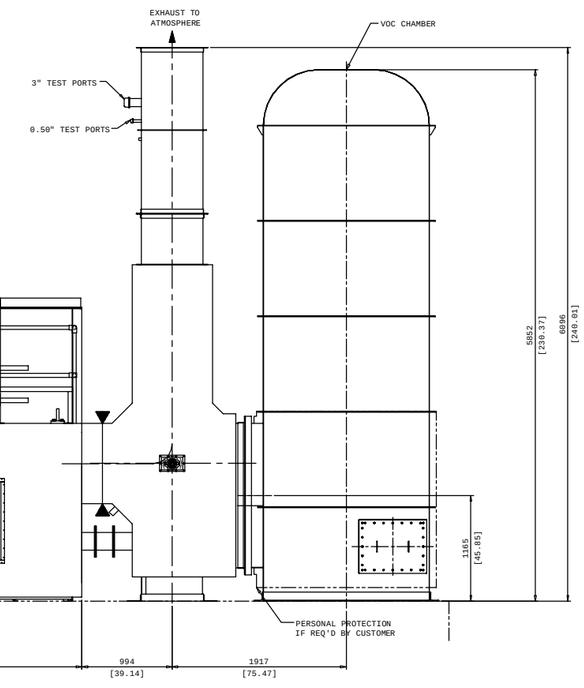
DRAWING FOR PRELIMINARY APPROVAL
TO ALLOW FOR DURR DESIGN.
FINAL DRAWINGS WILL BE SUBMITTED
FOR APPROVAL PRIOR TO RELEASE.

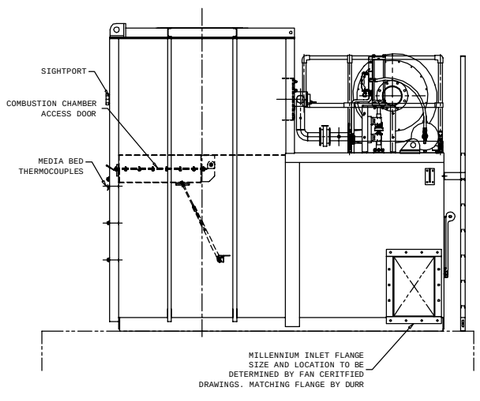
APPROVED

THIS DRAWING REFLECTS THE SPECIFICATIONS AS DEFINED IN THE JOB PROPOSAL. APPROVAL OF THIS DRAWING RELEASES THIS DESIGN FOR CONSTRUCTION. ANY CHANGES AFTER THIS APPROVAL MAY RESULT IN ADDITIONAL COST TO THE CUSTOMER AND MAY DELAY DELIVERY. TO MEET A X/X/XX SHIP DATE THIS WOULD NEED TO BE APPROVED BY X/X/XX.

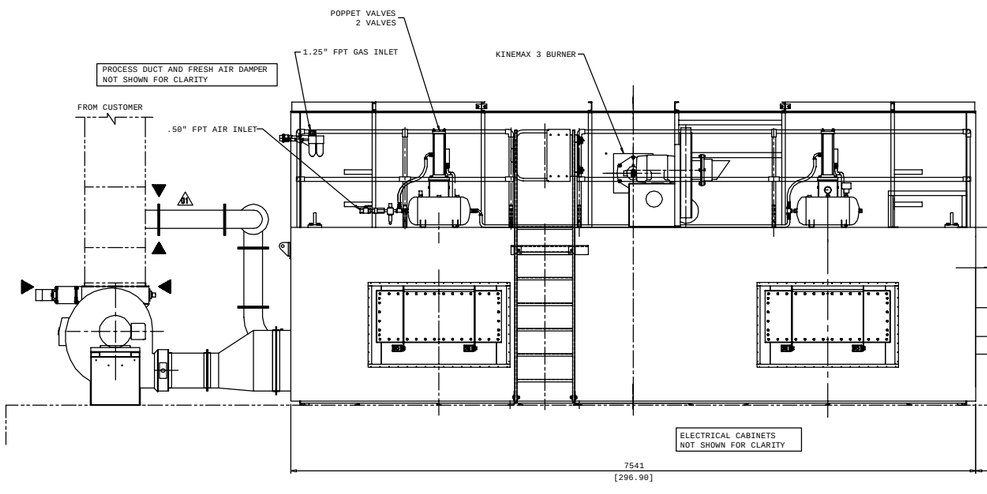
☐ APPROVED
☐ APPROVED AS NOTED
☐ NOT APPROVED

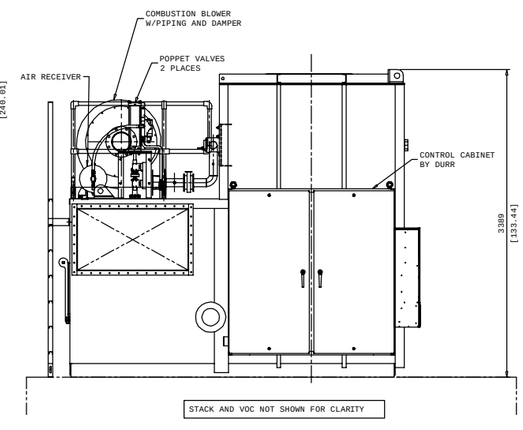
SIGNED_____ DATE_____





FAN, STACK AND VOC NOT SHOWN FOR CLARITY





STACK AND VOC NOT SHOWN FOR CLARITY

REVISIONS				
ZONE	REV	DESCRIPTION	APVD	DATE
	01	CHANGE TO DIRECT DRIVE, ADDED ELECTRICAL CABINET		
		UPDATE FLUSH RETURN	USDEPLOV	3/18/22
	02	REMOVED 2ND ELECTRICAL CABINET	USDEPLOV	3/23/22

UNLESS OTHERWISE SPECIFIED: TOLERANCE DECIMALS X +/-1.0 X.X +/-0.5 X.XX +/-0.1 ANGULAR +/-30'
DIMENSIONS ARE IN MILLIMETERS [INCHES]
THIRD ANGLE PROJECTION
DRAWN BY: INMINLBA DATE: 02/14/2022
CORRECTED BY: INMINUJA DATE: 02/14/2022
This drawing and the information contained herein is the property of Durr Megtec and shall not be used, copied or disclosed without written permission.
SCALE 1:20 DO NOT SCALE DRAWING SHEET 1 OF 1 SIZE J

Dürr Megtec

TITLE GENERAL ARRANGEMENT, RM-12,LG CHEMICAL

DRAWING NUMBER P140577-0101 REV 02

REFF#:1065371_01

1.0 DÜRR SYSTEMS, INC. FIELD SERVICE RATES

1.1 Term of Proposal: Unless otherwise provided, this Proposal is subject to acceptance by Buyer within thirty (30) days from the Proposal date.

1.2 Domestic:

a. From the hour the Seller's representative leaves the basing point and including the hour of Seller's representative's return to its basing point, payment shall be made by Buyer to Seller at the rates listed below.

b. A workday is defined as any day, Monday through Friday, whether actual work is performed or not. Also, any travel time to or from the base point is considered a workday and payment shall made in accordance with the applicable workday rates defined herein.

Straight Time (Service)	$166.00/hour	Up to 8 hours per day Monday through Friday
Straight Time (fitter, confined space attendant)	$134.00/hour	Up to 8 hours per day Monday through Friday
Overtime	$250.00/hour	Over 8 hours up to 12 hours Monday through Friday Saturdays up to 8 hours
Premium Time	$300.00/hour	Over 12 hours Monday through Friday Over 8 hours on Saturday All day on Sunday
Travel Time	$165.00/hour	All travel based on actual travel hours Billed at straight time rate
Holiday Time	$350.00/hour	All work and travel on Holidays and Holiday weekends
Weekend Layover Fee	8 hours straight time/Day	Plus actual expenses
Trainer / Service Engineer	$230.00/hour (straight time)	Customer plant training. Process Support, Second level field service support.
24/7 Technical Support	Dürr provides 24 hour, 365 day phone technical support. After business hours, a charge of $500.00 dollars per troubleshooting issue will apply.	

- ***Prices are subject to change without notice.***
- ***All service calls are billed at a rate of 4 hours minimum service plus travel.***
- ***Rates are in US dollars***

2.0 EXPENSES

2.1 Transportation

Travel by air will be Coach Class for US, Canada and Mexico, Business Class for International. Round trip transportation to and from the job site location will be billed at cost plus a ten percent (10%) processing fee.

2.2 Room, Board and Local Transportation

Meals, living expenses, such as lodging, laundry, etc., and local car/equipment rental will be billed at cost plus a ten (10) % percent processing fee.

2.3 Subcontractor Charges

Charges from Seller's subcontractors will be billed at cost plus a fifteen percent (15%) processing and administration fee.

2.4 Mileage Charges

Mileage charges for the usage of personal vehicles will be billed at $0.79 per mile from the representative's basing point.

2.5 Daily Rate

$185.00/day (ground transportation & food) $85.00/day (Regional Technician Daily Rate)

3.0 MISCELLANEOUS

3.1 Rate Adjustments

Unless otherwise agreed, rates will be paid as set forth in this Proposal and may be adjusted to those in effect at the time the service is performed. **The listed rates are available only for calculating additional labor cost. These rates are not to be used for calculating deducts of labor cost without the expressed written consent of Dürr Systems, Inc.**

3.2 Lay-Over Expense

Where circumstances require that a service representative be held over on weekends during which no work is performed, charges will be made for eight (8) hours per day at the straight time rate and living expenses will be billed per Section 2.

3.3 Cancellation

In the event the Buyer should cancel a service requirement less than five (5) business days in advance of a previously agreed upon start date, a cancellation fee of one (1) day's service will be charged per Section 1 above.

3.4 Reporting/Engineering Services Charges

Standard reports may be issued for all field service visits, whether completed on-site or after departure from site. Appropriate report writing time will be invoiced accordingly.

Unless otherwise provided, all engineering services or other work performed by the Seller at its basing point or its offices, including report research and/or writing will be billed at $166 per hour per Section 1.1 above.

Oxi.X RM

Regenerative Thermal Oxidizer

Regenerative thermal oxidizers (RTOs) from Dürr Megtec offer proven volatile organic compound (VOC) destruction performance capabilities and a range of operating cost advantages for low-flow process applications. The Oxi.**X** RM RTO, formerly known as Millennium®, redefines the economics of clean air compliance when compared with other VOC control technologies typically deployed in high-flow process applications. This unique, compact system can meet the needs of a wide variety of industrial applications at flows extending to 20,000 SCFM. This particular RTO combines operating efficiency, destructive effectiveness and overall reliability with very affordable capital, installation and operating costs.

The system features integrated ductwork, individual poppet valves, and a unique, single-box configuration. These features save on both capital and installation costs. The compact, space-saving unit offers considerable installation flexibility. Systems for either indoor or outdoor placement are available, and the relatively light weight of the Oxi.**X** RM RTO easily permits rooftop installation.

HIGHLIGHTS

- Flow capacity: Up to 20,000 SCFM
- VOC destruction: Typically 98-99%
- Thermal efficiency: Up to 97%
- System fan: Forced draft w/VFD
- Optional secondary heat recovery possible

Oxi.X RM

Regenerative Thermal Oxidizer

SUPERIOR FUEL EFFICIENCY

The system delivers thermal efficiencies up to 97 percent. Even at relatively low solvent concentrations, the system can sustain thermal conditions with the heat released during VOC oxidation, thereby requiring no additional fuel.

REGULATORY COMPLIANCE

The small, entrained volume of the Oxi**.X** RM RTO holds VOC puffs to a minimum. The standard system can achieve up to 98 percent VOC destruction, which is sufficient to meet most clean air requirements. For higher cleanup rates, a VOC capture system is available. This option can be ordered as original equipment or field-installed at a later date.

FAST, SIMPLE INSTALLATION

The system is preassembled, prewired, prepiped and pretested at the factory. All units ship on commercial trucks. Installation and start-up time is kept to a minimum, typically requiring less than one week. Turnkey installations are available.

OPERATIONAL RELIABILITY

The Oxi**.X** RM RTO practically operates by itself. In standard configuration, the only moving parts are two reinforced poppet-style valves. An advanced electronic control system automatically tunes the system for high VOC destruction rates with maximum fuel efficiency.

REMOTE SUPPORT

The Track and Monitor package offers operators analysis and troubleshooting support via the connected gateway. The package features services that support daily work, including secure remote access, real-time monitoring and custom data analysis. This security-certified solution is compatible with corporate networks and avoids network interference.

PERFORMANCE FEATURES

- Energy-efficient variable frequency drive (VFD)
- Low pressure drop ceramic media
- Purge/idle makeup air damper
- Recirculation systems
- Hot-side bypass
- Secondary heat recovery plant energy requirements

The Oxi.**X** RM RTO offers the economic advantages of regenerative thermal oxidation exclusively for low-flow process applications.

Dürr Systems, Inc.
Clean Technology Systems
830 Prosper Street
De Pere, WI 54115
USA

Phone: +1 920 336-5715
E-mail: durrmegtecinquiries@durrusa.com
www.durr-megtec.com

Subject to change. The information in this datasheet contains only general descriptions or performance characteristics which may vary in actual cases. The requested performance parameters shall be binding only if they are explicitly agreed within the sales contract. © Dürr 2021

General Terms and Conditions of Sale

Seller shall provide only the materials, equipment, and where applicable, the labor and services described in this Proposal in accordance with, and subject to, the following terms and conditions which are part of the Contract between Seller and Buyer and which are accepted by Buyer if Buyer either issues a purchase order covering the Work or otherwise authorizes the Seller to perform the Work.

No other material or equipment of any nature is included in the price stated in the Proposal. Buyer acknowledges it has inspected, examined, and studied all plans, specifications, prints, drawings, and material lists furnished by Seller and that it has approved the same, including, without limitation of the foregoing, Buyer's Scope of Work in connection therewith. For the purpose hereof, except as otherwise provided in this Proposal, Buyer's Scope of Work shall mean all site preparation, utility connections, etc., required for the installation of the equipment.

1. **Term of Proposal**. Unless otherwise provided, this Proposal is subject to acceptance by Buyer within thirty (30) days from the Proposal date.

2. **Delivery**. Unless otherwise provided, all shipments of materials and equipment shall be made by Seller Ex-works Origin. Title and risk of damage to or loss of goods shall pass to Buyer upon delivery of goods to carrier. No claim will be allowed unless made by Buyer within 7 days from receipt of shipment. This Contract is based on the current freight rates and the price is subject to adjustment in the event that a change in such rates affects Seller's cost of performance hereunder. Prices quoted are for furnishing and shipping complete, or in accordance with the delivery schedule specified, the quality or quantities listed for each item. Should shipping releases or schedules be changed for any reason beyond Seller's control, Seller reserves the right to invoice according to work performed by Seller through the date of any such change. If Buyer declines or is unable to take delivery at the time(s) specified in the Proposal or Contract, Seller will have the equipment stored for Buyer at Buyer's risk and account, and the materials shall be considered "delivered." Buyer shall pay storage, handling and re-handling charges and continue to make payments according to the payment terms contained herein.

3. **Installation**. If installation work is a part of this Contract, the equipment and/or machinery shall be assemble, erected and installed under the personal direction of an employee or agent of Seller. Buyer shall furnish sufficient electricity, water, compressed air, light, heat, sanitary facilities, and fire protection as well as adequate all-weather storage space, ingress and egress to the job site and other items that may be listed under Buyer's responsibilities. The site is to be prepared for installation personnel to work in a normal fashion with no extra equipment or procedures required due to construction or production interferences. Unless otherwise stated, installation shall be performed only during Seller's normal working hours and any overtime work required for any reason shall be requested by and paid for by Buyer.

4. **Site Access**. Unless otherwise provided, or waived in writing by Seller, the following will be available to Seller throughout the duration of the Work at no cost to Seller: A) A safety buffer zone shall be established nominally fifty (50) feet all around the base of Seller's work area, which will be maintained free and clear of all work, contractors, equipment and personnel; B) An adequate construction staging, lay down and material storage area for Seller's exclusive use shall be available adjacent to the safety buffer area. This area and the safety buffer shall be graded, leveled, well drained, and even with the top of the foundation and be suitable for delivery vehicles and Seller's equipment in all weather conditions; C) All weather access roads shall be made available and maintained by Buyer from a main highway and from the railroad sidings (if applicable) to Seller's area and the location of construction; and Seller's rail siding, (if applicable), shall be available to Seller within 300 feet, by the normal routing, of Seller's area.

5. **Licenses, Permits**. All building, erection or other licenses or permits necessary or related to the work, shall be secured and paid for by the Buyer.

6. **Changes and Differing Conditions**. A) If Buyer requests changes, or changes in site conditions or installation requirements occur subsequent to issuance of the Purchase Order, the parties shall renegotiate the price to reflect all expenses caused by the changes. B) Buyer, by written order accepted by Seller, may make reasonable changes in the scope of work subject to equitable adjustments in the Contract price and schedule, including an allowance for increased overhead and profit. Seller is not obligated to incur any expense or do any work in excess of that reasonably anticipated unless Buyer issues a written order for such expense and work with mutually acceptable terms and conditions. C) Seller reserves the right to make changes, subject to Buyer's approval, in design or material, which in Seller's judgment would improve the equipment and/or its operation. D) If Seller is installing equipment and any site conditions or installation requirements at the time of erection differ materially from those evident at the time of Seller's pre-bid site visit, Buyer's representations, and conditions ordinary to similar projects, then any additional costs caused by the differing site conditions or installation requirements shall be subject to equitable adjustment to the Contract price and schedule. E) If Seller's activities or operations at the site are interrupted by any party other than Seller, an equitable adjustment shall be made to the Contract price and schedule.

7. **Shipping, Delays, Suspension, Payment Acceleration**. All shipping dates are approximate, based on prompt receipt by Seller of all necessary information and are subject to change by reason of conditions beyond Seller's reasonable control as stated in Article 24. If a delay in shipment or installation is caused by Buyer or by any other cause beyond Seller's reasonable control, the portion of the Contract price already performed by Seller shall become due and payable within 30 days of shipment, or if not shipped, 30 days from the date the equipment is ready for shipment. If Buyer requires Seller to delay engineering, fabrication, shipment, installation, or start-up of the equipment and/or machinery under this Contract, Seller shall be entitled to full reimbursement for all costs incurred as a result of such delay. If Buyer suspends work on this Contract, Buyer shall reimburse Seller for all costs incurred by Seller as a result of such suspension. If the suspension exceeds 90 days, Seller shall also have the right to cancel the unfinished portion of the Contract without liability to Buyer of any kind and Seller will be paid according to Article 16.

8. **Other Contractors.** Seller has no duty or authority to direct, supervise or oversee any contractors of Buyer or to provide the means, methods or sequence of their work or to stop their work. Seller's services and/or presence at a site shall not relieve others of their responsibility to Buyer or to others. Seller shall not be liable for the failure of Buyer's contractors or others to fulfill their responsibilities, and Buyer agrees to indemnify, hold harmless and defend Seller against all claims arising out of such failures.

9. **Safety Devices**. Seller will supply such safety devices or fire protection equipment as is specified in the Proposal. If Buyer desires or requires through local, state, or insurance underwriter's specifications or regulations, other additional safety devices or equipment, Seller may elect to furnish same at Buyer's cost.

10. **OSHA – Federal, State & Local.** Seller will comply with the Federal OSHA requirements in effect as of the date of the Proposal relative to the Work. Seller's sole responsibility is limited to modification or replacement of the equipment cited as violating such standards. OSHA requirements with respect to noise are specifically excluded. Where state, local or Buyer's health and safety requirements differ from the Federal OSHA requirements, modifications or changes in design to meet such requirements will be incorporated at Buyer's request. Additional costs arising from such requests and from erection procedures required by state, local or Buyer's health and safety regulations which deviate from Federal OSHA requirements are for Buyer's account.

11. **Material/Workmanship Warranty (Applicable to Equipment, Systems, and Spare Parts Orders).** Seller warrants that all equipment it manufactures and furnishes and work provided will be free from defects in materials and workmanship for a period of twelve (12) months from the date Buyer is able to begin deriving commercial benefit from the work or eighteen (18) months from the date the first item is shipped, whichever occurs earlier. For equipment whose operation involves burners, commercial benefit is defined as the date of first burner ignition of the equipment. Seller's sole obligation is to repair or replace, at Seller's option, any part or component which, after Seller's inspection, proves to be defective, provided that Seller shall not be obligated for any removal, shipping or reinstallation costs. Seller will make repaired or replacement components available to Buyer in Seller's standard packaging, Ex-works Seller's shipping point. The warranty does not apply to consumable, replaceable parts or components normally subject to wear and replacement. Seller's obligations in this Article are subject to the following conditions: A) Receipt from Buyer of immediate written notice describing the defect in detail. B) Buyer shall not have attempted to correct the defect without Seller's approval. C) Buyer shall have installed (if applicable), operated and maintained the equipment strictly in accordance with Seller's operating and maintenance instructions, including, but not limited to, Seller's design basis or other design criteria stated in Seller's Proposal. D) The defect has been caused solely by faulty materials or workmanship for which Seller is responsible, and is not due to such things as erosion, corrosion, or deterioration resulting from the manner in which the equipment is operated, accident (including damage during shipment), neglect, misuse or abuse, or exposure to conditions beyond the environmental power or operating constraints specified by Seller.

To the extent that the materials and equipment furnished consist of products manufactured by other parties, such manufacturer's warranty is hereby assigned to Buyer, and Seller's responsibility with respect to any such products shall not extend beyond the manufacturer's warranty. It is understood that Seller's warranty with respect to such products is limited to repair or replacement at Seller's option and does not include labor, repair or replacement costs, or travel unless otherwise provided.

12. **Services Warranty (Applicable to Consulting, Design, Engineering, Inspection and Planning Orders).** A). Seller warrants that the services shall be performed in a competent and non-negligent manner. Within a period of twelve (12) months from completion of such services, Seller shall; at its cost, correctly re-perform any non-conforming services or, if such services cannot be re-performed, refund the amount paid for such non-conforming services. B). Seller warrants that any engineering and/or design work that it performs hereunder shall be performed in accordance with generally accepted trade or industry practice. Seller's liability for such warranty shall be fully satisfied by revision and resubmission of all calculations and drawings incorrectly completed as a consequence of breach of this warranty. C). Buyer expressly acknowledges and agrees that the foregoing warranties in this Article 12 are offered by Seller expressly contingent upon Buyer's strict compliance with Article 18, and further that any failure of Buyer to comply with the terms thereof shall be deemed as a breach of Buyer's obligations hereunder.

13. **Patent Warranty.** Seller shall defend, at its expense, any suit or proceeding brought against Buyer based on any claim that the equipment covered herein, except for equipment or material manufactured or designed to Buyer's specifications, infringes any U.S. patent issued as of the date of this Proposal, and pay any court imposed damages and costs finally awarded against Buyer, but not to exceed the amount previously paid to Seller by Buyer hereunder provided: A) Seller is promptly notified by Buyer in writing of such claim; and, B) Seller is given full authority, information, and assistance by Buyer which Seller deems necessary for the conduct of such defense. In order to avoid such claims and/or minimize potential liability, Seller shall have the right and option at any time to: A) procure for the Buyer the right to use the equipment; or B) modify the equipment so that it no longer infringes; or C) replace the equipment with non-infringing equipment.

14. **Performance Guarantee**. Seller's sole guarantees are those contained in its Proposal to Buyer. These guarantees are contingent upon the correctness and accuracy of the information provided by Buyer and are based upon the operating conditions specified in Seller's Proposal and operation and maintenance by properly trained personnel. These guarantees will be deemed satisfied by successful completion of performance tests in accordance with applicable standard procedures as specified in the proposal and in effect on the date of this proposal. Performance tests shall be conducted by the Buyer, (unless otherwise specified in Seller's Proposal), and witnessed by Seller, at its option, within 90 days of initial operation of the equipment. If the tests are not conducted within 90 days of the initial operation or within 6 months of shipment, whichever is earlier, and through no fault of Seller, the equipment shall be deemed accepted by the Buyer and in compliance with all contractual requirements. Seller makes no warranty whatsoever as to the inclusion of the equipment supplied by Seller into Buyer's manufacturing process, Seller's warranty being limited solely to the performance of its equipment in accordance with the applicable provisions in Seller's proposal. If the equipment fails to meet the Contract performance guarantees, Seller will supply at its sole option, repaired or replacement parts pursuant to the delivery terms of the Proposal subject to the limitations stated in Article 27.

15. **IMPLIED WARRANTIES/GUARANTEES DISCLAIMER. THE WARRANTIES AND GUARANTEES FURNISHED BY SELLER, AS EXPRESSLY INCLUDED HEREIN, CONSTITUTE THE SELLER'S SOLE OBLIGATION HEREUNDER AND ARE IN LIEU OF ANY OTHER WARRANTIES OR GUARANTEES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

16. **Cancellations**. If Buyer cancels for any reason at any time after Seller has received a purchase order (or other authorization) for any equipment, parts, or services or any combination thereof, Buyer shall pay to Seller within 30 days of such cancellation, all contract costs and other expenses incurred by Seller prior to receipt of the request for cancellation (including, but not limited to, engineering expenses, and overhead, costs of expended materials, direct labor with factory burden, and all commitments to Seller's suppliers, subcontractors and others), plus cancellation charges of 20% of the Contract price to cover general and administrative expenses plus 10% of the Contract price to cover profit lost by reason of cancellation. If Buyer materially breaches any obligation, then Seller may cancel the unfinished portion of the Contract without liability of any kind to Buyer. In any such case the terms of this Article 16 shall apply.

17. **Bonds.** If Seller agrees in writing to furnish any bond or bonds on account of the execution or fulfillment of this Contract, then the cost will be added to the quoted price. The penal sum of any bond or bonds furnished by the Seller in connection with this Contract shall be automatically reduced to 5% of the initial Contract value upon the date Buyer is able to begin deriving benefit from the work or 3 months after the date Seller notifies Buyer of its readiness to ship equipment, whichever occurs earlier. Buyer agrees to execute any acknowledgement or furnish documents required to effect this reduction.

18. **Credit and Payment**. A) Unless otherwise agreed, payment shall be as outlined in the Proposal and payments shall be made in current funds of the U.S. at par within 30 days of presentation of an invoice.

General Terms and Conditions of Sale

Payments not received by the due date shall be subject to a monthly interest charge at the rate of 2% per month or the maximum amount allowed by law, whichever is less, due and payable until the payment is received. B) Buyer shall also pay all collection costs of Seller on any delinquent amounts including, but not limited to, court costs and attorney fees. Seller will assess Buyer's financial condition and Seller shall have the absolute right to (i) limit the amount of credit that Seller may extend to Buyer for the purpose of goods hereunder, and delay manufacture or shipment of Buyer's orders based upon those limitations; (ii) require full or partial payment in advance; (iii) ship goods to Buyer C.O.D., require payment by irrevocable confirmed letter of credit, or require payment to be secured by letters of credit; (iv) require written guarantees of payment satisfactory to Seller; or (v) cancel or refuse to accept or fill any order from Buyer then outstanding or thereafter placed, all on terms satisfactory to Seller, in its sole and absolute discretion.

18.1 **Default in Payment.** A) If any payment due Seller is more than 30 days past due, Seller shall have the right at its sole option to accelerate the payment of all outstanding amounts, including, but not limited to, amounts previously retained pursuant to the Contract, by notifying Buyer in writing that all outstanding amounts are immediately due and presenting Buyer with an invoice. Seller shall also have the right in such event to discontinue all work on the project without incurring any liability to Buyer for such action; B) If the total aggregate amount of delinquent payments exceeds 10% of the total Contract price, Buyer shall provide, at Seller's request, additional collateral, including, but not limited to, irrevocable letters of credit, sufficient to secure payment of all Contract amounts; C) The foregoing remedies of Seller are in addition to all other remedies Seller may have at law or in equity, including, but not limited to, the right to obtain liens on Buyer's assets through legal or equitable proceedings.

18.2 **Security Agreements**. A) Buyer hereby grants to Seller a security interest in the equipment or materials sold hereunder to secure the purchase price of same. Buyer shall execute any financing or other statements or filings which in Seller's sole judgment are necessary or appropriate to evidence or perfect such security interest, which shall thereafter be filed by Buyer with the appropriate recording officer. This Contract shall constitute the security agreement between the parties and is intended to and shall afford the Seller all rights of a secured party under Article 9 of the Uniform Commercial Code; B) Until Buyer has paid the full amount due and owing for any equipment or materials purchased hereunder, Buyer shall be prohibited from transferring such equipment or materials to any creditor of Buyer other than Seller, unless Seller provides its prior written consent to such transfer, such consent not to be unreasonably withheld; C) If Buyer becomes insolvent, files for Bankruptcy, or goes into receivership or liquidation, Buyer agrees to use its best efforts and to provide all assistance requested by Seller in order to secure Seller's position as a preferred creditor with respect to all amounts due to Seller.

18.3 **Payment of Retained Amounts**. A) If this Contract permits Buyer to withhold final payment, and acceptance is not based upon performance tests, such payments shall be due and payable within 30 days after the equipment is ready for operation; B) If such deferred payment is contingent upon tests and such tests are delayed through no fault of Seller for more than 30 days after the equipment is first ready for operation, final payment shall be due and payable upon expiration of the 30 day period; C) If a retention value is required and agreed, it shall accrue interest at the rate of 1% per month on the outstanding balance until exchanged for a letter of credit or paid to Seller. Seller retains the right to provide Buyer with a letter of credit in lieu of retention at any time during the performance of the contract.

18.4 **International Project Payment Requirements**. If this Contract involves shipment of Seller's goods outside the U.S.A. the following payment terms apply, unless otherwise provided in Seller's Proposal: 1) Down Payment - EFT: The initial down payment will be made by EFT within 10 days after Seller issues an invoice and formal order acknowledgement letter to Buyer. 2) Other Payments- Commercial Letter of Credit**;** Balance of Contract price will be paid by Irrevocable Letter of Credit (L/C) issued within in USD by a Prime Bank within 30 days after Seller's issuance of its formal acknowledgement letter and covering the following payments:

a. Shipping Payment: L/C will allow a payment at sight against Seller's shipping documents (invoice, packing list and bill of lading/airway bill) presented to Seller's bank. Unless otherwise specified in Seller's proposal, the combined value of this payment and the initial down payment will equal 95% of the Contract price.
b. Final Retention Payment: (if applicable) will be due upon the earlier of, either 1) acceptance certificate, or 2) 180 days after date of bill of lading corresponding to last major shipment.

L/C General Requirements: A) The L/C will be issued on terms acceptable to Seller (generally described in this Article 18.4), and advised and confirmed by Seller's Bank. B) L/C will allow not less than 21 days after issuance of 3rd party transport documents for presentation of Seller's documents. C) L/C will expire in USA no earlier than 30 days after Seller's last shipment under the contract. D) L/C will allow partial and transshipments by ocean or air. E) L/C will be freely negotiable in USA with reimbursement instructions and authorizing reimbursement via SWIFT/TELEX. F) All banking charges for Buyer's account.

19. **Escalation**. Buyer will adjust the Contract price and pay Seller for: A) costs Seller has or may incur that were not anticipated by Seller as of the date of the initial Proposal or, B) the Contract exceeds the time frame contemplated by the parties.

20. **Taxes and Duties.** Unless otherwise provided, any tax or import duty imposed by any federal, state, local or municipal Authority arising out of the sale, manufacture or installation of the equipment or performance covered by this Contract, is not included in the price as quoted in the Proposal, and Buyer is responsible for any such amount(s).

21. **Proprietary & Confidential Materials**. All information supplied by Seller as to design, manufacture, erection, operation and maintenance of the equipment, including all drawings, patterns, specifications and information in Seller's Proposal or Contract, shall be the proprietary and confidential property of Seller and shall be returned to Seller at its request. Buyer shall have no rights in Seller's proprietary and confidential property and shall not disclose such to others or allow others to use such property, except as required for the Buyer to obtain service, maintenance, and installation for the equipment purchased from the Seller. Specifically, Buyer agrees that no drawings, specifications or information included in Seller's Proposal or Contract shall be used by Buyer for competitive bidding or similar purposes without Seller's consent and Buyer shall not reproduce or build assemblies or process systems per Seller's design drawings without explicit approval of Seller; B) Buyer shall hold in confidence and shall not disclose, divulge or publish to any person, or use or copy any trade secret, process, record, plan, projection, information pertaining to customers or prospective customers, financial information, marketing strategies, or any other confidential or proprietary information of Seller (including the terms and conditions of this Contract or any other agreement between Buyer or Seller) acquired or in connection herewith, or disclosed or transmitted by Seller or any of its agents, employees, or affiliates, except as authorized in writing by Seller, and Buyer shall keep, and shall require its officers, directors, employees, and agents to keep such information confidential; C) This clause shall survive the termination of this Contract and be in effect as long as Buyer has possession of any of Seller's proprietary or confidential information.

22. **Hazardous Materials**. If the Buyer's facilities contain hazardous materials, including asbestos bearing materials and any such materials are encountered, Seller shall have no obligation to remove or remediate them in the absence of a separate agreement which includes separate consideration to Seller for such work. If Seller or any of its subcontractors is required to perform work within or immediately adjacent to any facilities that are determined to contain hazardous material and/or asbestos, and the said work must be interrupted to allow for the remediation or removal of such materials by others, Seller shall be entitled to any and all costs and other expenses associated with such interruption in work. Buyer shall fully defend, hold harmless and indemnify Seller and its agents from and against any claim arising out of exposure to such hazardous and/or asbestos bearing materials.

23. **Health and Safety**. Seller shall not be responsible for health or safety programs or precautions related to Buyer's activities or operations, Buyer's other contractors, the work of any other person or entity, or Buyer's site conditions. Seller shall not be responsible for inspecting, observing, reporting or correcting health and safety conditions or deficiencies of Buyer or others at Buyer's site, and Buyer agrees to indemnify, hold harmless and defend Seller against any claims arising out of such conditions or deficiencies. So as not to discourage Seller from voluntarily addressing health or safety issues while at Buyer's site, in the event Seller does not address such issues by making observations, reports, suggestions or otherwise, it is understood and agreed that Seller shall nevertheless have no liability or responsibility arising on account thereof.

24. **Delays and Damages – Force Majeure**. A) In the event of delays in the performance of the obligations hereunder or damages due to conditions beyond Seller's reasonable control, including, but not limited to acts of God, acts of Buyer, or Buyer's customer or other contractors employed by Buyer, acts of civil or military authority, governmental restrictions, prohibitions and regulations, priorities, fire, storms, strikes, floods, epidemics, quarantine restrictions, war, riot, delays in transportation, car shortages, or Buyer's inability to obtain necessary labor, materials, or manufacturing facilities, the Contract dates shall be extended by an equitable period of time and Seller shall be entitled to an equitable adjustment in the Contract price. B) Acceptance of the equipment by Buyer shall constitute a waiver of all claims for damages. C) Seller's shipping dates are approximate. Seller's performance is predicated on certain performance of Buyer and Seller is not responsible for loss or damage arising from delays caused by Buyer's inability to act, failure to perform, or failure to provide complete and/or accurate information. D) This Section shall in no event be construed to relieve Buyer from the obligation to pay for goods shipped by Seller.

25. **Disclaimer of Consequential Damages.** Seller, it's subsidiaries, affiliates, agents, or employees shall not be liable to Buyer for incidental, indirect, special, liquidated or consequential damages, including, but not limited to, loss of profits or revenue, loss of use of equipment, costs of replacement or substitute goods or product, costs of capital, additional expenses incurred in the use of equipment or facilities, or claims of third parties. This disclaimer shall apply to consequential damages based upon any cause of action whatsoever asserted against Seller, including one arising out of any breach of warranty, express or implied; guarantee; products liability; negligence; tort; or any other theory of liability.

26. **Indemnification by Buyer**. Buyer shall indemnify Seller for, and hold Seller harmless from, all costs and expenses incurred by Seller, including, without limitation, costs of investigation, attorney's fees, and amounts paid in settlement or satisfaction of claims, proceedings or judgments in connection with all claims and proceedings against Seller based upon claimed defects in design in any equipment or material manufactured for Buyer by Seller to Buyer's specifications or design.

27. **Limitation of Liability.** Seller's liability for any and all claims, excluding property damage and personal injury claims, allegedly resulting from breach of contract, tort, or any other theory of liability shall not exceed either A) the amount of the initial purchase price paid to Seller by Buyer in contracts up to one million USD in value, or B) 25% of the total contract price in contracts greater than one million. Seller's liability for property damage and personal injury is limited to the amount indicated on Seller's insurance certificate issued by Seller for this contract.

28. **Buyer's Negligence and Insurance**. Seller shall not be responsible for losses or damages arising out of the negligence of the Buyer, its employees, agents or architects or those of third parties for whom Seller is not responsible, or losses for which the Buyer has agreed to provide insurance. If both Seller and Buyer are negligent and the negligence of both is the proximate cause of the accident, then each party will be responsible for its portion of the liability or damages (excluding consequential or indirect damages which are disclaimed by Seller) resulting therefrom equal to such party's comparative share of the total negligence.

29. **Severability.** Should any part of this Contract be declared invalid or unenforceable, such decision shall not affect the validity of any remaining portion, which remaining portion shall remain in full force and effect, and Seller shall have the right to replace the part declared invalid or unenforceable with a provision which serves as much as validly possible the same commercial purpose as the part determined to be invalid or unenforceable.

30. **Assignment/Subcontracts**. This Contract shall be binding upon and inure to the benefit of the parties, their successors, and assigns provided that Buyer may not assign the Contract without prior written consent of Seller. Seller may subcontract any portion of the work.

31. **Disputes.** If a dispute arises hereunder, the parties will confer and attempt to amicably resolve the dispute. If after good faith negotiation, the parties cannot reach agreement, then the matter will be finally resolved in any court having jurisdiction and venue located within the County of Oakland, State of Michigan or the U.S. District Court for the Eastern District of Michigan.

32. **Entire Agreement, Contract Interpretation, Governing Law**. All communications, written and verbal, between the parties with reference to the subject of this Contract prior to the date of acceptance are merged herein, and this Proposal, when duly accepted and approved, shall constitute the sole and entire agreement and Contract between the parties. No change in or modifications of said Contract shall be binding upon the parties or either of them, unless the changes or modifications shall be duly accepted in writing by both parties. Unless Seller expressly agrees to the contrary in writing, these General Terms and Conditions of Sale (including statements made in the Proposal) shall govern any conflict with any in Buyer's documents. Any contract resulting from this Proposal shall be construed, governed and enforced in accordance with the laws of the State of Michigan, exclusive of the choice of law rules thereof. The U.N. Convention on Contracts for the International Sale of Goods shall not apply to this Contract.

TECHNICAL BID EVALUATION	PROJ. NO. : PC2145	OWNER : LG Chem	REV.	DATE	PREP'D	CHK'D	CHK'D	APP'D
1. Item : Regenerative Thermal Oxidizer Unit(RTO)	REQ'N NO. : PC2145	PROJECT : ABS Project	A	15.JAN. 2022	S.K PARK	H.K KANG		
	ITEM NO. : COMMON MR							

DESCRIPTION	REQ'N REQUIREMENTS	VENDOR	MEETING 1/27/22	Final Proposal 03/07/22	Final Proposal 3/21/22
1 General					
-. TBE based on Material Requisition	By Vendor	Refer to Durr Propoal for Scope of Supply		Refer to Proposal # 140577.3 for offered scope of supply in pricing table. Customer P.O. to confirm customer's selected final scope of supply.	
-. In case of deviation, priority will be given to the MR and TBE over Vendor Proposal.	By Vendor	Refer to Durr Propoal for Scope of Supply		Refer to Proposal # 140577.3 for offered scope of supply in pricing table. Customer P.O. to confirm customer's selected final scope of supply.	
-. Explosion Proof	NEC : Class I Div 2(Gas Proof)	Durr takes exception	Base Bid: XP Devices/Instruments on Gas Inlet and Gas Train; Option for 2 Items: Motors, Electrical Panel, All Instruments not included in Base Bid (i.e. RTO Chamber and Outlet). Also, Remote HMI	No Explosion Proof equipment, except for instruments, is provided as part of the scope of supply	
-. IP Grade(Motor)	IP54	Acknowledged		Acknowledged - IP54 is General Purpose Industrial Electric Motor Rating	
-. Delivery Duration	30/Sep, 2022	Durr would require receipt of P.O. by February 18, 2022		Please refer to section 4.1.2 of Proposal # 140577.3 which states 28 to 30 weeks from acceptance of P.O. For informational purposes, 30 weeks from 3/11/22 is 10/7/22.	If the order is placed by April 1, 2022, Durr can deliver the RTO by January 2023.
-. Delivery Condition	LGC SITE (OHIO, USA)	Acknowledged		Acknowledged	
-. Electric Power Motor	AC480Vx60Hzx3Phase	Acknowledged		Acknowledged	
Instrument	AC240Vx60Hzx1Phase	Instrument 120 VAC/24 VDC, 60 Hz, 1 phase		Instrument Power: 120 VAC/24 VDC, 60 Hz, 1 phase	
-. Certification work	NEMA, NRTL(UL Certificate)	Acknowledged		Durr clarification: The electrical cabinets are UL508A, but the entire system is not UL rated.	
-. APPLIDED CODE (PRESSURE PART / PIPE / FLANGE)	ASME / ANSI	Acknowledged		Acknowledged	
2 Process Specification					
1) Type	3 Bed Type	Durr is supply 2-Bed Type with VOC Entrapment Chamber	Add Activated Carbon Filter	Durr is supply 2-Bed Type with VOC Entrapment Chamber. The Activated Carbon Filter has not been selected as part of the final scope of supply.	
2) Flow Rate	300 NCMM	Acknowledged		Acknowledged	
3 Scope of Supply					
1) Engineering & Design					
A. CIVIL(Data for earthquake resistance and civil engineering design)	Only Equipment Outline dwg and Loading Data	Not included	GA and Loading Diagram Information included	GA and Loading Diagram Information included	
B. RTO INSIDE (Frame, Walk way)	By Vendor	Included		Included	
C. ROUTING, ISO DWG, P&ID	By Vendor	Included		Included	

TECHNICAL BID EVALUATION 1. Item : Regenerative Thermal Oxidizer Unit(RTO)	PROJ. NO. : PC2145	OWNER : LG Chem	REV.	DATE	PREP'D	CHK'D	CHK'D	APP'D
	REQ'N NO. : PC2145	PROJECT : ABS Project	A	15.JAN. 2022	S.K PARK	H.K KANG		
	ITEM NO. : COMMON MR							

DESCRIPTION	REQ'N REQUIREMENTS	VENDOR	MEETING 1/27/22	Final Proposal 03/07/22	Final Proposal 3/21/22
D. Electric & Instruments	By Vendor	Included		Included	
E. Calculation	By Vendor	Included		Included	
F. Oper. & Inter-Lock Logics	By Vendor	Need clarification	Durr recommendations included	Durr recommendations included	
2) Procurements for RTO system	By Vendor	Included		Included	
A. All Equipment For RTO system	By Vendor	Included per proposal		Refer to Proposal # 140577.3 for offered scope of supply in pricing table. Customer P.O. to confirm customer's selected final scope of supply.	
B. Duct & Pipe & Flange (to Connection Point)	By Vendor	Not included		Not included	
C. Instruments	By Vendor	Included per proposal		Refer to Proposal # 140577.3 for offered scope of supply in pricing table. Customer P.O. to confirm customer's selected final scope of supply.	
D. Control / Operating Panel(PLC) * Main power Supply & Ethernet connection : LGC	By Vendor	Included per proposal		Refer to Proposal # 140577.3 for offered scope of supply in pricing table. Customer P.O. to confirm customer's selected final scope of supply.	
3) Installation & Construction	By Vendor	Included per proposal		Not included	
A. Steel Structure(Frame, Walk way, Sample point)	By Vendor	Included per proposal		Refer to Proposal # 140577.3 for offered scope of supply in pricing table. Customer P.O. to confirm customer's selected final scope of supply.	
B. Mechanical & Piping	By Vendor	Included per proposal		Refer to Proposal # 140577.3 for offered scope of supply in pricing table. Customer P.O. to confirm customer's selected final scope of supply.	
C. Electric & Instrument	By Vendor	Included per proposal		Refer to Proposal # 140577.3 for offered scope of supply in pricing table. Customer P.O. to confirm customer's selected final scope of supply.	
D. Activated carbon filter installation (1EA)	By Vendor	N/A	Include Activated Carbon Filter - operate for 1 hour. LG to resubmit process information	Not included as part of the scope of supply	
E. Construction briefing session, Appointment of safety supervisor, Conduct work risk assessment	By Vendor	TBD	LG stated to delete this line	LG stated to delete this line	
F. Packing	By Vendor	Included		Included	
G. Transportation	LGC SITE (OHIO, USA)	TBD	Freight to be included, most accurate on new proposal	Refer to Proposal # 140577.3 for offered scope of supply in pricing table. Customer P.O. to confirm customer's selected final scope of supply.	
4) Commissioning & Test	By Vendor	Durr included Commissioning and Mechanical Startup Testing. Durr has not included any Performance Testing.	Durr can provide preliminary, informal test DRE with FID for THCs	Not included	

TECHNICAL BID EVALUATION 1. Item : Regenerative Thermal Oxidizer Unit(RTO)	PROJ. NO. : PC2145 REQ'N NO. : PC2145 ITEM NO. : COMMON MR	OWNER : LG Chem PROJECT : ABS Project	REV. A	DATE 15.JAN. 2022	PREP'D S.K PARK	CHK'D H.K KANG	CHK'D	APP'D

DESCRIPTION	REQ'N REQUIREMENTS	VENDOR	MEETING 1/27/22	Final Proposal 03/07/22	Final Proposal 3/21/22
A. Works for Leak Test	By Vendor	N/A	Leak Test ???	N/A, Not Included	
B. PIPE & DUCT CLEANING	By Vendor	N/A		N/A, Not Included	
C. All Preparation Works for Commissioning	By Vendor	Included	Not Included	Not included	
D. Supervising for Commissioning	By Vendor	Included	Included	Not included	
4 Process & Mechanical Design					
1) Quantity	1 SET				
2) Retention Time sec	MIN. 1.5	Take Exception	Durr Design	Durr Design	
3) VOCs DESTRUCTION EFFICIENCY %	99	Included		Refer to section 6.2.1 of Proposal # 140577.3 for the verbage regarding the 99% VOC Destruction Efficiency.	
4) THERMAL RECOVERY EFFICIENCY %	By Vendor	95 ± 2% Included		Refer to section 6.2.3 of Proposal # 140577.3 for the verbage regarding the 95 ± 2% Thermal Efficiency.	
5) TEMP. (INLET / FURNACE / OUTLET) ℃	50~70 / MAX. 1000 / 100~200	70 °F Max Inlet, 1750 °F Max Combustion Chamber, 530 °F Max Outlet		70 °F Max Inlet, Preliminary Estimate: 1750 °F Max Combustion Chamber, 530 °F Max Outlet - to be confirmed during Engineering phase of project.	
6) Retention Chamber			Size Information		
A. Type	3 BED	Durr is supply 2-Bed Type with VOC Entrapment Chamber		Durr is supply 2-Bed Type with VOC Entrapment Chamber	
B. Capacity	18,000	Acknowledged		Acknowledged	
C. Size (L*W*H)	By Vendor	Refer to Proposal		Refer to section 5.2 of Proposal # 140577.3 for the data presented in the table regarding the size of the RM12.	
D. Differential Press.	By Vendor	16.70 in w.c. including 2 in w.c. for upstream (pre-RTO) considerations		Initial Design: 16.70 in w.c. including 2 in w.c. for upstream (pre-RTO) considerations. This will be confirmed during Engineering Phase of project.	
E. Mat'l (Shell / Insulation)	SS400 / B.V	Acknowledged		Acknowledged that SS400 is Carbon Steel basis.	

TECHNICAL BID EVALUATION 1. Item : Regenerative Thermal Oxidizer Unit(RTO)	PROJ. NO. : PC2145	OWNER : LG Chem	REV.	DATE	PREP'D	CHK'D	CHK'D	APP'D
	REQ'N NO. : PC2145	PROJECT : ABS Project	A	15.JAN. 2022	S.K PARK	H.K KANG		
	ITEM NO. : COMMON MR							

DESCRIPTION	REQ'N REQUIREMENTS	VENDOR	MEETING 1/27/22	Final Proposal 03/07/22	Final Proposal 3/21/22
	Above SS400 6T (Shot Blasted, Rust Preventative, Heat resisting Paint)	TBD	Chamber Thickness?	TBD during Engineering Phase	Acknowledged that SS400 is Carbon Steel basis. Additionally, Durr's Standard High Temperature Paint is the color "No. 15 Charcoal", please refer to the attached color pallet. If the requirement for the color choices per the Painting Specification are included with the other standard High Temperature paints on the attached color pallet, then please refer to the updated proposal #US04-140577.4 for the respective pricing adder. If the requirement for the color choices per the Painting Specification are NOT included on the attached color pallet, then please notify Durr accordingly with the Paint Color numbers so an additional price adder can be investigated.
7) Ceramic Heat Transfer Media					
A. Type / MFR.	HONEYCOMB / CERAMIC(AUSTRIA) or European	TBD	Durr utilized Lantec MLM-S. Provide Thermal Efficiency values for each size of MLM	Durr is utilizing Lantec MLM-S for this project which is made in China.	
B. Size (L*W*H) / Q'TY mm, EA	L150 * W150 * H300	Included		nominal size is Length: 150 mm; Width: 150 mm; Height: 100 mm or greater	
C. Specific Surface Area m2	min 1000	TBD	Durr utilized Lantec MLM-S. Provide Thermal Efficiency values for each size of MLM	Durr is utilizing Lantec MLM-S for this project.	
D. Free Area %	Minimun 70	TBD	Durr utilized Lantec MLM-S. Provide Thermal Efficiency values for each size of MLM	Durr is utilizing Lantec MLM-S for this project.	
E. Amount m3	By Vendor	TBD	Durr utilized Lantec MLM-S. Provide Thermal Efficiency values for each size of MLM	Durr is utilizing Lantec MLM-S for this project.	
F. Layer	By Vendor	TBD	Durr utilized Lantec MLM-S. Provide Thermal Efficiency values for each size of MLM	Durr is utilizing Lantec MLM-S for this project.	
G. MAT'L (Shell / Insulation)	CERAMIC	Acknowledged		Durr is utilizing Lantec MLM-S for this project.	
8) Ceramic Filter					
A. Type / MFR.	HONEYCOMB / CERAMIC(AUSTRIA) or European (Made in China is not allowed)	N/A		Durr is utilizing Lantec MLM-S for this project which is made in China.	
B. SIZE (L*W*H) / Q'TY mm, EA	By Vendor	N/A		N/A	
9) Internal Insulation		N/A	Internal Insulation provided for Combustion Chamber	Internal Insulation provided for Combustion Chamber	
A. Mat'l	CERAMIC	N/A		N/A	
B. Thickness mm	200	N/A		N/A	
C. Density / Temp. kg/m3, ℃	By Vendor	N/A		N/A	

TECHNICAL BID EVALUATION 1. Item : Regenerative Thermal Oxidizer Unit(RTO)	PROJ. NO. : PC2145 REQ'N NO. : PC2145 ITEM NO. : COMMON MR	OWNER : LG Chem PROJECT : ABS Project	REV. A	DATE 15.JAN. 2022	PREP'D S.K PARK	CHK'D H.K KANG	CHK'D	APP'D

DESCRIPTION	REQ'N REQUIREMENTS	VENDOR	MEETING 1/27/22	Final Proposal 03/07/22	Final Proposal 3/21/22
10) Burner					
A. Type / Capa. kcal/hr	By Vendor			By Durr - Design will be finalized during Engineering phase of project	
B. Q'ty set	1 set	Acknowledged		Quantity of 1 Burner Acknowledged	
C. Turn Down Ratio	10:1	Acknowledged		Acknowledged	
D. Fuel Fluid	LNG GAS	Natural Gas		Natural Gas	
E. MFR.	By Vendor	Maxon		Maxon	
F. IGNITOR(점화기)	All-in one Type (일체형)	Please Clarify	Durr Design	Durr Design	
11) Combustion Air Unit					
A. Combustion Air Blower					
- Type / MFR.	Turbo Fan / By Vendor	New York Blower		New York Blower	
- Q'ty	1 Set	1 Set		Quantity of 1 Combustion Blower	
- Flow Rate / Press.	By Vendor	TBD	Durr Design	Durr Design	
- Shaft Seal Type	Grand Packing	TBD	Durr Design	Durr Design	
- Mat'l (Casing / Impeller / Shaft)	SS304 / SS304 / SS304	Included		Carbon Steel; Stainless Steel not part of scope of supply	
- DRIVE					
*Type / MFR.	By Vendor	TBD		TBD	
*Rated Power / RPM	By Vendor / 1750	TBD		TBD	
*Volts / PHASE / Hz	480V / 3Φ / 60hz	Included		Included	
*Enclosure (Type / IP Grade)	TEFC / IP54	TBD		TBD	
*Insulation Class / Temp. Rise	F / B	TBD		TBD	
*Type Of Protection	NEC : Class I Div 2(Gas Proof)	Durr Takes Exception	Option for Motor: Class 1, Div 2	Typical Motor Protection with IP54; Explosion-Proof Motors not part of scope of supply	
B. Suction Filter with Sliencer	By Vendor	Included			
C. Expansion Joint & Manual Damper	By Vendor	TBD	Durr Design	Durr Design	
D. Pressure Gauge Q'ty	RESPECTIVELY 1EA DIAPHRAM, 200DIA (1/2" Flange Type) Oil filled	TBD	Durr Design	Durr Design	
E. Pressure Transmitter Q'ty	1 EA	TBD	Durr Design	Durr Design	
F. Manual Damper for Combustion Air blower Discharge	By Vendor	TBD	Durr Design	Durr Design	
12) Pilot Gas Train					
A. Q'ty / Fuel	1SET / LNG	N/A	Durr to check	N/A, only main gas (fuel) train in the below referenced #13 included.	
B. Shut Off V/V (Type / QT'Y / MFR.)	BALL / 2EA(DOUBLE) / KITZ or equivalent	N/A	Durr to check	N/A, not included	

TECHNICAL BID EVALUATION 1. Item : Regenerative Thermal Oxidizer Unit(RTO)	PROJ. NO. : PC2145 REQ'N NO. : PC2145 ITEM NO. : COMMON MR	OWNER : LG Chem PROJECT : ABS Project	REV. A	DATE 15.JAN. 2022	PREP'D S.K PARK	CHK'D H.K KANG	CHK'D	APP'D

DESCRIPTION	REQ'N REQUIREMENTS	VENDOR	MEETING 1/27/22	Final Proposal 03/07/22	Final Proposal 3/21/22
C. Press. Gauge (MFR.)	By Vendor	N/A	Durr to check	N/A, not included	
D. Press. Regulator (Q'ty / MFR.)	1EA / By Vendor	N/A	Durr to check	N/A, not included	
E. Press. Reducing V/V (Q'ty / MFR.)	1EA / By Vendor	N/A	Durr to check	N/A, not included	
F. Flow Indicator (Q'ty / MFR.)	1EA / By Vendor	N/A	Durr to check	N/A, not included	
G. Emergency Vent with AUTO V/V	REQ'D	N/A	Durr to check	N/A, not included	
13) Fuel Train					
A. Q'ty / Fuel	2 SETS / LNG or R-BD	1/Natural Gas		Quantity of 1 for Natural Gas	
B. Shut Off V/V (Type / Q'ty / MFR.)	BALL / 2EA(DOUBLE) / KITZ or equivalent	TBD	Durr to check	Durr to check during Engineering phase of project	
C. Press. Gauge (MFR.)	By Vendor	TBD	Durr to check	Durr to check during Engineering phase of project	
D. Press. Transmitter (Q'ty / MFR.)	2EA / DIAPHRAM	TBD	Durr to check	Durr to check during Engineering phase of project	
E. Press. Reducing V/V (Q'ty / MFR.)	2EA / PICV	TBD	Durr to check	Durr to check during Engineering phase of project	
F. Flow Transmitter / Type (LNG / RBD)	VOLTEX / MASS(R-BD)	TBD	Durr to check	Durr to check during Engineering phase of project	
G. Control V/V (QT'Y / MFR.)	2SET / MOTOYAMA or AZBIL	TBD	Durr to check	Durr to check during Engineering phase of project	
H. Atomizing Air Unit				Need Clarification, Not Included	
- Air Filter, Regulator, ON/OFF V/V, PG, Press Transmitter	By Vendor	Need clarification		Need Clarification, Not Included	
- MAIN BLOCK V/V	By Vendor	Need clarification		Need Clarification, Not Included	
I. Flame Detector(화염감지기)					
- Type / QT'Y	TRANSMITTER / 2EA	Included/TBD	LG Preferred: Honeywell, Qty 2	Quantity of 1; Quantity of 2 is not included as part of scope of supply	
- Detecting Method / MFR.	Dual(UV/IR 겸용) / D-LX 110UA/84EX	Need clarification	Confirm IR	Honeywell UV; UV/IR not included as part of scope of supply	
J. Emergency Vent with AUTO V/V	REQ'D	Not included	Combustion Chamber???	Vent Piping on Gas (Fuel) Train not included. Also, Combustion Chamber Explosion Relief Vent is not included.	

TECHNICAL BID EVALUATION 1. Item : Regenerative Thermal Oxidizer Unit(RTO)	PROJ. NO. : PC2145	OWNER : LG Chem	REV.	DATE	PREP'D	CHK'D	CHK'D	APP'D
	REQ'N NO. : PC2145	PROJECT : ABS Project	A	15.JAN. 2022	S.K PARK	H.K KANG		
	ITEM NO. : COMMON MR							

DESCRIPTION	REQ'N REQUIREMENTS	VENDOR	MEETING 1/27/22	Final Proposal 03/07/22	Final Proposal 3/21/22
K. Painting	By Vendor	Not included based on Durr not possessing the project Painting Specification	LG will provide Painting Specification	Durr Standard; compliance with LG Painting Specification is not included as part of scope of supply	Durr's Standard High Temperature Paint is the color "No. 15 Charcoal", please refer to the attached color pallet. If the requirement for the color choices per the Painting Specification are included with the other standard High Temperature paints on the attached color pallet, then please refer to the updated proposal #US04-140577.4 for the respective pricing adder. If the requirement for the color choices per the Painting Specification are NOT included on the attached color pallet, then please notify Durr accordingly with the Paint Color numbers so an additional price adder can be investigated.
14) IN/OUT DUCT			Durr will supply from Process Fan to Exhaust Stack. Durr to include return line for VOC entrapment chamber	Durr will supply from Process Fan to Exhaust Stack. Durr to include return line for VOC entrapment chamber	
A. MAT'L	SS400	Not Included		Not Inlcuded	
B. Thickness	min 3.2T	Not Included		Not Inlcuded	
C. Insulation (MAT'L / THICKNESS)[Out]	B.V / B.V	Not Included		Not Inlcuded	
D. Accessory	TEST PORT & PLATFORM	Not Included		Not Inlcuded	
E. Emergency VENT including ON/OFF V/V(AUTO)	By Vendor	Not Included		Not Inlcuded	
F. LEL Detector (Q'TY / TYPE / MFR.) - VOC concentration measurement @ Inlet duct	2EA/IR/GASTRON, 1EA/FID/TACHIN SMAT. or equvivalent	Not Included		Not Inlcuded	
G. Flame arrester @ Inlet duct	1 EA	Not Included		Not Inlcuded	
15) Purge Duct					
A. MAT'L	SS400	Not included, N/A		Not included, N/A	
B. THICKNESS mm	Minimum 3.2T	Not included, N/A		Not included, N/A	
C. INSULATION (MAT'L / THICKNESS)	By Vendor	Not included, N/A		Not included, N/A	
D. PURGE AIR FAN		Not included, N/A		Not included, N/A	
- Type / MFR.	TURBO FAN / By Vendor	Not included, N/A		Not included, N/A	
- Q'ty	1 set	Not included, N/A		Not included, N/A	
- Flow Rate / Press. NM3/hr, mmAq	By Vendor	Not included, N/A		Not included, N/A	
- Shaft Seal Type	Grand Packing	Not included, N/A		Not included, N/A	
- MAT'L (CASING / IMPELLER / SHAFT)	SS304 / SS304 / SS304	Not included, N/A		Not included, N/A	
- DRIVE		Not included, N/A		Not included, N/A	
*Type / MFR.	By Vendor	Not included, N/A		Not included, N/A	
*Rated Power / RPM	By Vendor / 1750	Not included, N/A		Not included, N/A	

TECHNICAL BID EVALUATION	PROJ. NO. : PC2145	OWNER : LG Chem	REV.	DATE	PREP'D	CHK'D	CHK'D	APP'D
1. Item : Regenerative Thermal Oxidizer Unit(RTO)	REQ'N NO. : PC2145	PROJECT : ABS Project	A	15.JAN. 2022	S.K PARK	H.K KANG		
	ITEM NO. : COMMON MR							

DESCRIPTION	REQ'N REQUIREMENTS	VENDOR	MEETING 1/27/22	Final Proposal 03/07/22	Final Proposal 3/21/22
*Volts / PHASE / Hz	480V / 3Φ / 60hz	Not included, N/A		Not included, N/A	
*Enclosure (Type / IP Grade)	TEFC / IP54	Not included, N/A		Not included, N/A	
*Insulation Class / Temp. Rise	F / B	Not included, N/A		Not included, N/A	
*Type Of Protection	NEC : Class I Div 2(Gas Proof)	Not included, N/A		Not included, N/A	
- Expansion Joint & Manual Damper	By Vendor	Not included, N/A		Not included, N/A	
- Press. / Thermo Gauge (QT'Y / MFR.)	IN/OUT RESPECTIVELY 1EA	Not included, N/A		Not included, N/A	
16) Main Exhaust Blower					
A. Type / MFR.	TURBO FAN / By Vendor	New York Blower		New York Blower	
B. Q'ty	1 set	1 set	2 sets, 100% as option	2 sets, 1 duty and 1 standby, each 100%	
C. Flow Rate / Press. Nm3/hr X mmAq	18,000Nm3/hr X 500mmAq	18,000 Nm3/hr x 400 mmAq		Initial Design: 18,000 Nm3/hr vs. 16.70 in w.c. including 2 in w.c. for upstream (pre-RTO) considerations. This will be confirmed during Engineering Phase of project.	
D. Shaft Seal Type	Grand Packing	Need clarification		Need Clarification	
E. MAT'L (CASING / IMPELLER / SHAFT)	SUS304 / SUS304+Anti Static TEFLON COATING / SUS304 Coating Thickness is 60~80 micrometer Coating Inspection Report Non-spark Type	Housing: 304 S.S.; Wheel: 2205 Duplex S.S.; Shaft: 316 S.S.; Anti-spark coating included		Carbon Steel basis for both fans; Stainless Steel is not part of the scope of supply	
F. DRIVE					
*Type / MFR.	Inverter / By Vendor	Inverter/TBD		Inverter/TBD	
*Rated Power / RPM	By Vendor / 1750	TBD/TBD		TBD/TBD	
*Volts / PHASE / Hz	480V / 3Φ / 60hz	Included		Included	
*Enclosure (Type / IP Grade)	TEFC / IP54	Included		Included	
*Insulation Class / Temp. Rise	F / B	TBD		TBD	
*Type Of Protection	NEC : Class I Div 2(Gas Proof)	Take exception to Class 1, Division 2	Option: Class 1, Div 2	Typical Motor Protection with IP54; Explosion-Proof Motors not part of scope of supply	
G. BRG. LUBRICATION TYPE	GREESE	Included	Poppet Valve Lubrication?	Need Clarification, nothing added to scope of supply	
H. POWER TRANSMISSION	COUPLING	Need clarification	Direct Drive, Arr 8, Vibration Sensors @ Main Fan	Direct Drive, Arr 8, Vibration Sensors @ Main Fan	
I. Expansion Joint & Manual Damper	By Vendor	Need clarification		Need Clarification, nothing added to scope of supply	
J. Press. / Thermo Gauge (QT'Y / MFR.)	IN/OUT RESPECTIVELY 1EA / By Vendor	Need clarification		Need Clarification, nothing added to scope of supply	

TECHNICAL BID EVALUATION	PROJ. NO. : PC2145	OWNER : LG Chem	REV.	DATE	PREP'D	CHK'D	CHK'D	APP'D
1. Item : Regenerative Thermal Oxidizer Unit(RTO)	REQ'N NO. : PC2145	PROJECT : ABS Project	A	15.JAN. 2022	S.K PARK	H.K KANG		
	ITEM NO. : COMMON MR							

DESCRIPTION	REQ'N REQUIREMENTS	VENDOR	MEETING 1/27/22	Final Proposal 03/07/22	Final Proposal 3/21/22
17) Exhaust Stack					
A. Dimension (ID x H)	By Vendor	Refer to proposal GA drawing		Refer to proposal GA drawing	
B. Insulation (Mat'l / Thickness)	By Vendor	Refer to proposal	Personnel Protection - Base, Ladder and Platform	Personnel Protection - Base, Ladder and Platform	
C. Accessory	Access Hole (Environmental law)	Refer to proposal		Refer to proposal	
	& PLAT FORM				
18) A.C Filter(RTO Emergency Bypass)			Activated Carbon included - 1 hr operation	Activated Carbon not included as part of the scope of supply	
Capacity Nm3/Hr	18,000	N/A		N/A	
Material	304 S.S	N/A		N/A	
5 Electric & Instrumentation					
1) Local Control Panel		Included		Included	
A. Type	Self Standing, Outdoor Installation	Outdoor Installation		Outdoor Installation	
B. Cabinet Size	By Vendor	Included, TBD		Included, TBD	
C. Every component inside LCP	Required	Included, TBD		Included, TBD	
- MCC, Inverte, Relay and etc		Included, TBD		Included, TBD	
D. Explosion Proof	Non-explosion	Non-Explosion Proof		Non-Explosion Proof	
2) Control System		Included, TBD		Included, TBD	
A. PLC	Required	Allen Bradley CompactLogix		Allen Bradley CompactLogix	
B. Touch Screen	Required	Panelview Plus 1000		Panelview Plus 1000	
C. MMI PC	Required	Panelview Plus 1000		Panelview Plus 1000	
D. Communication between PLC and MMI	Ethernet	Durr Standard		Durr Standard	
3) UL Certification (NRTL)	Required	UL Listed		Durr clarification: The electrical cabinets are UL508A, but the entire system is not UL rated.	
6 Other Requirements					
1) Guarantee	US Compliance	Need clarification	LG and Durr discussed	LG and Durr discussed	

TECHNICAL BID EVALUATION	PROJ. NO. : PC2145	OWNER : LG Chem	REV.	DATE	PREP'D	CHK'D	CHK'D	APP'D
1. Item : Regenerative Thermal Oxidizer Unit(RTO)	REQ'N NO. : PC2145	PROJECT : ABS Project	A	15.JAN. 2022	S.K PARK	H.K KANG		
	ITEM NO. : COMMON MR							

DESCRIPTION	REQ'N REQUIREMENTS	VENDOR	MEETING 1/27/22	Final Proposal 03/07/22	Final Proposal 3/21/22
2) Painting (ONLY C.S PART)	LGC PAINTING SPEC	Not included based on Durr not possessing the project Painting Specification	LG to provide Painting Specification	Durr Standard; compliance with LG Painting Specification is not included as part of scope of supply	Durr's Standard High Temperature Paint is the color "No. 15 Charcoal", please refer to the attached color pallet. If the requirement for the color choices per the Painting Specification are included with the other standard High Temperature paints on the attached color pallet, then please refer to the updated proposal #US04-140577.4 for the respective pricing adder. If the requirement for the color choices per the Painting Specification are NOT included on the attached color pallet, then please notify Durr accordingly with the Paint Color numbers so an additional price adder can be investigated.
3) Working Stage & Ladder	By Vendor(OSHA)	Need clarification	Durr to provide Ladder & Platform	Included	
4) Documentation	By Vendor	Need clarification	Durr to provide standard list of documentation. Emissions based on inlet concentrations; Utilities consumption. Durr supply data sheet as soon as possible after contract.	Durr to provide standard list of documentation. Emissions based on inlet concentrations; Utilities consumption. Durr supply data sheet as soon as possible after contract.	
A. P&ID, PFD	By Vendor	Preliminary P&ID and GA submitted with Proposal	Project level P&ID, GA will be generated	Project level P&ID, GA will be generated	
B. Instrument Schedule	By Vendor	Included		Included	
C. Control Logic (Flow Chart)	By Vendor	Need clarification		Need Clarification, nothing added to scope of supply	
D. All Eng. Dwg & Operation Manual (English)	By Vendor	Included		Included	
E. Specification Requirements for EQUIP.	By Vendor	Per Proposal Scope		Per Proposal Scope as confirmed by Purchase Order	
F. All Documents for Environmental Permit	By Vendor	Need clarification	LG to apply for Environmental Permit. Durr submit documents in 2 weeks after contract.	LG to apply for Environmental Permit. Durr submit documents in 2 weeks after contract.	
5) Operator training	By Vendor	Included	Included with the option of Commissioning	Not included as part of the scope of supply	
6) Spare Parts	Commissioning & Start-Up	Not Included	Essential Spare List Only. Next time will have discussion on Maintenance and Spare Parts.	Not included as part of the scope of supply	
7) Noise Level	85 dB under	TBD	Durr to include as option	Not included as part of the scope of supply	
8) Installation Work	Machine/Pipe, Installation License LGC Welding Skills Test CERTI. Possession	Need clarification	Not included	Not included as part of the scope of supply	
9) Safety Management	Have a legally appointed safety manager Conduct work risk assessment, comply with safety specifications	Not Included	Not included	Not included as part of the scope of supply	
10) Other Compliance					

TECHNICAL BID EVALUATION	PROJ. NO. : PC2145	OWNER : LG Chem	REV.	DATE	PREP'D	CHK'D	CHK'D	APP'D
1. Item : Regenerative Thermal Oxidizer Unit(RTO)	REQ'N NO. : PC2145	PROJECT : ABS Project	A	15.JAN. 2022	S.K PARK	H.K KANG		
	ITEM NO. : COMMON MR							

DESCRIPTION	REQ'N REQUIREMENTS	VENDOR	MEETING 1/27/22	Final Proposal 03/07/22	Final Proposal 3/21/22
Document for permission (Environment, atmospheric,PSM,HAZOP, etc)	By Vendor	Need clarification	Refer to above	Refer to above clarifications pertaining to this subject	
Installation of Explosion vents in each of 3 RTO combusion chambers	By Vendor	Not Included and not applicable	Need to research???	Not included as part of the scope of supply	
Apply the project Painting Specification	By Vendor	Not included based on Durr not possessing the project Painting Specification	LG to provide Painting Specification	Durr Standard; compliance with LG Painting Specification is not included as part of scope of supply	Durr's Standard High Temperature Paint is the color "No. 15 Charcoal", please refer to the attached color pallet. If the requirement for the color choices per the Painting Specification are included with the other standard High Temperature paints on the attached color pallet, then please refer to the updated proposal #US04-140577.4 for the respective pricing adder. If the requirement for the color choices per the Painting Specification are NOT included on the attached color pallet, then please notify Durr accordingly with the Paint Color numbers so an additional price adder can be investigated.
7 Out of Scope					
-. Main Power Supply	LGC	Need Clarification	Performed by LG General Contractor. LG will bring to Durr's control panel.	Performed by LG General Contractor. LG will bring to Durr's control panel.	
-. Commincation cable between LCP and HMI PC	LGC	Need Clarification	1 for control room included. Remote HMI to supplied by Durr loose and installed by LG.	Remote HMI to be supplied by Durr loose and installed by LG. Communication cable between LCP and HMI is by LG. Please note that this model of RTO does not have a control room, just local control panel.	
8 Test & Inspection					
-. Mill Certification Report	By Vendor	Need Clarification	Certificate of Analysis (COA) for metals used for combustion chamber. Durr to confirm what can be provided?	Certificate of Analysis (COA) for metals used for combustion chamber. Durr to confirm what can be provided during the Engineering Phase of the project.	
-. Visual and Dimensional Insepction	By Vendor	Included		Shop Inspection Included	
-. Running Test & Performance Test	By Vendor	Mechanical Startup Test included; Performance Test not included	Pre-Performance Test with FID included	Not included as part of the scope of supply	
-. Final Inspection	By Vendor	Included		Shop Inspection Included	
9 Certification					
-. Material Mill Certification	NEMA , UL Certificate	Need Clarification		Need Clarification, nothing added to scope of supply	

TECHNICAL BID EVALUATION	PROJ. NO. : PC2145	OWNER : LG Chem	REV.	DATE	PREP'D	CHK'D	CHK'D	APP'D
1. Item : Regenerative Thermal Oxidizer Unit(RTO)	REQ'N NO. : PC2145	PROJECT : ABS Project	A	15.JAN. 2022	S.K PARK	H.K KANG		
	ITEM NO. : COMMON MR							

DESCRIPTION	REQ'N REQUIREMENTS	VENDOR	MEETING 1/27/22	Final Proposal 03/07/22	Final Proposal 3/21/22
10 Guarantee	30 months after delivery and 18 months after completion of commissioning	Durr Standard - 12 months from startup not to exceed 180 days from shipment date.		Refer to section 6.1 of Proposal # 140577.3 for the verbage regarding the Warranty options.	
11 Document	SEE M.R TBD	Need Clarification	Durr to submit standard document list	Durr to submit standard document list	
12 Installation period	By Vendor	1 - 2 weeks	Durr to provide Installation Supervision; LG will hire General Contractor	Not included as part of the scope of supply	
TBE RESULT					

*** LEGEND ; OK : IN ACCORDANCE WITH REQ'N M.R : MFR'S RECOMMENDATION N.S : NOT SPECIFIED IN QUOTATION N.A : NOT APPLICABLE**

No. 1 Black

No. 2 Silver

No. 3 Lagoon

No. 4 Topaz

No. 5 Horizon

No. 6 Newport

No. 7 Mauve

No. 8 Walnut

No. 9 Fawn

No. 10 Russet

No. 11 Quarry

No. 12 Camouflage

No. 13 Dusty

No. 14 Golden

No. 15 Charcoal

No. 16 Steel

No. 17 Pewter

No. 18 White

No. 19 Safety Blue

No. 20 Safety Orange

No. 21 Safety Green

No. 22 Safety Yellow

No. 23 Safety Red

Consult the Kem Hi-Temp product data sheets for specific heat resistance of each color in the desired product series.

APPENDIX D. PRELIMINARY CAPTURE EFFICIENCY ESTIMATE

A	B	C	D	E=A+D	F=1-(E-D)/E
Ambient VOCs, ppm	Hood at Die Face VOCs, ppm	Knockout Pot VOCs, ppm (calculated)	Inlet to RTO VOCs, ppm	Total VOCs (Ambient + Inlet to RTO), ppm	Capture Efficiency, %
3.34	87.25	434.42	521.67	525.00	99.36%

Notes

The values shown above were estimated by LG Chem in response to Ohio EPA's request for a preliminary capture-efficiency estimate. They are not the results of a U.S. EPA Method 204 study. Capture efficiency will be verified through subsequent Method 204 testing, or another method approved by Ohio EPA.

APPENDIX E. PERFORMANCE TEST

Source Test Report for 2026 Compliance Testing

LG Chemical America, Inc.
Ravenna, Ohio

Extrusion Process (P004)

Prepared for:	LG Chemical America Inc. 6800 North Chestnut Street Ravenna, OH 44266
Prepared by:	Onterris Air Quality Services, LLC 10060 Brecksville Road Brecksville, OH 44141
For Submission To:	Akron Regional Air Quality Management District 1867 W Market St Akron, OH 44313

Document Number:	NE011AS-070363-RT-2828
Test Date:	July 30, 2026
Submittal Date:	August 24, 2026

STAC STACK TESTING ACCREDITATION COUNCIL
ACCREDITED TO ASTM D7036 ONLY CERT #3925.01

For Planet
& Progress

Review and Certification

2026 Compliance Testing
LG Chemical America, Inc.
Extrusion Process (P004)

All work, calculations, and other activities and tasks performed and presented in this document were carried out by me or under my direction and supervision. I hereby certify that, to the best of my knowledge, Onterris operated in conformance with the requirements of the Onterris Quality Management System and ASTM D7036-04 during this test project.

Jeremiah Hicks

Jeremiah Hicks
Account Manager

08 / 24 / 2026

Date

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

robert j lisy jr

Robert J. Lisy, Jr.
District Manager

08 / 25 / 2026

Disclaimer

Onterris Air Quality Services (Onterris) certifies to LG Chemical America (the Client) that the conclusions in this report are the professional opinions of Onterris at the time of the report and concerning the scope described in the report. The opinions are based on the site conditions observed on the date set out in the report and information obtained during the performance of the scope and do not contemplate subsequent changes in site conditions or information or changes in applicable law or standards subsequent to the date of the report. Onterris has exercised a customary level of skill, care, and diligence in using information received from the Client and/or third parties in the preparation of the report, however, assumes no responsibility or liability for the consequences of any error or omission contained in such information. This report was prepared solely for the use of the Client in relation to the specific scope, location, and purpose for which Onterris was retained and is not intended to be used for any variation or extension of the scope or any other project or purpose. Any other use or reliance on the report by the Client or any use or reliance by any third party without the prior express written consent of Onterris is at the sole risk and responsibility of the user and Onterris makes no representation or warranty with respect to any unauthorized use and expressly disclaims any legal duty of care to any such person. Neither Onterris nor its affiliates are responsible for damages, losses, fines, penalties, or other harm incurred by such unauthorized user as a result of decisions made or actions taken based on this report. This report may not be read or reproduced except in its entirety.

Table of Contents

1 Introduction 5
1.1 Summary of Test Program 5
1.2 Key Personnel 7
2 Plant and Sampling Location Descriptions 8
2.1 Process Description, Operation, and Control Equipment 8
2.2 Flue Gas Sampling Locations 8
2.3 Operating Conditions and Process Data 8
3 Sampling and Analytical Procedures 9
3.1 Test Methods 9
3.1.1 EPA Method 1 9
3.1.2 EPA Method 2 9
3.1.3 EPA Method 3A 10
3.1.4 EPA Method 4 11
3.1.5 Method 25A 13
3.2 Process Test Methods 14
4 Test Discussion and Results 15
4.1 Field Test Deviations and Exceptions 15
4.2 Presentation of Results 15
5 Internal QA/QC Activities 17
5.1 QA/QC Audits 17
5.2 QA/QC Discussion 17
5.3 Quality Statement 17

List of Figures

Figure 3-1 EPA Method 2 Sampling Train 10
Figure 3-2 EPA Methods 3A Sampling Train 11
Figure 3-3 EPA Method 4 (Detached) Sampling Train 12
Figure 3-4 EPA Method 25A Sampling Train 14

List of Tables

Table 1-1 Summary of Test Program 5
Table 1-2 Summary of Average Compliance Results – P004 RTO 6
Table 1-3 Test Personnel and Observers 7
Table 2-1 Sampling Locations 8
Table 4-1 VOC Emission Results – P004 RTO Inlet Duct 16
Table 4-2 VOC Emission and DE Results – P004 RTO Exhaust Stack 16

Appendices

Appendix A Field Data and Calculations 18
Appendix A1 Sampling Locations 19
Appendix A2 P004 RTO Inlet Data Sheets 23
Appendix A3 P004 RTO Exhaust Data Sheets 36
Appendix A4 Instrumental Test Method Data 50
Appendix A5 Example Calculations 74
Appendix B Facility Process Data 79
Appendix C Quality Assurance / Quality Control 81
Appendix C1 Units and Abbreviations 82
Appendix C2 Manual Test Method QA/QC Data 92
Appendix C3 Instrumental Test Method QA/QC Data 117
Appendix C4 Accreditation Information / Certifications 132
Appendix D Regulatory Information 154

1 Introduction

1.1 Summary of Test Program

LG Chemical America, Inc. contracted Onterris Air Quality Services, LLC (Onterris) to perform a compliance test program on the Extrusion Process (P004) at the LG Chemical America, Inc. facility (Facility ID: 16-67-06-0181) located in Ravenna, Ohio.

The tests are conducted to satisfy emissions testing requirements pursuant to Ohio Environmental Protection Agency (OEPA) Permit-to-Install and Operate (PTIO) No.: P0132055.

The specific objectives were to:

- Measure emissions of Total Organic Compounds (TOC) at the P004 Regenerative Thermal Oxidizer (RTO) Inlet Duct and P004 RTO Exhaust Stack
- Determine Volatile Organic Compound (VOC) destruction efficiency (DE) of the P004 RTO
- Conduct the test program with a focus on safety

Onterris performed the tests to measure the emission parameters listed in Table 1-1.

Table 1-1 Summary of Test Program

Test Date	Unit ID / Source Name	Activity / Parameters	Test Methods	No. of Runs	Duration (Minutes)
7/30/2026	P004 RTO Inlet Duct	Traverse Points	EPA M1	--	--
		Stack Gas Velocity, Volumetric Flow Rate	EPA M2	3	60
		H_2O	EPA M4	3	60
		O_2, CO_2	EPA M3A	3	60
		TOC, as propane	EPA M25A	3	60
7/30/2026	P004 RTO Exhaust Stack	Traverse Points	EPA M1	--	--
		Stack Gas Velocity, Volumetric Flow Rate	EPA M2	3	60
		H_2O	EPA M4	3	60
		O_2, CO_2	EPA M3A	3	60
		TOC, as propane	EPA M25A	3	60

To simplify this report, a list of Units and Abbreviations is included in Appendix D1. Throughout this report, chemical nomenclature, acronyms, and reporting units are not defined. Please refer to the list for specific details.

This report presents the test results and supporting data, descriptions of the testing procedures, descriptions of the facility and sampling locations, and a summary of the quality assurance procedures used by Onterris. The average emission test results are summarized and compared to their respective permit limits in Table 1-2. Detailed results for individual test runs can be found in Section 4.0. All supporting data can be found in the appendices.

The testing was conducted by the Onterris personnel listed in Table 1-3. The tests were conducted according to the test plan (protocol) dated July 14, 2026, that was submitted to ARAQMD.

Table 1-2 Summary of Average Compliance Results – P004 RTO

July 30, 2026

Parameter/Units	Average Results	Allowable
Volatile Organic Compounds (VOC) – P004 RTO Exhaust Stack		
ppmvd, as propane	5.6	≤ 7
VOC Destruction Efficiency – P004 RTO		
%	98.2	≥ 99

1.2 Key Personnel

A list of project participants is included below:

Facility Information

Source Location:	LG Chemical America, Inc. 6800 North Chestnut Street Ravenna, OH 44266	
Project Contact:	Richard Schubert	Thomas C. Willeford
Role:	Environmental Health and Safety Manager	Environmental Engineer Specialist
Company:	LG Chemical America	LG Chem Ohio Petrochemical, Inc.
Telephone:	330.313.3078	216.282.4696
Email:	rschubert@lgchem.com	twilleford@lgchem.com

Agency Information

Regulatory Agency:	Akron Regional Air Quality Management District
Agency Contact:	Laura Miracle
Telephone:	330.812.3953
Email:	lmiracle@schd.org

Testing Company Information

Testing Firm:	Onterris Air Quality Services	
Contact:	Jeremiah Hicks	Robert J. Lisy, Jr.
Title:	Account Manager	District Manager
Telephone:	440.340.8189	440.262.3760
Email:	jhicks@onterris.com	rlisy@onterris.com

Test personnel and observers are summarized in Table 1-3.

Table 1-3 Test Personnel and Observers

Name	Affiliation	Role/Responsibility
Jeremiah Hicks	Onterris	Account Manager, QI
Cedric Ebbeler	Onterris	Senior Field Technician, QI
Andrew Greenwood	Onterris	Field Technician
Richard Schubert	LG Chemical America, Inc.	Test Coordinator
Mike Burr	Trinity Consultants	Observer
Kelly Kanoza	ARAQMD	Observer

2 Plant and Sampling Location Descriptions

2.1 Process Description, Operation, and Control Equipment

LG Chemical America operates an extrusion process which includes cooling, pelletizing, and screening. The various particulate emission sources are controlled by Dust Collector DC-1701, while the off-gases from the extruders are controlled by a regenerative thermal oxidizer (RTO).

2.2 Flue Gas Sampling Locations

Information regarding the sampling location(s) is presented in Table 2-1.

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.)	
P004 RTO Inlet Duct	23.8 x 24.0	98.0 / 4.1	30.0 / 1.3	Flow: 16 (8 / per port) CEMS: 1
P004 RTO Exhaust Stack	48.4 x 26.6 (rectangular)	125.5 / 3.7	35.0 / 1.0	Flow: 16 (4 / per port) CEMS: 1

The sample locations were verified in the field to conform to EPA Method 1. Acceptable cyclonic flow conditions were confirmed prior to testing using EPA Method 1, Section 11.4. See Appendix A1 for more information.

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 was tested when operating at >90% capacity.

Plant personnel were responsible for establishing the test conditions and collecting all applicable unit-operating data. The process data that was provided is presented in Appendix B. Data collected includes the following parameters:

- P004 Production, kg
- Times (Start and Stop), hh:mm
- RTO Temperatures (Chamber A and Chamber B), °F

3 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:

- Method Options:
  - None
- Method Exceptions:
  - None

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

- Method Exceptions:
  - None

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

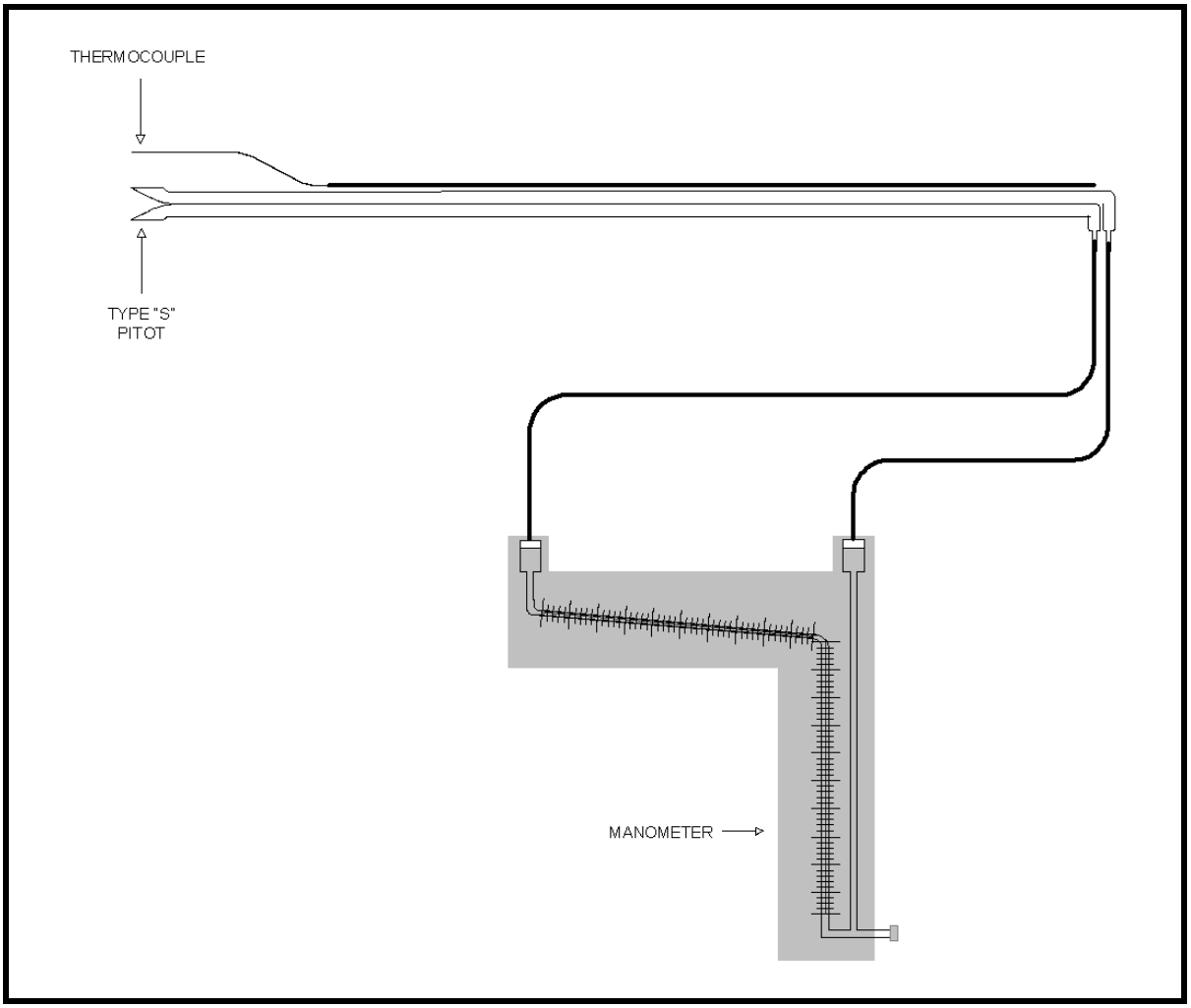


Figure 3-1 EPA Method 2 Sampling Train

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:
  - EPA Method 205 is used to prepare calibration gas mixtures
  - Single-point sampling is performed if O_2 and CO_2 measurements are for molecular weight calculations only
  - Calibration span values at both sampling locations are 21.89% O_2 and 21.65% CO_2
- Method Exceptions:
  - None

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

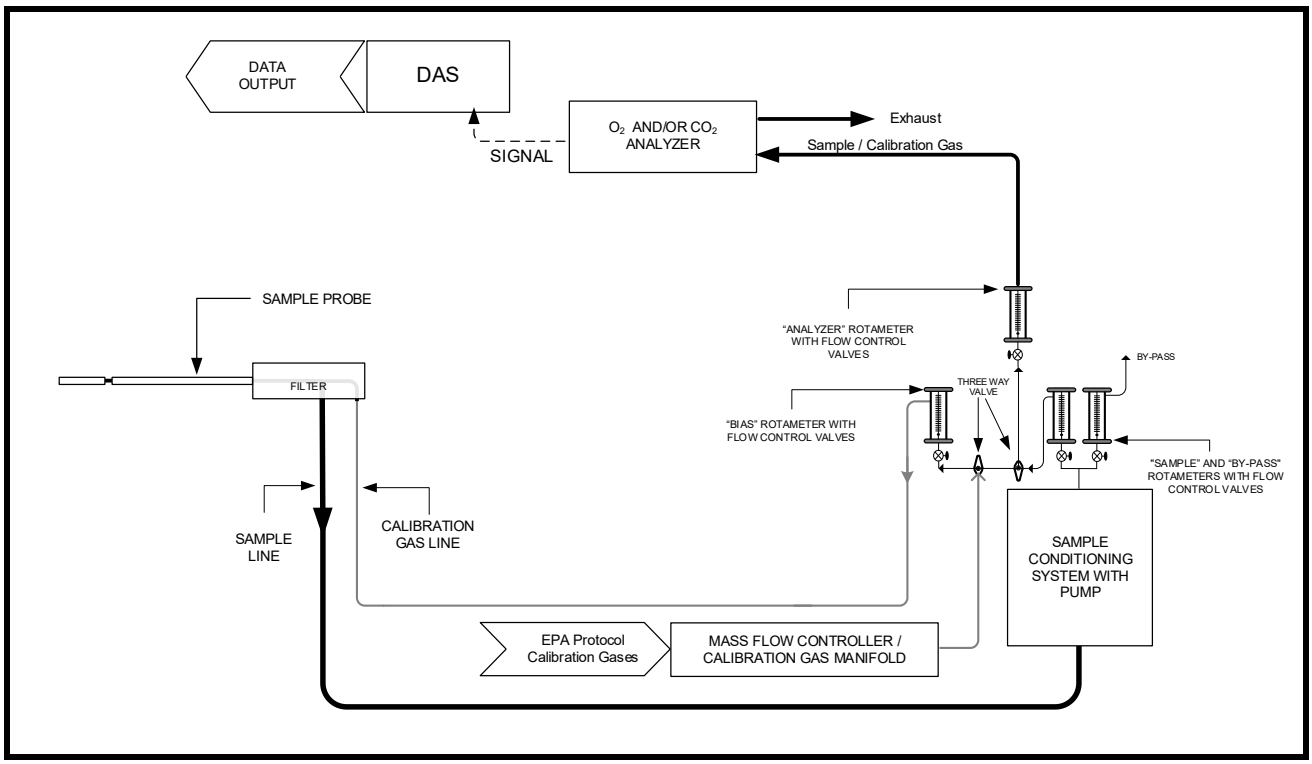


Figure 3-2 EPA Methods 3A Sampling Train

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:
  - None
- Method Exceptions:
  - Moisture sampling is performed as a stand-alone method at a single point in the centroid of the stack

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

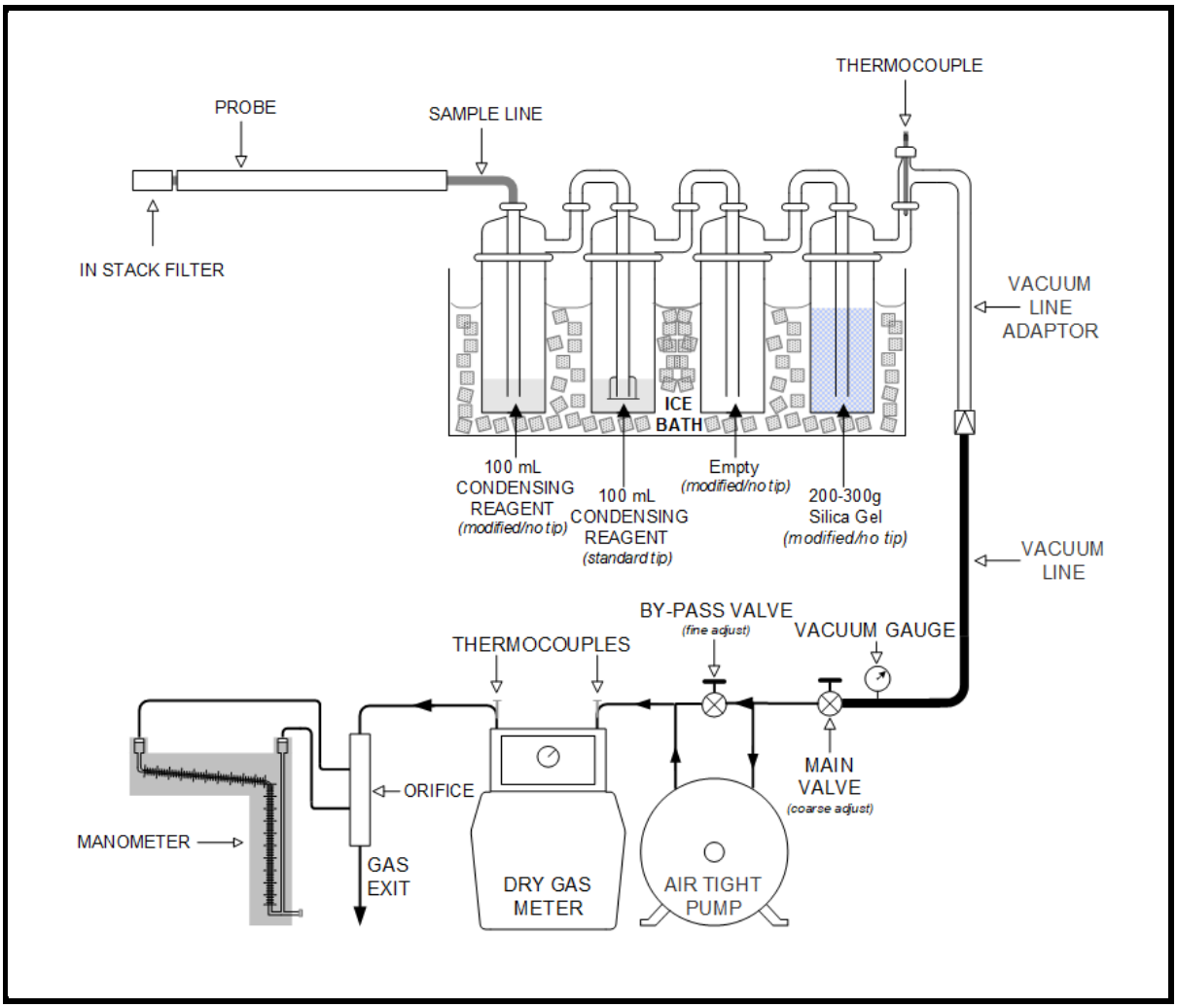


Figure 3-3 EPA Method 4 (Detached) Sampling Train

3.1.5 EPA Method 25A

Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

EPA Method 25A is an instrumental test method used to measure the concentration of THC in stack gas. A gas sample is extracted from the source through a heated sample line and glass fiber filter to a flame ionization analyzer (FIA). Results are reported as volume concentration equivalents of the calibration gas or as carbon equivalents.

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

- Method Options:
  - EPA Method 205 is used to prepare calibration gas mixtures
  - Results are reported in terms of propane
  - Span value, as propane, at the P004 RTO Inlet Duct is 1000 ppmvw
  - Span value, as propane, at the P004 RTO Exhaust Stack 100 ppmvw
- Method Exceptions:
  - None

The typical sampling system is detailed in Figure 3-4.

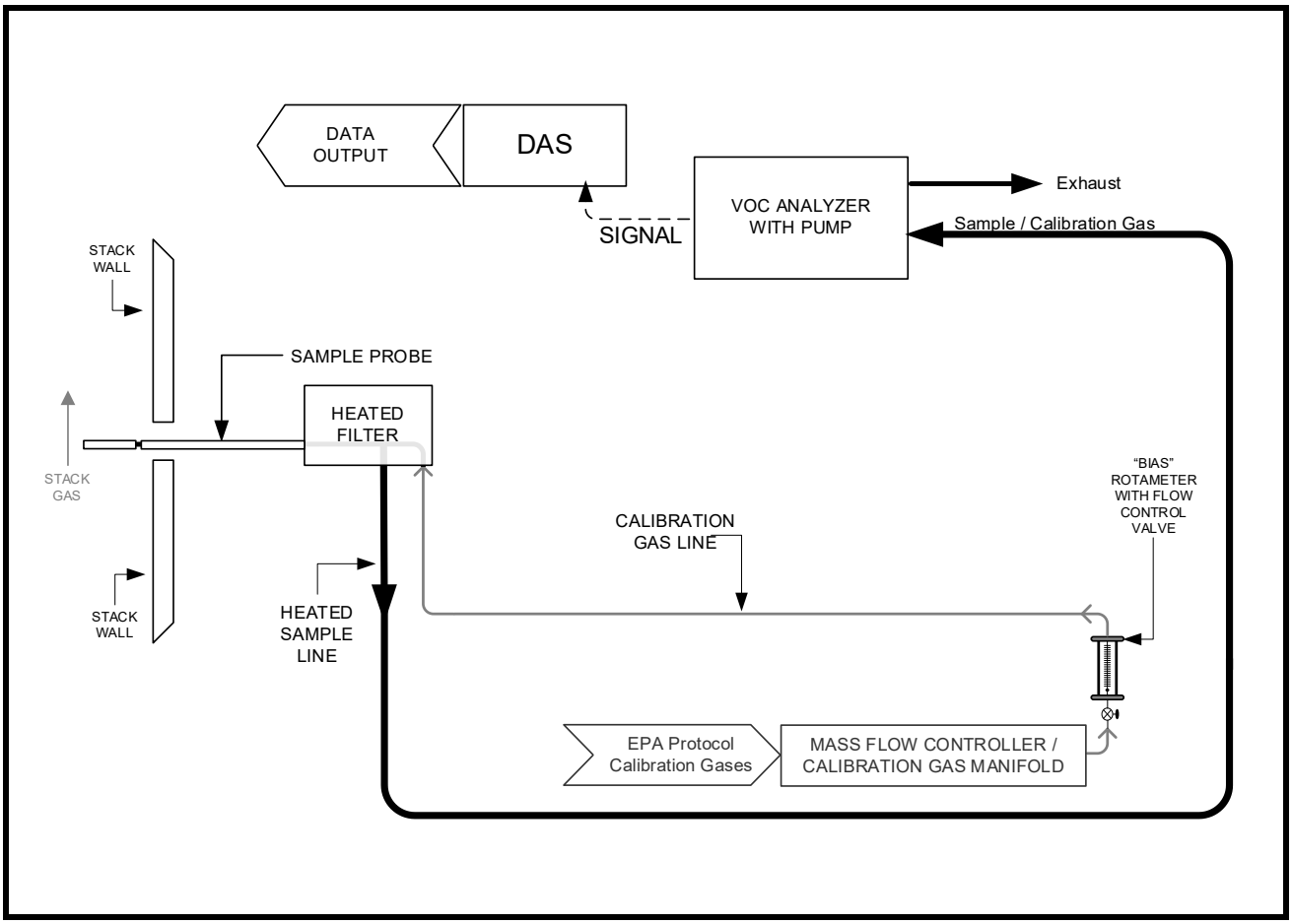


Figure 3-4 EPA Method 25A Sampling Train

3.2 Process Test Methods

The test plan did not require that process samples be collected during this test program; therefore, no process sample data are presented in this test report.

4 Test Discussion and Results

4.1 Field Test Deviations and Exceptions

The Onterris CEMS trailer experienced a power outage 26 minutes into Run 2. The onsite EPA representative and facility personnel were promptly notified by Onterris personnel. Following a 49-minute interruption, power was restored and sampling was resumed.

No other field deviations or exceptions from the test plan or test methods occurred during this test program.

4.2 Presentation of Results

The average results are compared to the permit limits in Table 1-2. The results of individual test runs performed are presented in Tables 4-1 and 4-2. Emissions are reported in units consistent with those in the applicable regulations or requirements. Additional information is included in the appendices as presented in the Table of Contents.

Table 4-1 VOC Emission Results – P004 RTO Inlet Duct

Parameter/Units	Run 1	Run 2	Run 3	Average
Date	7/30/2026	7/30/2026	7/30/2026	--
Time	08:38-09:38	10:15-12:04	12:40-13:40	--
Process Data[1]				
Production Rate, kg/hr	8,050	6,220	6,900	7,057
RTO Chamber A Temp, °F	1,595	1,595	1,595	1,595
RTO Chamber B Temp, °F	1,602	1,602	1,603	1,602
Sampling & Flue Gas Parameters				
sample duration, minutes	60	60	60	60
O_2, % volume dry	21.10	20.75	20.84	20.90
CO_2, % volume dry	0.043	0.039	0.031	0.038
flue gas temperature, °F	90.69	94.56	100.81	95.35
moisture content, % volume	2.83	2.62	1.85	2.43
volumetric flow rate, dscfm	3,971	3,732	3,633	3,779
Total Organic Compounds, as Propane (VOC)				
ppmvd	479	528	558	522
lb/hr	13.1	13.5	13.9	13.5

1 Process data was provided by LG Chemical America, Inc.

Table 4-2 VOC Emission and DE Results – P004 RTO Exhaust Stack

Parameter/Units	Run 1	Run 2	Run 3	Average
Date	7/30/2026	7/30/2026	7/30/2026	--
Time	08:38-09:38	10:15-12:04	12:40-13:40	--
Process Data[1]				
Production Rate, kg/hr	8,050	6,220	6,900	7,057
RTO Chamber A Temp, °F	1,595	1,595	1,595	1,595
RTO Chamber B Temp, °F	1,602	1,602	1,603	1,602
Sampling & Flue Gas Parameters				
sample duration, minutes	60	60	60	60
O_2, % volume dry	20.25	20.30	20.35	20.30
CO_2, % volume dry	0.42	0.43	0.43	0.42
flue gas temperature, °F	161.4	165.4	169.9	165.6
moisture content, % volume	2.89	2.58	2.04	2.50
volumetric flow rate, dscfm	6,649	6,418	6,381	6,482
Total Organic Compounds, as Propane (VOC)				
ppmvd	4.98	5.41	6.34	5.57
lb/hr	0.23	0.24	0.28	0.25
VOC Destruction Efficiency				
%	98.3	98.3	98.0	98.2

1 Process data was provided by LG Chemical America, Inc.

5 Internal QA/QC Activities

5.1 QA/QC Audits

The meter boxes and sampling trains used during sampling performed within the requirements of their respective methods. All post-test leak checks, minimum metered volumes, minimum sample durations met the applicable QA/QC criteria.

EPA Method 3A calibration audits were all within the measurement system performance specifications for the calibration drift checks, system calibration bias checks, and calibration error checks.

EPA Method 25A FIA calibration audits were within the measurement system performance specifications for the calibration drift checks and calibration error checks.

An EPA Method 205 field evaluation of the calibration gas dilution system was conducted. The dilution accuracy and precision QA specifications were met.

5.2 QA/QC Discussion

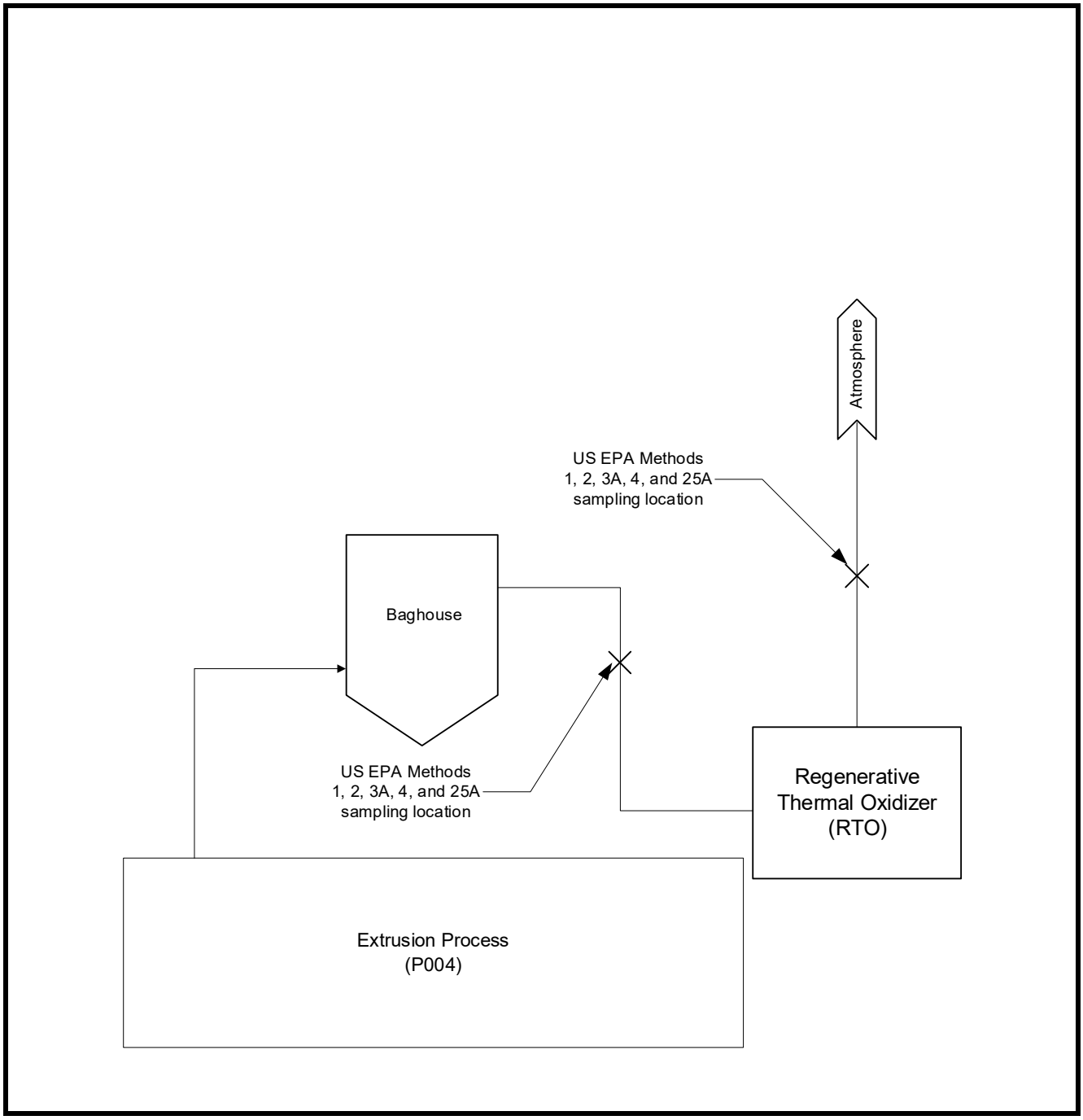
All QA/QC criteria were met during this test program.

5.3 Quality Statement

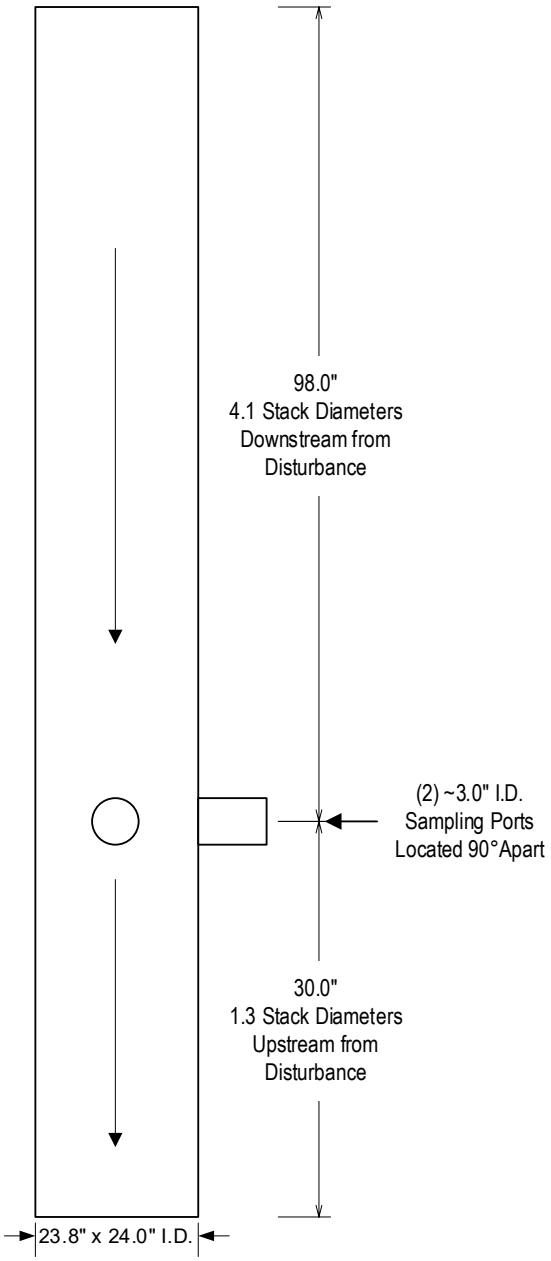
Onterris is qualified to conduct this test program and has established a quality management system that led to accreditation with ASTM Standard D7036-04 (Standard Practice for Competence of Air Emission Testing Bodies). Onterris participates in annual functional assessments for conformance with D7036-04 which are conducted by the American Association for Laboratory Accreditation (A2LA). All testing performed by Onterris 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 report appendices. The content of this report is modeled after the EPA Emission Measurement Center Guideline Document (GD-043).

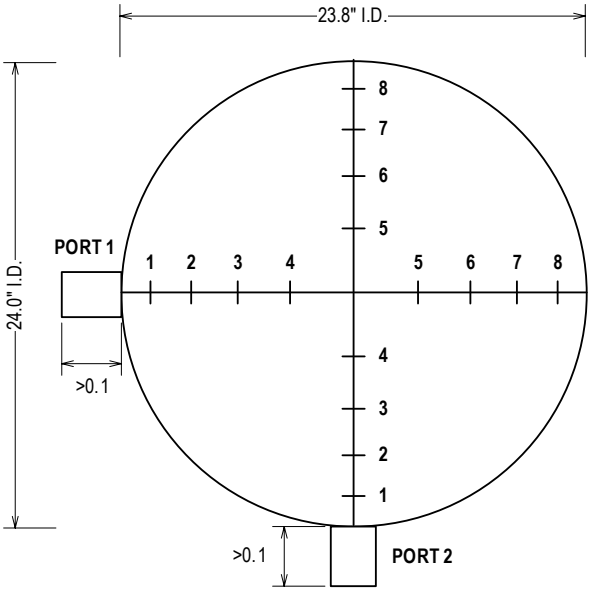
Appendix A Field Data and Calculations

Appendix A1 Sampling Locations



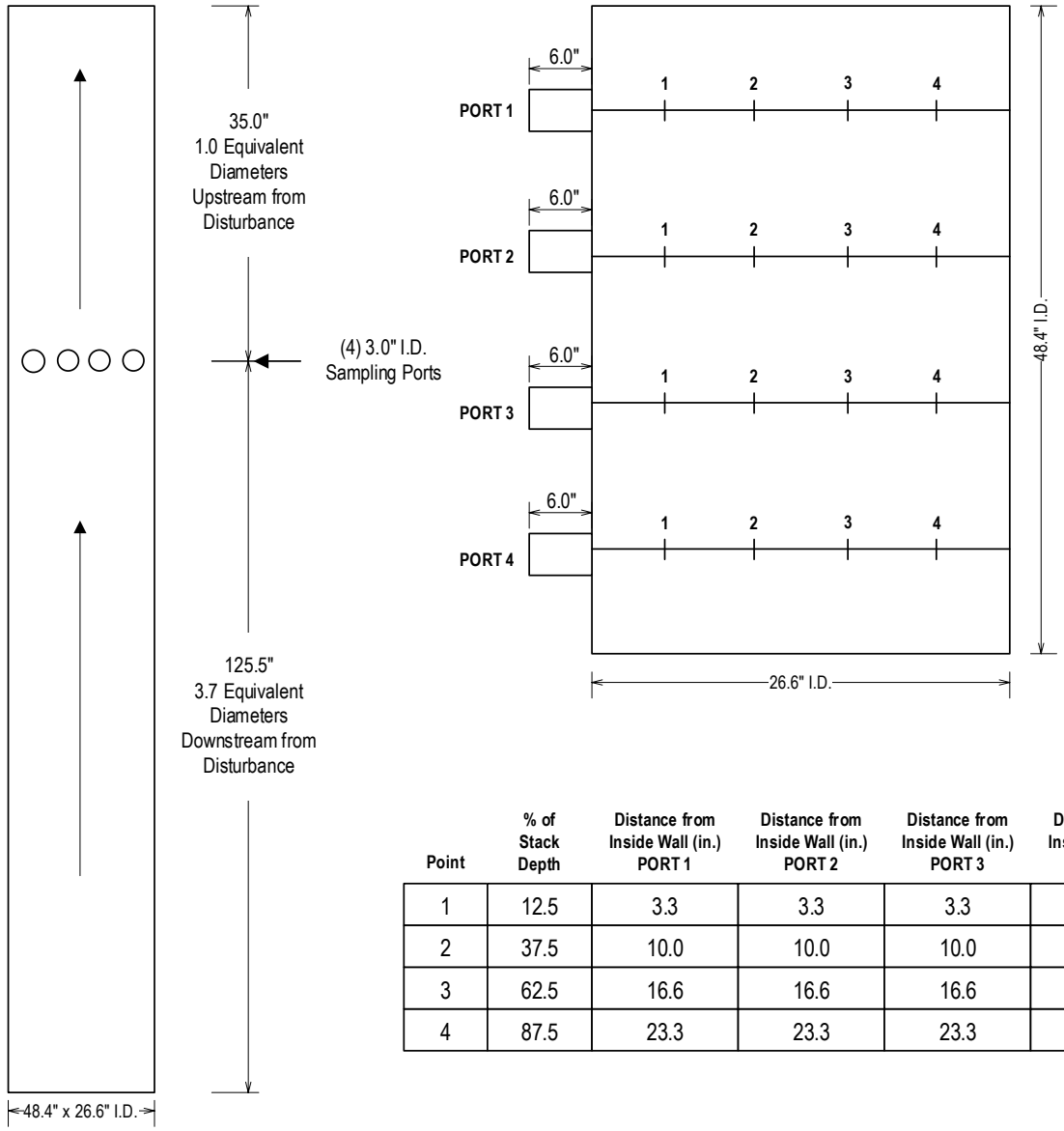
P004 Sampling Location/Process Flow Schematic





Point	% of Stack Depth	Distance from Inside Wall (in.) PORT 1	Distance from Inside Wall (in.) PORT 2
1	3.2	0.8	0.8
2	10.5	2.5	2.5
3	19.4	4.6	4.7
4	32.3	7.7	7.8
5	67.7	16.1	16.2
6	80.6	19.2	19.3
7	89.5	21.3	21.5
8	96.8	23.0	23.2

P004 RTO Inlet Duct Traverse Point Schematic



Point	% of Stack Depth	Distance from Inside Wall (in.) PORT 1	Distance from Inside Wall (in.) PORT 2	Distance from Inside Wall (in.) PORT 3	Distance from Inside Wall (in.) PORT 4
1	12.5	3.3	3.3	3.3	3.3
2	37.5	10.0	10.0	10.0	10.0
3	62.5	16.6	16.6	16.6	16.6
4	87.5	23.3	23.3	23.3	23.3

P004 RTO Exhaust Stack Traverse Point Schematic

Appendix A2 P004 RTO Inlet Data Sheets

Test Data

Number of Test Runs	3			
Number of Traverse Points	16			
	Run 1	**Run 2**	**Run 3**	**Average**
Total Sampling Run Time, Theta, min	60	60	60	60
Test Run Start Time, mm/dd/yyyy hh:mm	7/30/2026 8:38	7/30/2026 10:59	7/30/2026 12:40	
Test Run Stop Time, mm/dd/yyyy hh:mm	7/30/2026 9:38	7/30/2026 12:04	7/30/2026 13:40	
Stack Cross-Sectional Diameter 1, **circular,** in	23.8	23.8	23.8	23.8
Stack Cross-Sectional Diameter 2, **circular,** in	24.0	24.0	24.0	24.0
Elevation Difference Between Location/Site and Meter Box, ft	4	4	4	4
Elevation Difference Between Location/Site and Sampling Ports, ft	7	7	7	7
Air Percent by Volume Carbon Dioxide in Stack Gas, %-dry	0.043	0.039	0.031	0.038
Air Percent by Volume Oxygen in Stack Gas, %-dry	21.10	20.75	20.84	20.90
Air Percent by Volume Nitrogen in Stack Gas, %-dry	**78.86**	**79.21**	**79.13**	79.07

DETAILED RESULTS

Stack Gas Conditions	**Run 1**	**Run 2**	**Run 3**	**Average**
Stack Cross-Sectional Area, A, ft^2	3.12	3.12	3.12	3.12
Barometric Pressure at Location/Site, Pbar, in Hg	28.70	28.70	28.70	28.70
Barometric Pressure at Sampling Ports, in Hg	28.69	28.69	28.69	28.69
Dry Molecular Weight of Stack Gas, Md, lb/lb-mole	28.85	28.84	28.84	28.84
Wet Molecular Weight of Stack Gas, Ms, lb/lb-mole	28.54	28.55	28.64	28.58
Average Absolute Stack Gas Pressure, Ps, in Hg	29.49	29.49	29.48	29.49
Average Stack Gas Static Pressure, ps, in H_2O	10.88	10.88	10.64	10.80
Average Stack Gas Temperature, Ts, °F	90.7	94.6	100.8	95.4
Average Stack Gas Temperature, Ts, °R	550.4	554.2	560.5	555.0
Average Stack Gas Velocity, Vs, ft/sec	23.13	21.85	21.35	22.11
Average Stack Gas Velocity, Vs, ft/min	1,388	1,311	1,281	1,327
Wet Volumetric Stack Gas Flow at Actual Conditions, Qaw, acfm	4,324	4,084	3,991	4,133
Wet Volumetric Stack Gas Flow at Standard Conditions, scfm	4,087	3,833	3,701	3,874
Dry Volumetric Stack Gas Flow at Standard Conditions, Qstd, dscfm	3,971	3,732	3,633	3,779
Weight of Water Vapor Condensed in the Impingers, g	11.7	12.5	6.8	10.3
Weight of Water Vapor Collected in Silica Gel, g	11.2	8.9	7.8	9.3
Percent by Volume Moisture as measured in Stack Gas, $\%H_2O$	2.83	2.62	1.85	2.43
Dry Mole Fraction of Flue Gas, Mfd	0.972	0.974	0.982	0.976

Test Run Results	**Run 1**	**Run 2**	**Run 3**	**Average**
Pitot Tube Coefficient, Cp	0.84	0.84	0.84	0.84
Average Velocity Pressure, Delta P, in H_2O	0.16	0.14	0.13	0.14
Average Square Root of Delta P	0.40	0.38	0.36	0.38
Dry Gas Meter Calibration Factor, Gamma	1.0108	1.0108	1.0108	1.0108
Dry Gas Meter Calibration Coefficient, Delta H@	1.98	1.98	1.98	1.98
Initial Dry Gas Meter Reading, ft^3	694.87	733.98	773.73	734.20
Final Dry Gas Meter Reading, ft^3	733.92	773.65	812.89	773.48
Volume of Metered Gas Sample, Vm, dry, acf	39.053	39.663	39.151	39.289
Average Pressure Differential of Orifice Meter, Delta H, in H_2O	1.50	1.50	1.50	1.50
Average DGM Temperature, Tm, °F	80.9	84.3	89.7	85.0
Average Dry Gas Meter Temperature, Tm, °R	540.6	544.0	549.3	544.6
Volume of Dry Gas Sampled at Standard Conditions, Vmstd, dscf	37.099	37.440	36.598	37.045
Rate of Dry Gas Sampled at Standard Conditions, dscfm	0.618	0.624	0.610	0.617

SAMPLING QA

	Run 1	Run 2	Run 3	Average
Post-Test Meter Calibration Check Value, Yqa	1.037	1.025	1.043	1.035
Post-Test/Pre-Test Calibration Factor Difference, %	-2.60	-1.37	-3.19	-2.39
Allowable Post-Test Leak Rate, dscfm	0.020	0.020	0.020	0.020
Observed Post-Test Leak Rate, dscfm	0.000	0.000	0.000	0.000
Count of Velocity Pressure Readings Below 0.05 in H_2O	0	0	0	0
Sensitivity Factor for Differential Pressure Gauge, T	1.016	1.018	1.019	1.017

LG Chemical America, Inc.
PROJ-070363
P004 RTO Inlet Duct

Test Data - EPA Method 3A (O_2)

Number of Concentration Runs	3

Analyzer Calibration	**Run 1**	**Run 2**	**Run 3**	**Average**
Actual Concentration of the Mid-Level Calibration Gas, %	10.93	10.93	10.93	10.93
Actual Concentration of the High-Level Calibration Gas, %	21.89	21.89	21.89	21.89
Analyzer Span During Test Run, %	21.89	21.89	21.89	21.89
Calibration Gas QA	**GOOD**	**GOOD**	**GOOD**	
Analyzer Calibration Response for Zero Gas, %	0.10	0.10	0.10	0.10
Analyzer Calibration Response for Mid-Level Gas, %	11.07	11.07	11.07	11.07
Analyzer Calibration Response for High Level Gas, %	21.92	21.92	21.92	21.92
Initial System Calibration Response for Zero Gas, %	-0.17	-0.46	-0.49	-0.37
Initial System Calibration Response for Upscale Gas, %	10.69	10.81	10.66	10.72
Final System Calibration Response for Zero Gas, %	-0.46	-0.49	-0.49	-0.48
Final System Calibration Response for Upscale Gas, %	10.81	10.66	10.64	10.70

Analyzer Calibration QA	**Run 1**	**Run 2**	**Run 3**	**Average**
Initial System Calibration Bias for Zero Gas, % of Span	-1.23	-2.56	-2.70	-2.16
Initial System Calibration Bias for Upscale Gas, % of Span	-1.74	-1.19	-1.87	-1.60
Final System Calibration Bias for Zero Gas, % of Span	-2.56	-2.70	-2.70	-2.65
Final System Calibration Bias for Upscale Gas, % of Span	-1.19	-1.87	-1.96	-1.68
System Drift for Zero Gas, % of Span	-1.32	-0.14	0.00	-0.49
System Drift for Upscale Gas, % of Span	0.55	-0.69	-0.09	-0.08
Analyzer Calibration Error for Zero Gas, % of Span	0.46	0.46	0.46	0.46
Analyzer Calibration Error for Mid-Level Gas, % of Span	0.64	0.64	0.64	0.64
Analyzer Calibration Error for High-Level Gas, % of Span	0.14	0.14	0.14	0.14

CONCENTRATION CALCULATIONS - DRY SYSTEM

Calculate the Average Effluent Oxygen O_2 Concentration	**Run 1**	**Run 2**	**Run 3**	**Average**
Average O_2 Concentration Indicated by Gas Analyzer, dry basis, %-dry	21.05	20.81	20.75	20.87
Average of Initial and Final System Calibration Bias Check Responses for the Zero Gas, %	-0.32	-0.48	-0.49	-0.43
Average of Initial and Final System Calibration Bias Check Responses for the Upscale Calibration Gas, %	10.75	10.74	10.65	10.71
Average Effluent O_2 Concentration, dry basis, %-dry	21.10	20.75	20.84	20.90

LG Chemical America, Inc.
PROJ-070363
P004 RTO Inlet Duct

Test Data - EPA Method 3A (CO_2)

Analyzer Calibration	Run 1	Run 2	Run 3	Average
Actual Concentration of the Mid-Level Calibration Gas, %	10.93	10.93	10.93	10.93
Actual Concentration of the High-Level Calibration Gas, %	21.65	21.65	21.65	21.65
Analyzer Span During Test Run, %	21.65	21.65	21.65	21.65
Calibration Gas QA	**GOOD**	**GOOD**	**GOOD**	
Analyzer Calibration Response for Zero Gas, %	0.20	0.20	0.20	0.20
Analyzer Calibration Response for Mid-Level Gas, %	10.90	10.90	10.90	10.90
Analyzer Calibration Response for High Level Gas, %	21.68	21.68	21.68	21.68
Initial System Calibration Response for Zero Gas, %	0.22	0.23	0.23	0.23
Initial System Calibration Response for Upscale Gas, %	11.09	10.87	11.48	11.15
Final System Calibration Response for Zero Gas, %	0.23	0.23	0.20	0.22
Final System Calibration Response for Upscale Gas, %	10.87	11.48	11.04	11.13

Analyzer Calibration QA	Run 1	Run 2	Run 3	Average
Initial System Calibration Bias for Zero Gas, % of Span	0.09	0.14	0.14	0.12
Initial System Calibration Bias for Upscale Gas, % of Span	0.88	-0.14	2.68	1.14
Final System Calibration Bias for Zero Gas, % of Span	0.14	0.14	0.00	0.09
Final System Calibration Bias for Upscale Gas, % of Span	-0.14	2.68	0.65	1.06
System Drift for Zero Gas, % of Span	0.05	0.00	-0.14	-0.03
System Drift for Upscale Gas, % of Span	-1.02	2.82	-2.03	-0.08
Analyzer Calibration Error for Zero Gas, % of Span	0.92	0.92	0.92	0.92
Analyzer Calibration Error for Mid-Level Gas, % of Span	-0.14	-0.14	-0.14	-0.14
Analyzer Calibration Error for High-Level Gas, % of Span	0.14	0.14	0.14	0.14

CONCENTRATION CALCULATIONS - DRY SYSTEM

Calculate the Average Effluent Carbon Dioxide CO_2 Concentration	Run 1	Run 2	Run 3	Average
Average CO_2 Concentration Indicated by Gas Analyzer, dry basis, %	0.268	0.269	0.247	0.261
Average of Initial and Final System Calibration Bias Check Responses for the Zero Gas, %	0.23	0.23	0.22	0.22
Average of Initial and Final System Calibration Bias Check Responses for the Upscale Calibration Gas, %	10.98	11.18	11.26	11.14
Average Effluent CO_2 Concentration, dry basis, %	0.043	0.039	0.031	0.038

EPA Method 1 (Round/Rectangular) - Stack/Duct Dimensions

Company: LG Chemical

Project ID: PROJ-070363

Location: P004 (Inlet Duct) / Exhaust Stack

Technician: fg Date: 7.29.26

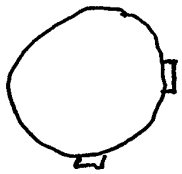
	Port 1	Port 2	Port 3	Port 4	Port 5
Relative Location [1]	L	R			
From Far Inside Wall to Outside of Port (in.) [2]	23.9	24.1			
Nipple Length and/or Wall Thickness (in.) [3]	0.1	0.1			
Nipple Protrusion (in.) [4]	—	—			
Stack/Duct Depth (Inner Dimension) (in.) [5]	23.8	24.0			
Port Hole Inner Diameter (in.) [6]	2	2			
Measured Particulate Build-up (in.) [7]	—	—			

Stack/Duct Width (inner), if Rectangular (in.)	—
Number of Ports Traversed	2
Direction of Flow and Stack Orientation:	↓ Vert
Sample Port Access	6' A-Frame
Elevation of Meter Box from Ground Level (ft)	4
Elevation of Ports from Ground Level (ft)	7
Isokinetic Sample (Yes / No)	No
Elevation of Barometer from Ground Level (ft)	4
Stack Outer Dimensions (in.)	—

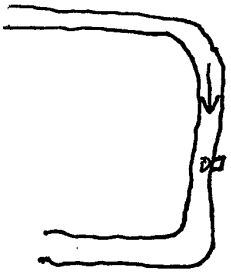
	Port 6	Port 7
1		
2		
3		
4		
5		
6		
7		

Distance Upstream from Flow Disturbance (in.)	30
Disturbance Type: Bend	
Distance Downstream from Flow Disturbance (in.)	98
Disturbance Type: Bend	

Stack/Duct Cross Section Schematic



Stack/Duct Flow Direction Schematic



QA/QC Check: Completeness [✓] Accuracy [✓] Specifications [✓]

Checked by: [signature]

EPA Method 1 - Cyclonic Flow Check

Company: LG Chemical | Pitot I.D.: T- PIT-471

Project ID: PROJ-070363 | Manometer I.D.: T- MTB-010

Location: P004 Inlet Duct / Exhaust Stack | Umbilical I.D.: T- UMC-106 MQU 205

Technician: AG | Date: 7/30/26 | Protractor ID: C- DART 001

Run Number - 1	Run Number -	Run Number -
Date - 7/30/26	Date -	Date -
Start Time - 7:58	Start Time -	Start Time -
Stop Time - 8:10	Stop Time -	Stop Time -
Zero and Level - Yes ✓	Zero and Level - Yes o	Zero and Level - Yes o
Pre Impact Side Leak Check-Pass ✓	Pre Impact Side Leak Check-Pass o	Pre Impact Side Leak Check-Pass o
Pre Static Side Leak Check-Pass ✓	Pre Static Side Leak Check-Pass o	Pre Static Side Leak Check-Pass o

Test Point	Notes	Yaw Angle (°)	Test Point	Notes	Yaw Angle (°)	Test Point	Notes	Yaw Angle (°)
1		36	1			1		
2		28	2			2		
3		15	3			3		
4		8	4			4		
5		29	5			5		
6		30	6			6		
7		8	7			7		
8		17	8			8		
9	Post change	2	9			9		
10		19	10			10		
11		14	11			11		
12		7	12			12		
13		10	13			13		
14		10	14			14		
15		10	15			15		
16		7	16			16		
17			17			17		
18			18			18		
19			19			19		
20			20			20		
21			21			21		
22			22			22		
23			23			23		
24			24			24		
25			25			25		
Avg.			Avg.			Avg.		

Post Impact Side Leak Check-Pass ✓	Post Impact Side Leak Check-Pass o	Post Impact Side Leak Check-Pass o
Post Static Side Leak Check-Pass ✓	Post Static Side Leak Check-Pass o	Post Static Side Leak Check-Pass o

QA/QC Check: Completeness [✓] Accuracy [✓] Specifications [✓] Checked by: [illegible]

Onterris Air Quality Services, LLC

EPA Method 2 - Flow Data

Page _____ of _____

Company:	LG Chemical	Pitot I.D.: T- PIT-471	Manometer I.D.: T- MTB-010
Project ID:	PROJ-070363	Thermocouple I.D.: T- ~~[illegible]~~	Temp Display I.D.: T-MTB-010
Location:	P004 Inlet Dust / Exhaust Stack	Umbilical ID: T- UMC-106 MQU-205	
Technician:	AG	Date: 7/30/26	

Zero/Level: Yes ✓	Zero/Level: Yes ✓	Zero/Level: Yes ✓	Zero/Level: Yes o	Zero/Level: Yes o
Impact Side Leak Check-Pass ✓	Impact Side - Pass ✓	Impact Side - Pass ✓	Impact Side - Pass o	Impact Side - Pass o
Static Side Leak Check-Pass ✓	Static Side - Pass ✓	Static Side - Pass ✓	Static Side - Pass o	Static Side - Pass o
Date: 7/30/26	Date: 7/30/26	Date: 7/30/26	Date:	Date:
Run No: 1	Run No: 2	Run No: 3	Run No:	Run No:
Start Time: 8:26 7:30	Start Time: 10:02	Start Time: 12:32	Start Time:	Start Time:
Stop Time: 8:~~48~~36 7:~~48~~	Stop Time: 10:12	Stop Time: 12:42	Stop Time:	Stop Time:
Pbar (mmHg): 729	Pbar (mmHg): 724	Pbar (mmHg): 729	Pbar (mmHg):	Pbar (mmHg):
Pstatic: 10.38	Pstatic: 10.88	Pstatic: 10.64	Pstatic:	Pstatic:

Point	DP*	Temp*	DP*	Temp*	DP*	Temp*	DP*	Temp*	DP*	Temp*
1	.14	83	.13	88	.16	96				
2	.15	85	.12	90	.15	97				
3	.15	90	.14	92	.17	99				
4	.14	87	.13	93	.13	100				
5	.15	89	.14	95	.14	101				
6	.16	91	.14	96	.14	101				
7	.15	90	.11	96	.13	100				
8	.13	94	.14	96	.15	102				
9	.19	95	.16	94	.14	100				
10	.20	92	.18	95	.11	104				
11	.19	93	.17	97	.10	103				
12	.17	94	.16	96	.12	104				
13	.15	93	.15	98	.14	101				
14	.14	92	.14	97	.13	103				
15	.18	92	.12	96	.12	102				
16	.16	91	.13	94	.11	100				
17										
18										
19										
20										
21										
22										
23										
24										
25										
	WB, °F		WB, °F		WB, °F		WB, °F		WB, °F	
	DB, °F		DB, °F		DB, °F		DB, °F		DB, °F	

Impact Side Leak Check-Pass ✓	Impact Side-Pass ✓	Impact Side-Pass ✓	Impact Side-Pass o	Impact Side-Pass o
Static Side Leak Check-Pass ✓	Static Side-Pass ✓	Static Side-Pass ✓	Static Side-Pass o	Static Side-Pass o

* Stack Dp in-H2O, Stack Temp, °F

Onterris Air Quality Services, LLC

QA/QC Check: Completeness [✓] Accuracy [✓] Specifications [✓]

Checked by: _____

Onterris

Sample Recovery & Calibration Check Datasheet

Page _____ of _____

Project Information

Date 7/29/26 Project # PROJ-070363

Customer / Facility LG Chemical

Unit ID / Sample Location P004 Inlet Duct / Exhaust Stack

Run # 1 - 3 Operator RG

Equipment Identification

Ref. Thermometer —

Hygrometer —

Field Balance A-BAL-018

Check Weights C-WS00-001

Calipers —

Balance Audit (Field balance must be within 0.5g of check weight mass)

Date	7/29/26	7/30/26	
Standard mass, g	500.0	500.0	500.0
Field balance mass, g	499.5	499.7	

Ambient Conditions (Mobile Lab)

Relative humidity, % —

Temperature, °F 75

Mobile lab # T8

Moisture Determination

	Contents	Run1 Initial	Run1 Final	Run1 Net	Run 2 Initial	Run 2 Final	Run 2 Net	Run 3 Initial	Run 3 Final	Run 3 Net
Knockout										
Impinger 1	water	720.1	722.8	2.7	702.5	709.0	6.5	710.4	715.3	4.9
Impinger 2	water	702.6	710.4	7.8	678.8	682.7	3.4	722.8	724.1	1.3
Impinger 3	MT	581.3	582.5	1.2	607.0	609.1	2.1	582.5	583.1	.6
Impinger 4										
Impinger 5				11.7			12			6.8
Impinger 6										
Impinger 7										
Impinger 8										
Silica Gel	Silica	894.6	905.8	11.2	901.7	910.6	8.9	922.6	930.4	7.8
Line Rinse										
Train Net Gain (Vlc)				22.9			20.9			14.6

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

Nozzle 1 diameters _____ D1 _____ D2 _____ D3 _____ Average

Nozzle 2 diameters _____ D1 _____ D2 _____ D3 _____ Average

Nozzle 3 diameters _____ D1 _____ D2 _____ D3 _____ Average

Nozzle Material ☐ quartz ☐ glass ☑ steel ☐ titanium ☐ inconel ☐ other _____

Probe Type ☐ heated ☑ unheated ☐ air-cooled ☐ water-cooled ☐ other _____

Probe Liner ☐ quartz ☐ glass ☐ steel ☑ Teflon ☐ other _____

Filter Information

Front Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other _____

Filter Number: Run 1: _____ Run 2: _____ Run 3: _____ Run ___: _____

Back Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other _____

Reagent Information

Type	Lot Number

Sample Observations

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓

Checked by: [signature] Team Leader: [signature]

001AS-QMS-FM-226

Onterris

EPA Method 4 Field Datasheet (Isokinetic)

AG 7.30.26

Page ____ of ____

Project Information		Sampling Conditions		ALT 011 TC ID:	Ambient °F	Ref. °F
Date 7/30/26	Project # PROJ-070363	Static Pressure, in. H_2O 10.88	Ambient Temp, °F 70	Stack PIT-471		
Customer/Facility LG Chemical	/ Ravenna, OH	Barometric Pressure, in. Hg 729	Ref. Barometer ID BAR-001	Probe		
Unit ID/Sample Location P004	Inlet Duct / Exhaust Stack	Wind Speed / Direction	Precipitation, Y / N type	Filter Box		
Run # 1 2 3 4 5 6	Operator AG	Probe / Filter Temp Range, °F 223 - 273		Filter Exit		
				Meter outlet MTB-010		
				Impinger Exit UMA-060		
				Other		
				Ref. Thermometer ID		
				Continuity Check ☐ Continuity w/ Proper Polarity		
				Notes: PMP-013		

Sampling Equipment IDs		Calibration		Equipment Checks	Pre	Mid	Post
Meterbox ID	MTB-010	Meterbox Y	1.0108	Pitot (+), pass @ in. H_2O	☑ @	☐ @	☐ @
Umbilical ID	UMC-106	Meterbox ΔH@, in. H_2O	1.9805	Pitot (-), pass @ in. H_2O	☑ @	☐ @	☐ @
Nozzle ID	—	Nozzle diameter, Dn, in.	—	Pitot visual inspection	☐ pass	☐ pass	☐ pass
Pitot / Probe ID	PIT-471	Pitot coefficient, Cp	.84	Nozzle visual inspection	☐ pass	☐ pass	☐ pass
Manometer ID	MTB-010	Manometer zero and level	☑ yes	Meter, cfm @ in. Hg	0.00 @ 15	@	0.000 @ 4
Sensitivity	—	K-Factor	—	Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	8:38	694.870		1.5	1.5					54		83		2
2	7:30		699.61			1.5					48		81		2
3	15		704.43			1.5					52		81		2
4	22:30		709.36			1.5					56		80		3
5	30		714.24			1.5					58		80		3
6	37:30		719.13			1.5					61		80		3
7	45		724.22			1.5					62		81		3
8	52:30		728.94			1.5					63		80		4
	1:00	9:38	733.923			1.5					64		82		4
						1.5									
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By [signature] Team Leader [signature]

001AS-QMS-FM-225

Onterris

EPA Method 4 Field Datasheet (Isokinetic)

Page ____ of ____

Project Information
Date 7/30/26 Project # PROJ-070363
Customer/Facility LG Chemical / Ravenna, OH
Unit ID/Sample Location P004 (Inlet Duct) / Exhaust Stack
Run # 1 (2) 3 4 5 6 Operator AG

Sampling Conditions
Static Pressure, in. H_2O 10.88 Ambient Temp, °F 72
Barometric Pressure, in. Hg 729 Ref. Barometer ID BAR-001
Wind Speed / Direction 0 Precipitation, Y / (N) type
Probe / Filter Temp Range, °F 223 - 273

ALT 011 TC ID:

	Ambient °F	Ref. °F
Stack PIT 471		
Probe		
Filter Box		
Filter Exit		
Meter outlet MTB-010		
Impinger Exit UMA-000		
Other		

Ref. Thermometer ID
Continuity Check ☐ Continuity w/ Proper Polarity
Notes: PMD-013

Sampling Equipment IDs
Meterbox ID MTB-010
Umbilical ID UMC-106
Nozzle ID
Pitot / Probe ID PIT 471
Manometer ID MTB-010
Sensitivity –

Calibration
Meterbox Y 1.0168
Meterbox ΔH@, in. H_2O 1.9805
Nozzle diameter, Dn, in. –
Pitot coefficient, Cp .84
Manometer zero and level ☑ yes
K-Factor –

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☑ @	☐ @	☐ @
Pitot (-), pass @ in. H_2O	☑ @	☐ @	☐ @
Pitot visual inspection	☐ pass	☐ pass	☐ pass
Nozzle visual inspection	☐ pass	☐ pass	☐ pass
Meter, cfm @ in. Hg	0.000 @ 15	@	0.000 @ 3
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	10:15	733.983		1.5	1.5					44		83		1
2	7:30		738.83			1.5					45		82		1
3	15		743.81			1.5					47		82		1
4	22:30	10:41 ~~7:0~~	748.65			1.5					54		82		2
5	30		753.74			1.5					48		86		2
6	37:30		758.72			1.5					50		86		2
7	45		763.65			1.5					56		86		2
8	52:30		768.67			1.5					59		86		2
	1:00		773.646			1.5					61		86		3
Averages															

1041 / 1130

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By [signature] Team Leader [signature]

001AS-QMS-FM-225

use 26:45

Onterris

EPA Method 4 Field Datasheet (Isokinetic)

Page ____ of ____

Project Information		Sampling Conditions		ALT 011 TC ID:	Ambient °F	Ref. °F
Date 7/30/26	Project # PROJ-070363	Static Pressure, in. H_2O 10.64	Ambient Temp, °F	Stack		
Customer/Facility LG Chemical	/ Ravenna, OH	Barometric Pressure, in. Hg 729	Ref. Barometer ID BAR-001	Probe		
Unit ID/Sample Location P004	Inlet Duct / Exhaust Stack	Wind Speed / Direction 0	Precipitation, Y / N, type N	Filter Box		
Run # 1 2 3 4 5 6	Operator AG	Probe / Filter Temp Range, °F 223 - 273		Filter Exit		
				Meter outlet MTB-010		
				Impinger Exit UMA-060		
				Other		

Sampling Equipment IDs		Calibration		Equipment Checks	Pre	Mid	Post
Meterbox ID	MTB-010	Meterbox Y	1.0108	Pitot (+), pass @ in. H_2O	☐ @	☐ @	☐ @
Umbilical ID	UMC-106	Meterbox ΔH@, in. H_2O	1.9805	Pitot (-), pass @ in. H_2O	☐ @	☐ @	☐ @
Nozzle ID	—	Nozzle diameter, Dn, in.	—	Pitot visual inspection	☐ ~~pass~~	☐ ~~pass~~	☐ ~~pass~~
Pitot / Probe ID		Pitot coefficient, Cp	.84	Nozzle visual inspection	☐ ~~pass~~	☐ ~~pass~~	☐ ~~pass~~
Manometer ID	MTB-010	Manometer zero and level	☑ yes	Meter, cfm @ in. Hg	0.000@15	@	0.000@ 8
Sensitivity	—	K-Factor	—	Intermediate leak check volume, ft^3		/	/

Ref. Thermometer ID

Continuity Check ☐ Continuity w/ Proper Polarity

Notes: DMP-013

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	12:40	773.734		1.5	1.5					54		84		3
2	7:30		778.47			1.5					48		84		4
3	15		783.24			1.5					50		89		5
4	22:30		788.20			1.5					54		90		5
5	30		793.08			1.5					54		90		5
6	37:30		798.92			1.5					54		90		6
7	45		802.96			1.5					56		90		6
8	52:30		807.86			1.5					58		90		7
	1:00	1340	812.885			1.5					59		90		8
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By [signature] Team Leader [signature]

001AS-QMS-FM-225

Appendix A3 P004 RTO Exhaust Data Sheets

Test Data

Number of Test Runs	3			
Number of Traverse Points	16			
	Run 1	**Run 2**	**Run 3**	**Average**
Total Sampling Run Time, Theta, min	60	60	60	60
Test Run Start Time, mm/dd/yyyy hh:mm	7/30/2026 8:38	7/30/2026 10:59	7/30/2026 12:40	
Test Run Stop Time, mm/dd/yyyy hh:mm	7/30/2026 9:38	7/30/2026 12:04	7/30/2026 13:40	
Stack Cross-Sectional Width, **rectangular,** W, in	48.4	48.4	48.4	48.4
Stack Cross-Sectional Depth, **rectangular,** D, in	26.6	26.6	26.6	26.6
Elevation Difference Between Location/Site and Meter Box, ft	4	4	4	4
Elevation Difference Between Location/Site and Sampling Ports, ft	15	15	15	15
Air Percent by Volume Carbon Dioxide in Stack Gas, %-dry	0.42	0.43	0.43	0.42
Air Percent by Volume Oxygen in Stack Gas, %-dry	20.25	20.30	20.35	20.30
Air Percent by Volume Nitrogen in Stack Gas, %-dry	**79.33**	**79.28**	**79.22**	79.28

DETAILED RESULTS

Stack Gas Conditions	**Run 1**	**Run 2**	**Run 3**	**Average**
Stack Cross-Sectional Area, A, ft^2	8.94	8.94	8.94	8.94
Barometric Pressure at Location/Site, Pbar, in Hg	28.70	29.88	28.70	29.09
Barometric Pressure at Sampling Ports, in Hg	28.68	29.86	28.68	29.08
Dry Molecular Weight of Stack Gas, Md, lb/lb-mole	28.88	28.88	28.88	28.88
Wet Molecular Weight of Stack Gas, Ms, lb/lb-mole	28.56	28.60	28.66	28.61
Average Absolute Stack Gas Pressure, Ps, in Hg	28.69	29.87	28.69	29.08
Average Stack Gas Static Pressure, ps, in H_2O	0.09	0.07	0.08	0.08
Average Stack Gas Temperature, Ts, °F	161.4	165.4	169.9	165.6
Average Stack Gas Temperature, Ts, °R	621.1	625.1	629.5	625.3
Average Stack Gas Velocity, Vs, ft/sec	15.67	14.57	15.11	15.12
Average Stack Gas Velocity, Vs, ft/min	940	874	906	907
Wet Volumetric Stack Gas Flow at Actual Conditions, Qaw, acfm	8,404	7,818	8,104	8,109
Wet Volumetric Stack Gas Flow at Standard Conditions, scfm	6,846	6,587	6,514	6,649
Dry Volumetric Stack Gas Flow at Standard Conditions, Qstd, dscfm	6,649	6,418	6,381	6,482
Weight of Water Vapor Condensed in the Impingers, g	14.7	12.3	9.2	12.07
Weight of Water Vapor Collected in Silica Gel, g	7.9	8.7	6.7	7.77
Percent by Volume Moisture as measured in Stack Gas, $\%H_2O$	2.89	2.58	2.04	2.50
Dry Mole Fraction of Flue Gas, Mfd	0.971	0.974	0.980	0.975

Test Run Results	**Run 1**	**Run 2**	**Run 3**	**Average**
Pitot Tube Coefficient, Cp	0.84	0.84	0.84	0.84
Average Velocity Pressure, Delta P, in H_2O	0.06	0.06	0.06	0.06
Average Square Root of Delta P	0.25	0.24	0.24	0.24
Dry Gas Meter Calibration Factor, Gamma	0.9881	0.9881	0.9881	0.9881
Dry Gas Meter Calibration Coefficient, Delta H@	2.10	2.10	2.10	2.10
Initial Dry Gas Meter Reading, ft^3	928.98	967.95	6.89	634.60
Final Dry Gas Meter Reading, ft^3	967.46	1,006.76	46.09	673.44
Volume of Metered Gas Sample, Vm, dry, acf	38.487	38.815	39.201	38.834
Average Pressure Differential of Orifice Meter, Delta H, in H_2O	1.50	1.50	1.50	1.50
Average DGM Temperature, Tm, °F	79.4	81.9	87.6	83.0
Average Dry Gas Meter Temperature, Tm, °R	539.1	541.6	547.2	542.6
Volume of Dry Gas Sampled at Standard Conditions, Vmstd, dscf	35.836	37.447	35.960	36.414
Rate of Dry Gas Sampled at Standard Conditions, dscfm	0.597	0.624	0.599	0.607

SAMPLING QA

	Run 1	Run 2	Run 3	Average
Post-Test Meter Calibration Check Value, Yqa	1.019	0.993	1.008	1.007
Post-Test/Pre-Test Calibration Factor Difference, %	-3.15	-0.47	-2.02	-1.88
Allowable Post-Test Leak Rate, dscfm	0.020	0.020	0.020	0.020
Observed Post-Test Leak Rate, dscfm	0.000	0.000	0.000	0.000
Count of Velocity Pressure Readings Below 0.05 in H_2O	0	0	0	0
Sensitivity Factor for Differential Pressure Gauge, T	1.039	1.044	1.043	1.042

LG Chemical America, Inc.
PROJ-070363
P004 RTO Exhaust Stack

Test Data - EPA Method 3A (O_2)

Number of Concentration Runs	3

Analyzer Calibration

	Run 1	Run 2	Run 3	Average
Actual Concentration of the Mid-Level Calibration Gas, %	10.93	10.93	10.93	10.93
Actual Concentration of the High-Level Calibration Gas, %	21.89	21.89	21.89	21.89
Analyzer Span During Test Run, %	21.89	21.89	21.89	21.89
Calibration Gas QA	**GOOD**	**GOOD**	**GOOD**	
Analyzer Calibration Response for Zero Gas, %	0.11	0.11	0.11	0.11
Analyzer Calibration Response for Mid-Level Gas, %	11.08	11.08	11.08	11.08
Analyzer Calibration Response for High Level Gas, %	21.93	21.93	21.93	21.93
Initial System Calibration Response for Zero Gas, %	0.13	0.16	0.12	0.14
Initial System Calibration Response for Upscale Gas, %	10.94	10.93	10.88	10.92
Final System Calibration Response for Zero Gas, %	0.16	0.12	0.15	0.14
Final System Calibration Response for Upscale Gas, %	10.93	10.88	10.85	10.89

Analyzer Calibration QA

	Run 1	Run 2	Run 3	Average
Initial System Calibration Bias for Zero Gas, % of Span	0.09	0.23	0.05	0.12
Initial System Calibration Bias for Upscale Gas, % of Span	-0.64	-0.69	-0.91	-0.75
Final System Calibration Bias for Zero Gas, % of Span	0.23	0.05	0.18	0.15
Final System Calibration Bias for Upscale Gas, % of Span	-0.69	-0.91	-1.05	-0.88
System Drift for Zero Gas, % of Span	0.14	-0.18	0.14	0.03
System Drift for Upscale Gas, % of Span	-0.05	-0.23	-0.14	-0.14
Analyzer Calibration Error for Zero Gas, % of Span	0.50	0.50	0.50	0.50
Analyzer Calibration Error for Mid-Level Gas, % of Span	0.69	0.69	0.69	0.69
Analyzer Calibration Error for High-Level Gas, % of Span	0.18	0.18	0.18	0.18

CONCENTRATION CALCULATIONS - DRY SYSTEM

Calculate the Average Effluent Oxygen O_2 Concentration

	Run 1	Run 2	Run 3	Average
Average O_2 Concentration Indicated by Gas Analyzer, dry basis, %-dry	20.14	20.13	20.12	20.13
Average of Initial and Final System Calibration Bias Check Responses for the Zero Gas, %	0.15	0.14	0.14	0.14
Average of Initial and Final System Calibration Bias Check Responses for the Upscale Calibration Gas, %	10.94	10.91	10.87	10.90
Average Effluent O_2 Concentration, dry basis, %-dry	20.25	20.30	20.35	20.30

LG Chemical America, Inc.
PROJ-070363
P004 RTO Exhaust Stack

Test Data - EPA Method 3A (CO_2)

Analyzer Calibration	Run 1	Run 2	Run 3	Average
Actual Concentration of the Mid-Level Calibration Gas, %	10.93	10.93	10.93	10.93
Actual Concentration of the High-Level Calibration Gas, %	21.65	21.65	21.65	21.65
Analyzer Span During Test Run, %	21.65	21.65	21.65	21.65
Calibration Gas QA	**GOOD**	**GOOD**	**GOOD**	
Analyzer Calibration Response for Zero Gas, %	0.13	0.13	0.13	0.13
Analyzer Calibration Response for Mid-Level Gas, %	11.11	11.11	11.11	11.11
Analyzer Calibration Response for High Level Gas, %	21.63	21.63	21.63	21.63
Initial System Calibration Response for Zero Gas, %	0.16	0.15	0.13	0.15
Initial System Calibration Response for Upscale Gas, %	10.91	10.92	10.94	10.92
Final System Calibration Response for Zero Gas, %	0.15	0.13	0.11	0.13
Final System Calibration Response for Upscale Gas, %	10.92	10.94	10.74	10.87

Analyzer Calibration QA	Run 1	Run 2	Run 3	Average
Initial System Calibration Bias for Zero Gas, % of Span	0.14	0.09	0.00	0.08
Initial System Calibration Bias for Upscale Gas, % of Span	-0.92	-0.88	-0.79	-0.86
Final System Calibration Bias for Zero Gas, % of Span	0.09	0.00	-0.09	0.00
Final System Calibration Bias for Upscale Gas, % of Span	-0.88	-0.79	-1.71	-1.12
System Drift for Zero Gas, % of Span	-0.05	-0.09	-0.09	-0.08
System Drift for Upscale Gas, % of Span	0.05	0.09	-0.92	-0.26
Analyzer Calibration Error for Zero Gas, % of Span	0.60	0.60	0.60	0.60
Analyzer Calibration Error for Mid-Level Gas, % of Span	0.83	0.83	0.83	0.83
Analyzer Calibration Error for High-Level Gas, % of Span	-0.09	-0.09	-0.09	-0.09

CONCENTRATION CALCULATIONS - DRY SYSTEM

Calculate the Average Effluent Carbon Dioxide CO_2 Concentration	Run 1	Run 2	Run 3	Average
Average CO_2 Concentration Indicated by Gas Analyzer, dry basis, %	0.57	0.56	0.54	0.55
Average of Initial and Final System Calibration Bias Check Responses for the Zero Gas, %	0.16	0.14	0.12	0.14
Average of Initial and Final System Calibration Bias Check Responses for the Upscale Calibration Gas, %	10.92	10.93	10.84	10.90
Average Effluent CO_2 Concentration, dry basis, %	0.42	0.43	0.43	0.42

Test Data - EPA Method 25A

Analyzer Calibration	Run 1	Run 2	Run 3	Average
Actual Concentration of the Low-Level Calibration Gas as Propane, ppmv	30.00	30.00	30.00	30.00
Actual Concentration of the Mid-Level Calibration Gas as Propane, ppmv	50.00	50.00	50.00	50.00
Actual Concentration of the High-Level Calibration Gas as Propane, ppmv	85.00	85.00	85.00	85.00
Analyzer Span During Test Run, ppmv	100.00	100.00	100.00	100.00
Calibration Gas QA	**GOOD**	**GOOD**	**GOOD**	
Initial Analyzer Calibration Response for Zero Gas, ppmv	0.03	0.03	0.03	0.03
Initial Analyzer Calibration Response for Low-Level Gas, ppmv	31.33	31.33	31.33	31.33
Initial Analyzer Calibration Response for Mid-Level Gas, ppmv	52.31	52.31	52.31	52.31
Initial Analyzer Calibration Response for High Level Gas, ppmv	84.97	84.97	84.97	84.97
Final Analyzer Calibration Response for Zero Gas, ppmv	0.08	0.18	-0.30	-0.01
Final Analyzer Calibration Response for Mid-Level Gas, ppmv	53.17	52.82	51.63	52.54

Analyzer Calibration QA	Run 1	Run 2	Run 3	Average
Zero Drift, % of Span	0.05	0.15	-0.33	-0.04
Calibration Drift for Mid-Level Gas, % of Span	0.86	0.51	-0.68	0.23
Calibration Error for Low-Level Gas, % of Tag Value	-4.43	-4.43	-4.43	-4.43
Calibration Error for Mid-Level Gas, % of Tag Value	-4.62	-4.62	-4.62	-4.62

DETAILED RESULTS

Emission Results	Run 1	Run 2	Run 3	Average
Average TGO (VOC) Mass Emission Rate as Propane, lb/hr	0.2273	0.2383	0.2776	0.2477

CONCENTRATION CALCULATIONS

Average Total Gaseous Organic (TGO) Concentration	Run 1	Run 2	Run 3	Average
Average TGO (VOC) Concentration Measured as Propane, ppmvw	4.83	5.27	6.21	5.44
Average TGO (VOC) Concentration Measured as Propane, ppmvd	4.98	5.41	6.34	5.57

EPA Method 1 (Round/Rectangular) - Stack/Duct Dimensions

Company: LG Chemical

Project ID: PROJ-070363

Location: P004 Inlet Duct / Exhaust Stack

Technician: AG Date: 7.29.26

	Port 1	Port 2	Port 3	Port 4	Port 5
Relative Location [1]	L	LC	RC	R	
From Far Inside Wall to Outside of Port (in.) [2]	32.6	32.6	32.6	32.6	
Nipple Length and/or Wall Thickness (in.) [3]	6	6	6	6	
Nipple Protrusion (in.) [4]	—	—	—	—	
Stack/Duct Depth (Inner Dimension) (in.) [5] *	26.6	26.6	26.6	26.6	
Port Hole Inner Diameter (in.) [6]	3	3	3	3	
Measured Particulate Build-up (in.) [7]	—	—	—	—	

Stack/Duct Width (inner), if Rectangular (in.)	48.4
Number of Ports Traversed	4
Direction of Flow and Stack Orientation:	↑ Vert
Sample Port Access	Platform
Elevation of Meter Box from Ground Level (ft)	4
Elevation of Ports from Ground Level (ft)	15
Isokinetic Sample (Yes / No)	No
Elevation of Barometer from Ground Level (ft)	4
Stack Outer Dimensions (in.)	—

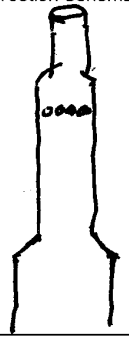
	Port 6	Port 7
1		
2		
3		
4		
5		
6		
7		

Distance Upstream from Flow Disturbance (in.)	35
Disturbance Type:	Diameter change
Distance Downstream from Flow Disturbance (in.)	125.5
Disturbance Type:	Diameter change

* ~~SHC~~ 8/4/2026 Rev JH

Stack/Duct Cross Section Schematic

Stack/Duct Flow Direction Schematic



QA/QC Check: Completeness [✓] Accuracy [✓] Specifications [✓]

Checked by: Onterris Air Quality Services, LLC

US EPA Method 1 Traverse Point Determination

Port Identifier	A	B	C	D	E	F	G
From Far Wall to Outside of Port, in.	32.6	32.6	32.6	32.6			
Nipple Length or Wall Thickness, in.	6.0	6.0	6.0	6.0			
Port Protrusion Length (opt), in.	0.0	0.0	0.0	0.0			
Depth of Stack or Duct, in.	26.6	26.6	26.6	26.6			

Notes:

Add nipple protrusion length to Point 1 only.

Actual nipple length = (length - protrusion)

Relocate to a distance equal to the inside diameter of the nozzle being used or to the above minimum distances, whichever is larger.

This Stack having a diameter greater than 24-inches, shall have no traverse points located within 1.0-inch of the stack wall.

Stack or Duct Type	Rectangular
Port Hole Inner Diameter, in.	3.0
Stack or Duct Width (If Rectangular), in.	48.4
Stack Outer Circumference, in.	
Number of Ports Traversed	4
Elevation of Meter Box from Ground Level, ft.	4
Elevation of Ports from Ground Level, ft.	15
Stack Build-Up, in.	
Equivalent Diameter, De (in.)	34.3
Stack Cross-Sectional Width (W), in.	48.4
Stack Cross-Sectional Depth (D), in.	26.6

"Vertical" or "Horizontal" Flow	Vertical
Direction of Flow (select)	Up
"Velocity" or "Isokinetic" Traverse	Velocity

Port Distance Upstream from Flow Disturbance, in.	35.0
Diameters Upstream from Flow Disturbance (0.5 De)	1.0
Minimum Traverse Points Needed for a Velocity Traverse	16
Minimum Traverse Points Needed for a Isokinetic Traverse	24

Port Distance Downstream from Flow Disturbance, in.	125.5
Diameters Downstream from Flow Disturbance (2.0 De)	3.7
Minimum Traverse Points Needed for a Velocity Traverse	16
Minimum Traverse Points Needed for a Isokinetic Traverse	24

Minimum Traverse Points per Method 1	16
Number of Traverse Points for this Rectangular Stack or Duct	16
Point Overide - Optional	

Calculated Duct Area, in^2	1287.44
Calculated Duct Area, ft^2	8.9406

Port	Point	% of Duct Depth	Dist. From Inside Wall, in. (Decimal)	Dist. From Outside Wall, in. (Decimal)
1	1	12.5	3.3	9.3
1	2	37.5	10.0	16.0
1	3	62.5	16.6	22.6
1	4	87.5	23.3	29.3
2	1	12.5	3.3	9.3
2	2	37.5	10.0	16.0
2	3	62.5	16.6	22.6
2	4	87.5	23.3	29.3
3	1	12.5	3.3	9.3
3	2	37.5	10.0	16.0
3	3	62.5	16.6	22.6
3	4	87.5	23.3	29.3
4	1	12.5	3.3	9.3
4	2	37.5	10.0	16.0
4	3	62.5	16.6	22.6
4	4	87.5	23.3	29.3

EPA Method 1 - Cyclonic Flow Check

Company: LG Chemical | Pitot I.D.: T- PIT-608

Project ID: PROJ-070363 | Manometer I.D.: T- MTB-012

Location: P004 Inlet Duct / Exhaust Stack | Umbilical I.D.: T- MQU-404

Technician: AG | Date: 7/30/26 | Protractor ID: C- DRR1-001

Run Number - 1	Run Number -	Run Number -
Date - 7/30/26	Date -	Date -
Start Time - 10:30	Start Time -	Start Time -
Stop Time - 10:40	Stop Time -	Stop Time -
Zero and Level - Yes ✓	Zero and Level - Yes o	Zero and Level - Yes o
Pre Impact Side Leak Check-Pass ✓	Pre Impact Side Leak Check-Pass o	Pre Impact Side Leak Check-Pass o
Pre Static Side Leak Check-Pass ✓	Pre Static Side Leak Check-Pass o	Pre Static Side Leak Check-Pass o

Test Point	Notes	Yaw Angle (°)	Test Point	Notes	Yaw Angle (°)	Test Point	Notes	Yaw Angle (°)
1		8	1			1		
2		8	2			2		
3		5	3			3		
4		8	4			4		
5	Port change	8	5			5		
6		9	6			6		
7		7	7			7		
8		1	8			8		
9	Port change	3	9			9		
10		6	10			10		
11		6	11			11		
12		2	12			12		
13	Port change	0	13			13		
14		6	14			14		
15		8	15			15		
16		1	16			16		
17			17			17		
18			18			18		
19			19			19		
20			20			20		
21			21			21		
22			22			22		
23			23			23		
24			24			24		
25			25			25		
Avg.			Avg.			Avg.		

Post Impact Side Leak Check-Pass ✓	Post Impact Side Leak Check-Pass o	Post Impact Side Leak Check-Pass o
Post Static Side Leak Check-Pass ✓	Post Static Side Leak Check-Pass o	Post Static Side Leak Check-Pass o

QA/QC Check: Completeness [✓] Accuracy [✓] Specifications [✓] Checked by:

Onterris Air Quality Services, LLC

file:///onterris-fs01/shared/hicks_montrose-env_com/Desktop/Project Management/Onterris Data Sheets/011AS-Manual Methods-Effective-04.22.2011/NE011AS-FORMS-TM-63.htm

EPA Method 2 - Flow Data

Page _____ of _____

Company:	LG Chemical	Pitot I.D.: T- PIT-~~MU~~608	Manometer I.D.: T- MTB-062
Project ID:	PROJ-070363	Thermocouple I.D.: T-	Temp Display I.D.:T- MTB-062
Location:	P004 Inlet Duct / Exhaust Stack	Umbilical ID: T- MDU 4A	
Technician: AG		Date: 7/30/26	

Zero/Level: Yes o ✓			Zero/Level: Yes o ✓		Zero/Level: Yes o ✓		Zero/Level: Yes o		Zero/Level: Yes o	
Impact Side Leak Check-Pass o ✓			Impact Side - Pass o ✓		Impact Side - Pass o ✓		Impact Side - Pass o		Impact Side - Pass o	
Static Side Leak Check-Pass o ✓			Static Side - Pass o ✓		Static Side - Pass o ✓		Static Side - Pass o		Static Side - Pass o	
Date: 7/30/26			Date: 7/30/26		Date: 7/30/26		Date:		Date:	
Run No: 1			Run No: 2		Run No: 3		Run No:		Run No:	
Start Time: 8:44			Start Time: 10:19		Start Time: 12:58		Start Time:		Start Time:	
Stop Time: 8:54			Stop Time: 10:29		Stop Time: 12:48		Stop Time:		Stop Time:	
Pbar (mmHg): 729			Pbar (mmHg): 729		Pbar (mmHg): 729		Pbar (mmHg):		Pbar (mmHg):	
Pstatic: .09			Pstatic: .07		Pstatic: .08		Pstatic:		Pstatic:	
Point	DP*	Temp*	DP*	Temp*	DP*	Temp*	DP*	Temp*	DP*	Temp*
1	.06	136	.05	131	.06	135				
2	.06	145	.06	135	.05	139				
3	.07	153	.05	140	.07	143				
4	.05	155	.06	143	.05	149				
5	.06	150	.07	152	.05	180				
6	.08	155	.05	157	.08	182				
7	.05	152	.06	162	.06	178				
8	.06	156	.05	167	.05	179				
9	.08	158	.06	180	.06	175				
10	.06	162	.05	192	.06	177				
11	.07	160	.05	188	.05	175				
12	.05	158	.06	185	.05	176				
13	.06	190	.05	182	.07	180				
14	.06	185	.06	180	.05	181				
15	.07	187	.07	178	.06	184				
16	.07	181	.05	176	.06	185				
17										
18										
19										
20										
21										
22										
23										
24										
25										
	WB, °F		WB, °F		WB, °F		WB, °F		WB, °F	
	DB, °F		DB, °F		DB, °F		DB, °F		DB, °F	
Impact Side Leak Check-Pass o ✓			Impact Side-Pass o ✓		Impact Side-Pass o ✓		Impact Side-Pass o		Impact Side-Pass o	
Static Side Leak Check-Pass o ✓			Static Side-Pass o ✓		Static Side-Pass o ✓		Static Side-Pass o		Static Side-Pass o	

* Stack Dp in-H2O, Stack Temp, °F

Onterris Air Quality Services, LLC

QA/QC Check: Completeness [✓] Accuracy [✓] Specifications [✓]

Checked By:

Onterris

Sample Recovery & Calibration Check Datasheet

Page ____ of ____

Project Information

Date 7/29/26 Project # PROJ-070363

Customer / Facility LG Chemical

Unit ID / Sample Location P004 Inlet Duct / Exhaust Stack

Run # 1 - 3 Operator AG

Equipment Identification

Ref. Thermometer —

Hygrometer —

Field Balance A-BAL-018

Check Weights C-W500-001

Calipers

Balance Audit (Field balance must be within 0.5g of check weight mass)

Date	7/29/26	7/30/26	
Standard mass, g	500.0	500.0	500.0
Field balance mass, g	499.5	499.7	

Ambient Conditions (Mobile Lab)

Relative humidity, % —

Temperature, °F 80

Mobile lab # 78

Moisture Determination

	Contents	Run1 Initial	Run1 Final	Run1 Net	Run 2 Initial	Run 2 Final	Run 2 Net	Run 3 Initial	Run 3 Final	Run 3 Net
Knockout										
Impinger 1	H2O	694.9	703.9	9	691.0	701.0	10	703.9	711.6	7.7 ~~8.2~~
Impinger 2	H2O	704.4	707.7	3.3	596.7	598.0	1.3	707.7	708.7	1
Impinger 3	MT	611.1	613.5	2.4	593.9	594.9	1	613.5	614.0	.5
Impinger 4										
Impinger 5				14.7			12.3			~~9.7~~
Impinger 6										* 9.2
Impinger 7										
Impinger 8										
Silica Gel	Silica	913.5	921.4	7.9	933.2	941.9	8.7	921.4	928.1	6.7
Line Rinse										
Train Net Gain (Vlc)				22.6			21			16.4

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

Nozzle 1 diameters ____ D1 ____ D2 ____ D3 ____ Average

Nozzle 2 diameters ____ D1 ____ D2 ____ D3 ____ Average

Nozzle 3 diameters ____ D1 ____ D2 ____ D3 ____ Average

Nozzle Material ☐ quartz ☐ glass ☑ steel ☐ titanium ☐ inconel ☐ other ____

Probe Type ☐ heated ☑ unheated ☐ air-cooled ☐ water-cooled ☐ other ____

Probe Liner ☐ quartz ☐ glass ☐ steel ☑ Teflon ☐ other ____

Filter Information

Front Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other ____

Filter Number: Run 1: ____ Run 2: ____ Run 3: ____ Run ____ : ____

Back Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other ____

Reagent Information

Type	Lot Number

Sample Observations

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓

* 8/19/26

Checked by: ____ Team Leader: ____

001AS-QMS-FM-226

Onterris

EPA Method 4 Field Datasheet (Isokinetic)

Page ____ of ____

Project Information		Sampling Conditions		ALT 011 TC ID:	Ambient °F	Ref. °F
Date 7/30/26	Project # PROJ-070363	Static Pressure, in. H_2O .09	Ambient Temp, °F 70	Stack PIT-608		
Customer/Facility LG Chemical	/ Ravenna, OH	Barometric Pressure, in. Hg 29	Ref. Barometer ID BAR-001	Probe		
Unit ID/Sample Location P004	Inlet Duct / Exhaust Stack	Wind Speed / Direction —	Precipitation, Y / N, type	Filter Box		
Run # 1 2 3 4 5 6	Operator AG	Probe / Filter Temp Range, °F 223 - 273		Filter Exit		
				Meter outlet MTB-012		
				Impinger Exit UMA-030		
				Other		
				Ref. Thermometer ID		
				Continuity Check ☐ Continuity w/ Proper Polarity		
				Notes: PMD-022		

Sampling Equipment IDs		Calibration		Equipment Checks	Pre	Mid	Post
Meterbox ID	MTB-012	Meterbox Y	0.9281	Pitot (+), pass @ in. H_2O	☑ @	☐ @	☐ @
Umbilical ID	UMC-605	Meterbox ΔH@, in. H_2O	2.1039	Pitot (-), pass @ in. H_2O	☑ @	☐ @	☐ @
Nozzle ID	—	Nozzle diameter, Dn, in.	—	Pitot visual inspection	☐ pass	☐ pass	☐ pass
Pitot / Probe ID	PIT-608	Pitot coefficient, Cp	.84	Nozzle visual inspection	☐ pass	☐ pass	☐ pass
Manometer ID	MTB-012	Manometer zero and level	☑ yes	Meter, cfm @ in. Hg	0.00 @ 15	@	0.000 @ 4
Sensitivity	—	K-Factor	—	Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	8:38	928.975		1.5	1.5					52		80		2
2	7:30		933.54			1.5					45		80		3
3	15		938.40			1.5					46		79		3
4	22:30		943.17			1.5					48		79		3
5	30		947.88			1.5					50		79		3
6	37:30		952.96			1.5					51		80		3
7	45		957.81			1.5					53		80		3
8	52:30		962.63			1.5					55		79		4
	1:00	9:38	967.462			1.5					56		79		4
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By [signature] Team Leader [signature]

001AS-QMS-FM-225

Onterris

EPA Method 4 Field Datasheet (Isokinetic)

Page ____ of ____

Project Information

Date 7/30/26 Project # PROJ-070363

Customer/Facility LG Chemical / Ravenna, OH

Unit ID/Sample Location P004 Inlet Duct / (Exhaust Stack)

Run # 1 (2) 3 4 5 6 Operator AG

Sampling Conditions

Static Pressure, in. H_2O 0.07 Ambient Temp, °F 72

Barometric Pressure, in. Hg 729 Ref. Barometer ID BAR-001

Wind Speed / Direction 0 Precipitation, Y / N / type 0

Probe / Filter Temp Range, °F 223 - 273

ALT 011 TC ID: Ambient °F Ref. °F

Stack PIT 608

Probe

Filter Box

Filter Exit

Meter outlet MTB-012

Impinger Exit VMA-030

Other

Ref. Thermometer ID

Continuity Check ☐ Continuity w/ Proper Polarity

Notes: PMP-022

Sampling Equipment IDs

Meterbox ID MTB-012

Umbilical ID UMC-605

Nozzle ID —

Pitot / Probe ID PIT-608

Manometer ID MTB-012

Sensitivity —

Calibration

Meterbox Y 0.9881

Meterbox ΔH@, in. H_2O 2.1039

Nozzle diameter, Dn, in.

Pitot coefficient, Cp .84

Manometer zero and level ☑ yes

K-Factor —

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☐ @	☐ @	☐ @
Pitot (-), pass @ in. H_2O	☐ @	☐ @	☐ @
Pitot visual inspection	☐ pass	☐ pass	☐ pass
Nozzle visual inspection	☐ pass	☐ pass	☐ pass
Meter, cfm @ in. Hg	0.001 @ 15	@	0.000 @ 2
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	10:15	967.948		1.5	1.5					60		80		1
2	7:30		972.81			1.5					52		80		2
3	15		976.43			1.5					50		79		2
4	22:30	1041 / 1130	982.58			1.5					53		80		2
5	30		987.36			1.5					59		83		2
6	37:30		992.21			1.5					56		83		2
7	45		996.93			1.5					58		84		2
8	52:30		1001.78			1.5					60		84		2
	1:00		1006.763			1.5					62		84		2
Averages															

1041 / 1130

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By [signature] Team Leader [signature]

001AS-QMS-FM-225

Onterris

EPA Method 4 Field Datasheet (Isokinetic)

Page ____ of ____

Project Information
Date 7/30/26 Project # PROJ-070363
Customer/Facility LG Chemical / Ravenna, OH
Unit ID/Sample Location P004 Inlet Duct / Exhaust Stack
Run # 1 2 3 4 5 6 Operator AG

Sampling Conditions
Static Pressure, in. H_2O ____ Ambient Temp, °F ____
Barometric Pressure, in. Hg 29 Ref. Barometer ID BAR-001
Wind Speed / Direction 0 Precipitation, Y / N type ____
Probe / Filter Temp Range, °F 223 - 273

ALT 011 TC ID:

	Ambient °F	Ref. °F
Stack PIT-605		
Probe		
Filter Box		
Filter Exit		
Meter outlet MTB-012		
Impinger Exit UMA-030		
Other		

Ref. Thermometer ID ____
Continuity Check ☐ Continuity w/ Proper Polarity
Notes: DMP-022

Sampling Equipment IDs
Meterbox ID MTB-012
Umbilical ID UMC-605
Nozzle ID —
Pitot / Probe ID ____
Manometer ID MTB-012
Sensitivity —

Calibration
Meterbox Y 0.9881
Meterbox ΔH@, in. H_2O 2.1034
Nozzle diameter, Dn, in. —
Pitot coefficient, Cp .84
Manometer zero and level ☑ yes
K-Factor —

Equipment Checks

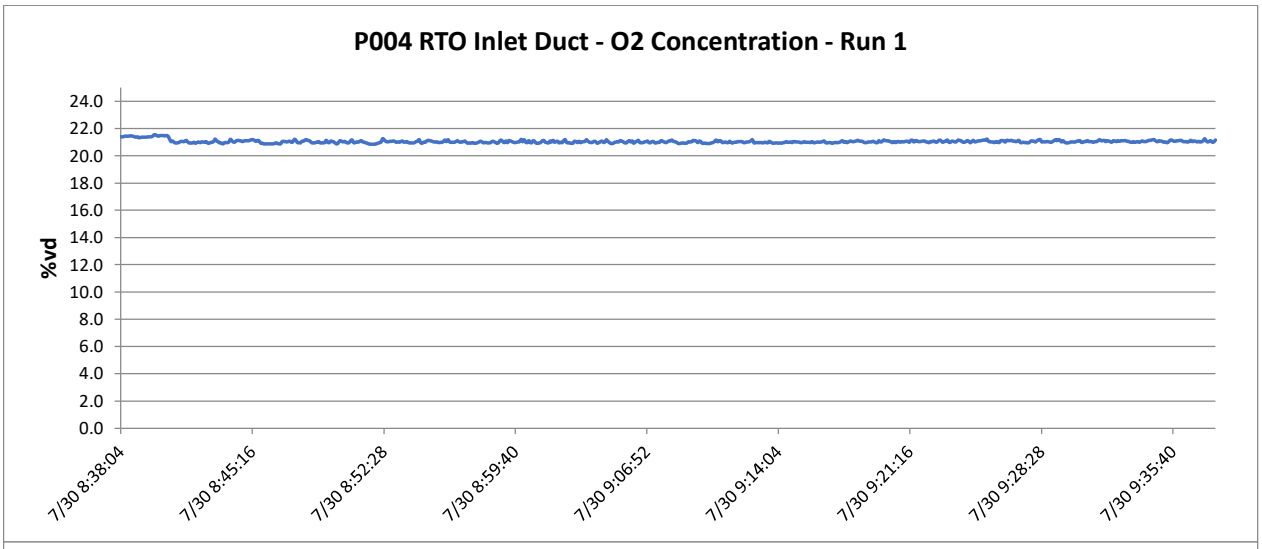
	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☐ @	☐ @	☐ @
Pitot (-), pass @ in. H_2O	☐ @	☐ @	☐ @
Pitot visual inspection	☐ pass	☐ pass	☐ pass
Nozzle visual inspection	☐ pass	☐ pass	☐ pass
Meter, cfm @ in. Hg	0.000 @ 15	@	0.000 @ 3
Intermediate leak check volume, ft^3		/	/

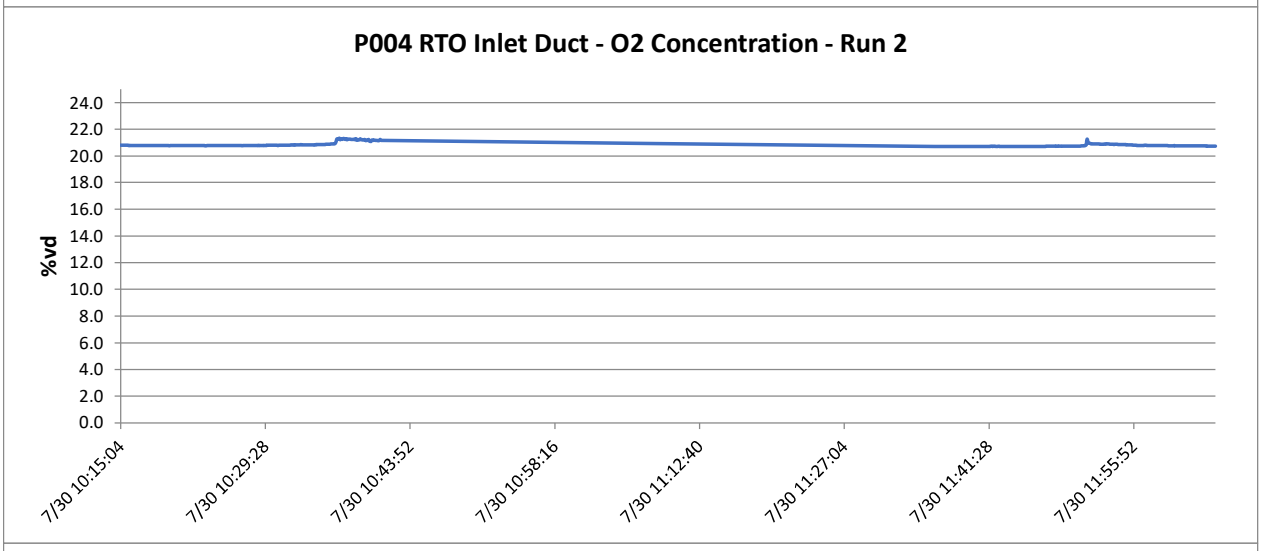
Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	12:40	006.885		1.5	1.5					64		87		2
2	7:30		11.73			1.5					51		87		2
3	15		16.71			1.5					52		86		3
4	22:30		21.53			1.5					54		87		3
5	30		26.45			1.5					55		87		3
6	37:30		31.38			1.5					58		88		3
7	45		36.21			1.5					58		88		3
8	52:30		41.18			1.5					59		89		3
	1:00	1340	~~46.0~~			1.5					61		89		3
			46.086												
			7.30.26												
Averages															

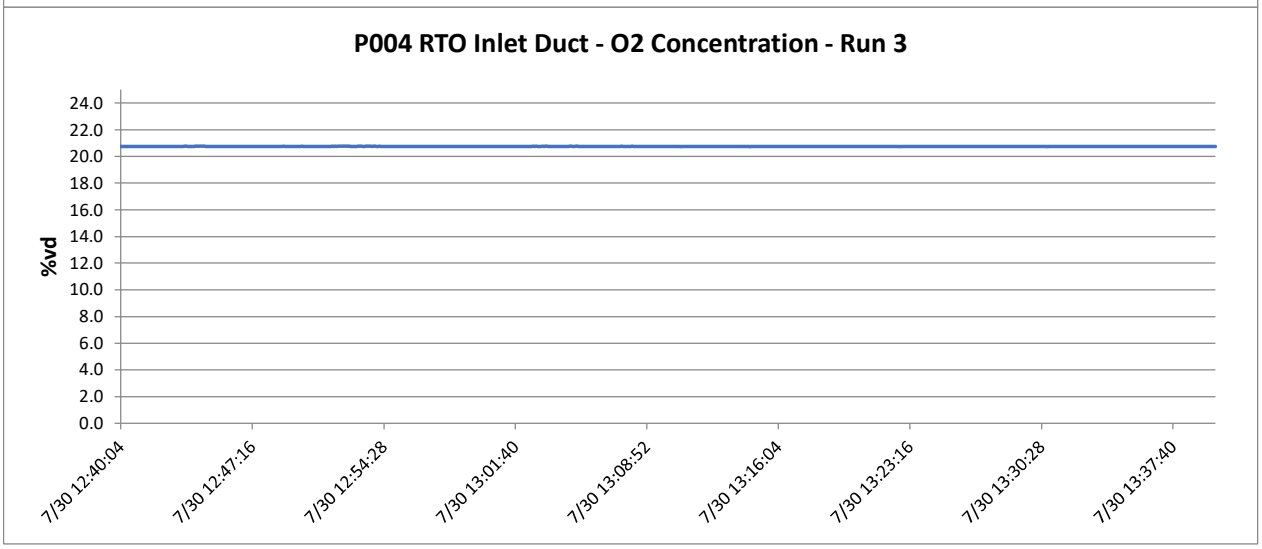
QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By RY Team Leader SF

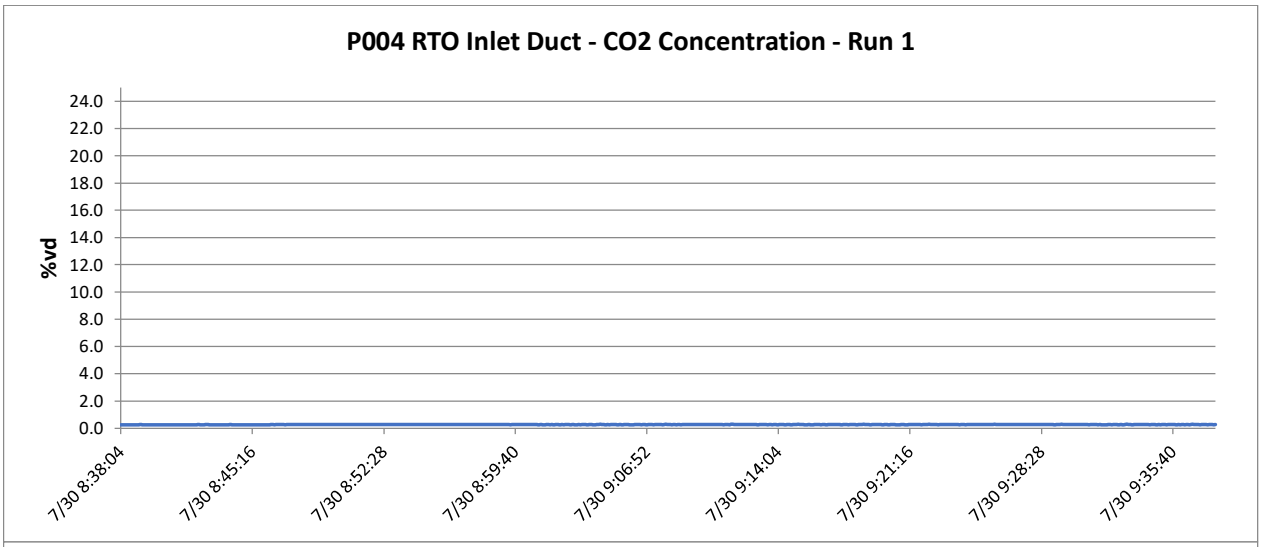
001AS-QMS-FM-225

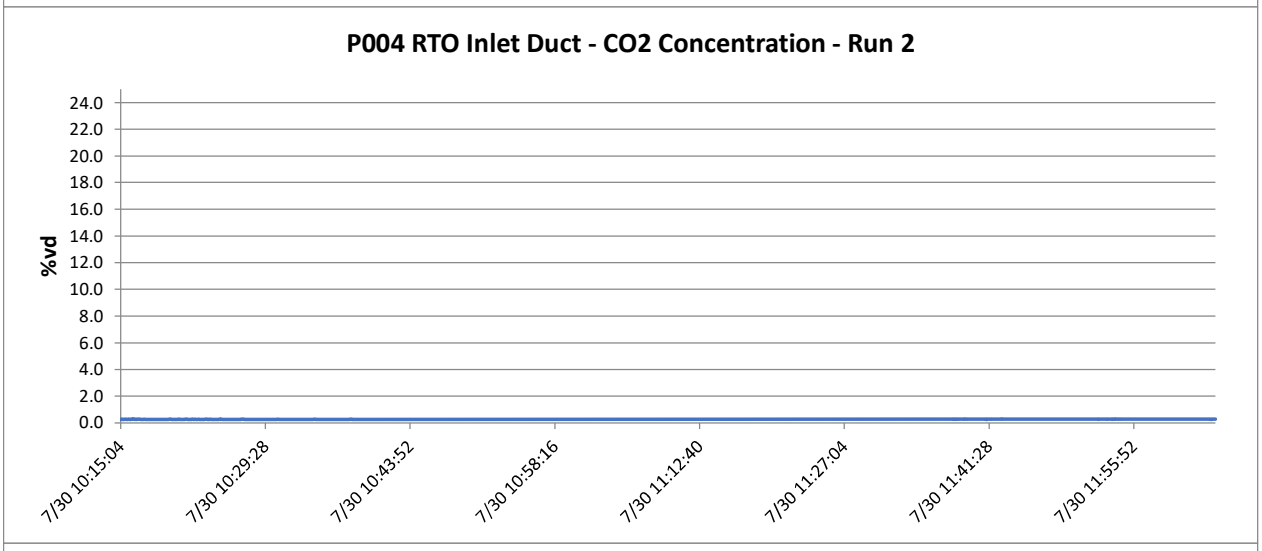
Appendix A4 Instrumental Test Method Data

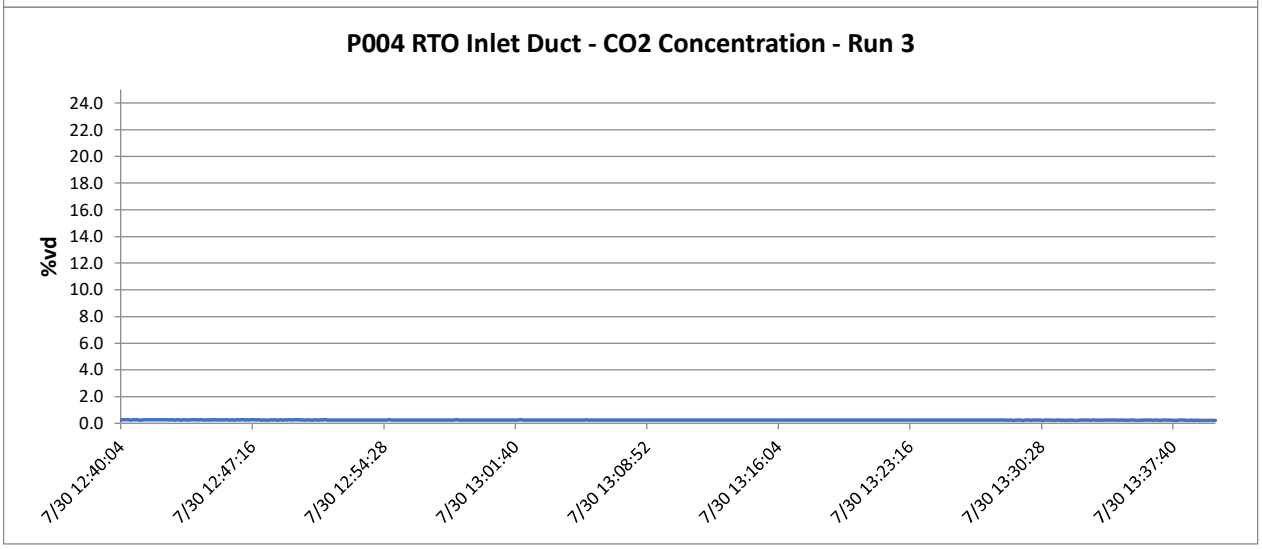

P004 RTO Inlet Duct - O2 Concentration - Run 1
%vd
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
7/30 8:38:04
7/30 8:45:16
7/30 8:52:28
7/30 8:59:40
7/30 9:06:52
7/30 9:14:04
7/30 9:21:16
7/30 9:28:28
7/30 9:35:40

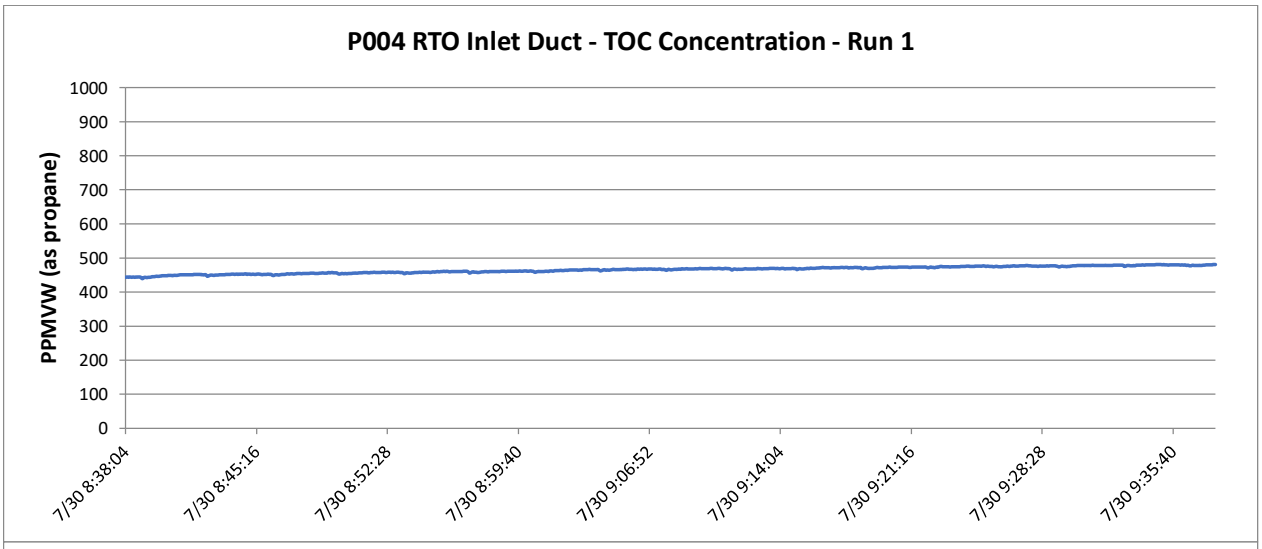

P004 RTO Inlet Duct - O2 Concentration - Run 2
%vd
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
7/30 10:15:04
7/30 10:29:28
7/30 10:43:52
7/30 10:58:16
7/30 11:12:40
7/30 11:27:04
7/30 11:41:28
7/30 11:55:52

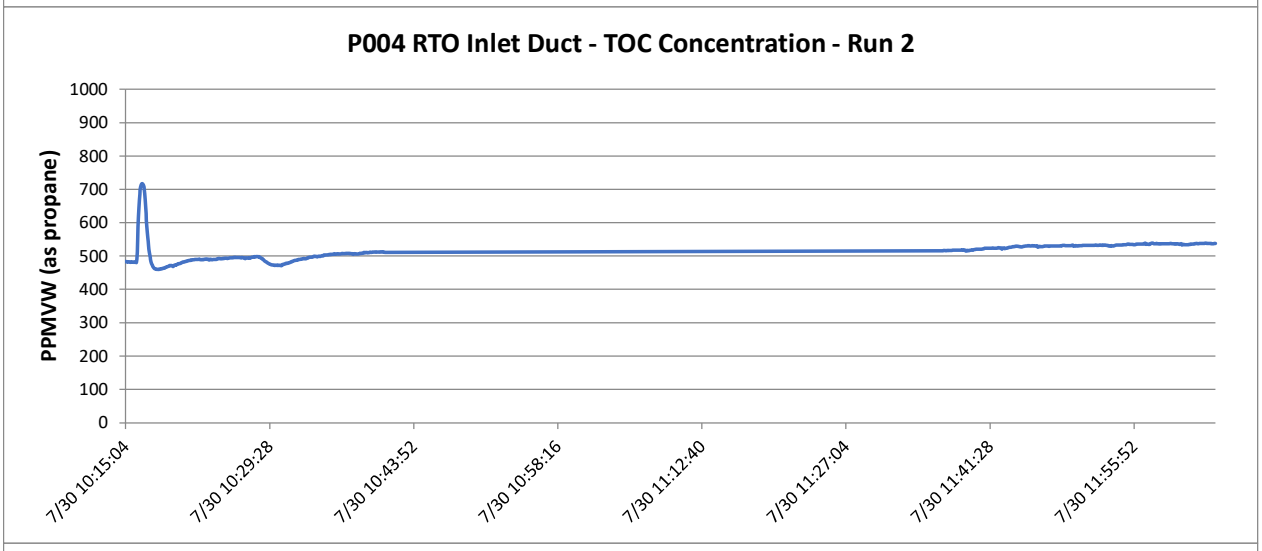

P004 RTO Inlet Duct - O2 Concentration - Run 3
%vd
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
7/30 12:40:04
7/30 12:47:16
7/30 12:54:28
7/30 13:01:40
7/30 13:08:52
7/30 13:16:04
7/30 13:23:16
7/30 13:30:28
7/30 13:37:40

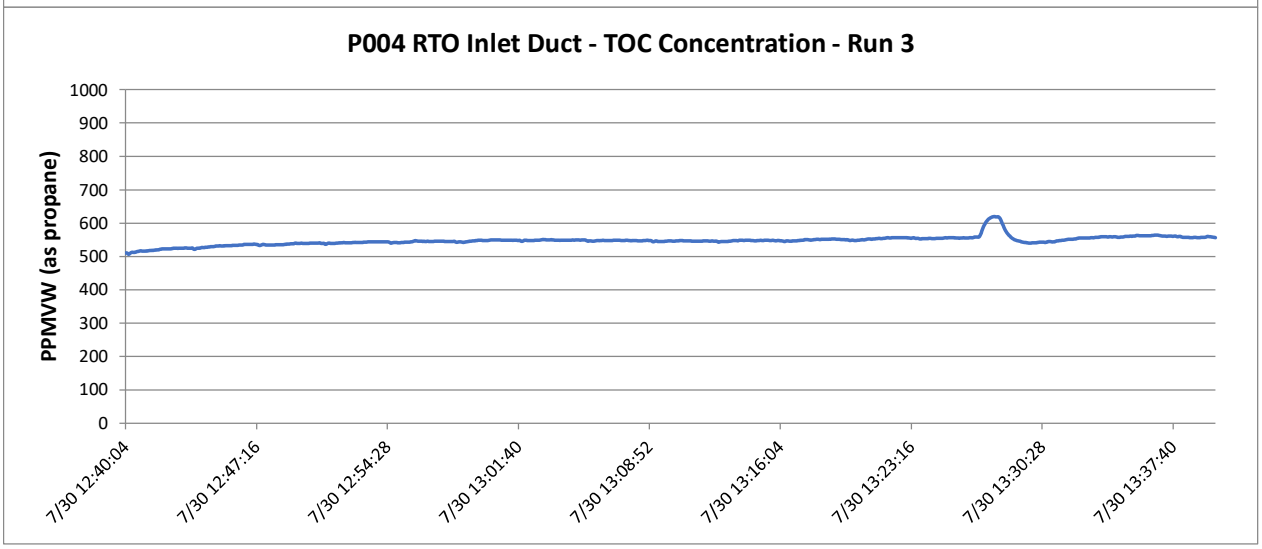

P004 RTO Inlet Duct - CO2 Concentration - Run 1
%vd
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
7/30 8:38:04
7/30 8:45:16
7/30 8:52:28
7/30 8:59:40
7/30 9:06:52
7/30 9:14:04
7/30 9:21:16
7/30 9:28:28
7/30 9:35:40

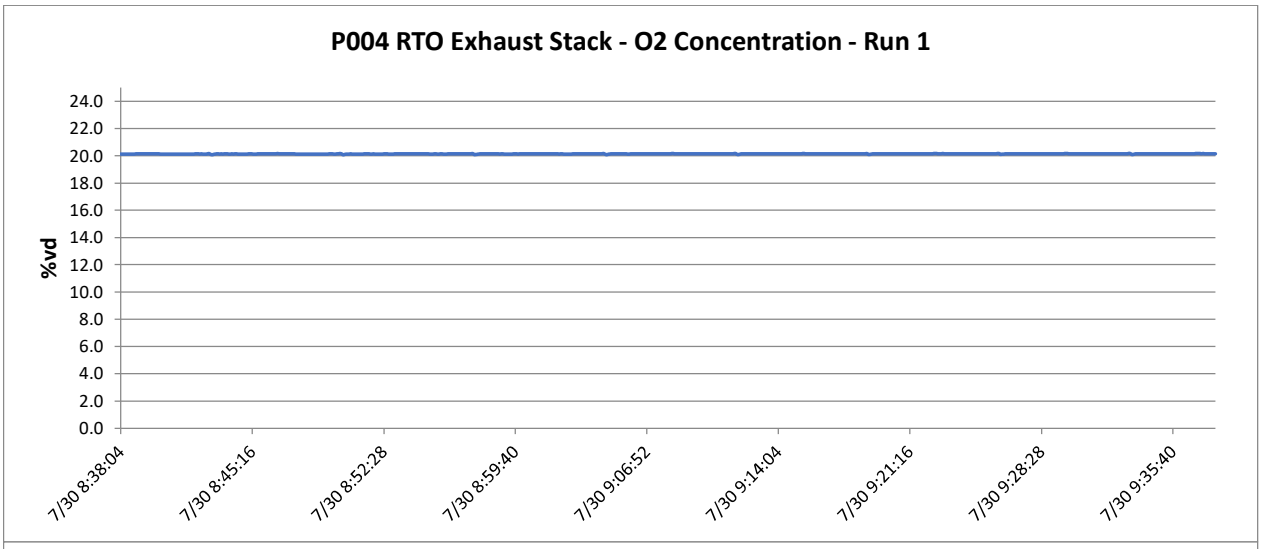

P004 RTO Inlet Duct - CO2 Concentration - Run 2
%vd
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
7/30 10:15:04
7/30 10:29:28
7/30 10:43:52
7/30 10:58:16
7/30 11:12:40
7/30 11:27:04
7/30 11:41:28
7/30 11:55:52

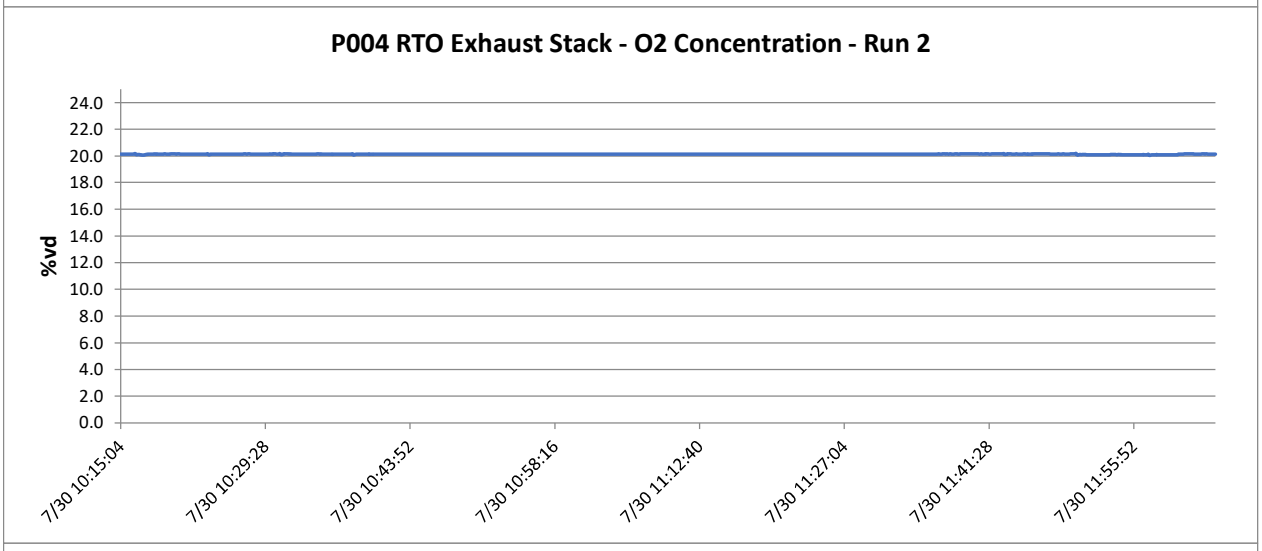

P004 RTO Inlet Duct - CO2 Concentration - Run 3
%vd
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
7/30 12:40:04
7/30 12:47:16
7/30 12:54:28
7/30 13:01:40
7/30 13:08:52
7/30 13:16:04
7/30 13:23:16
7/30 13:30:28
7/30 13:37:40

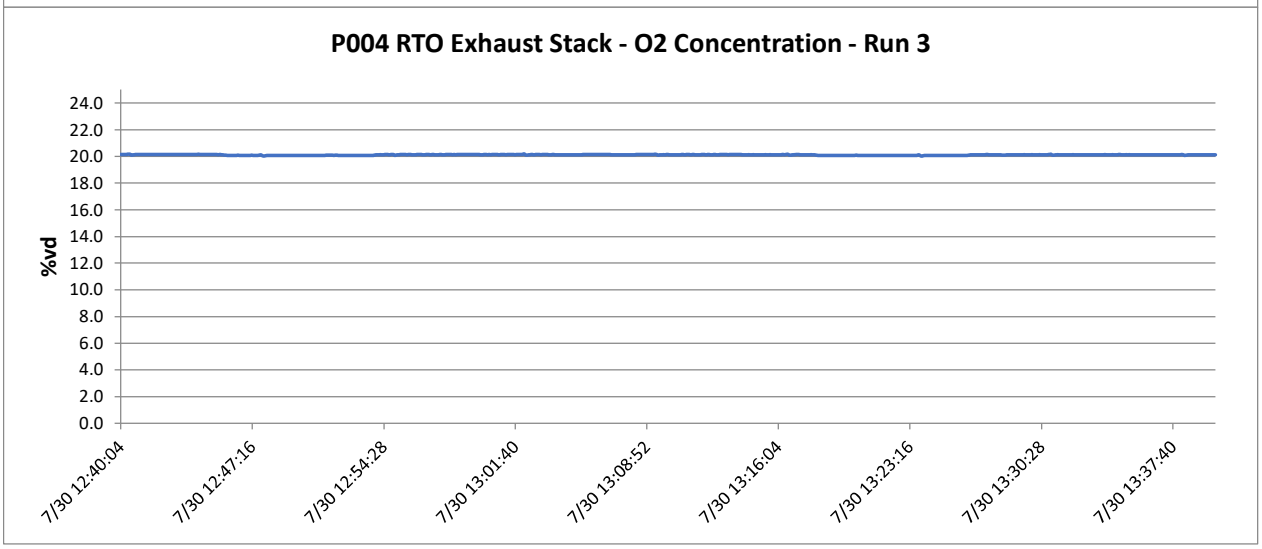

P004 RTO Inlet Duct - TOC Concentration - Run 1
PPMVW (as propane)
1000
900
800
700
600
500
400
300
200
100
0
7/30 8:38:04
7/30 8:45:16
7/30 8:52:28
7/30 8:59:40
7/30 9:06:52
7/30 9:14:04
7/30 9:21:16
7/30 9:28:28
7/30 9:35:40

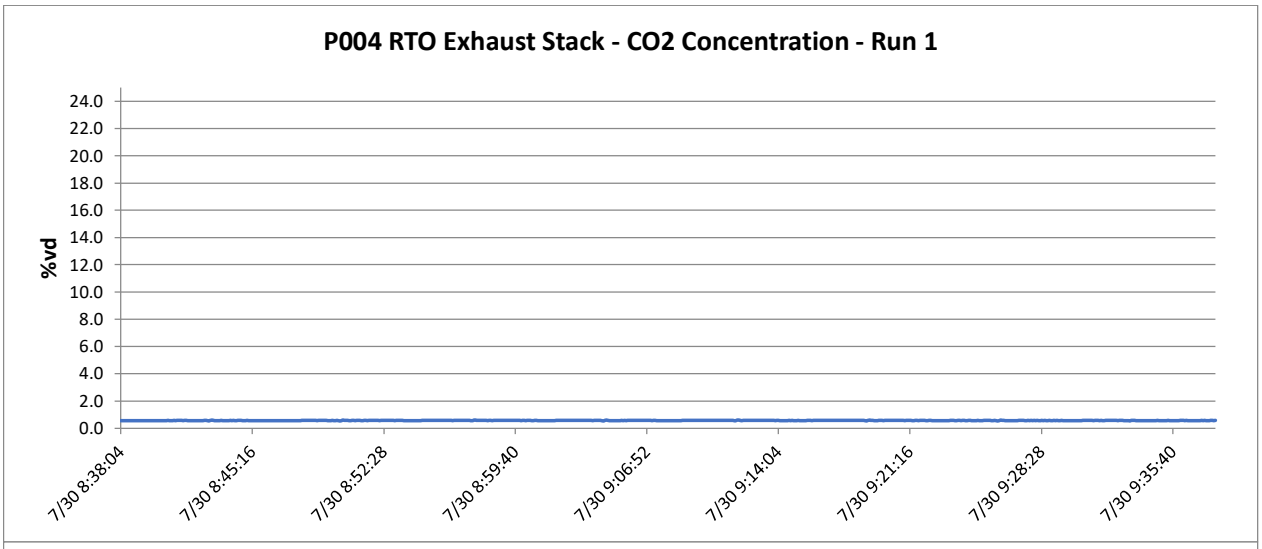

P004 RTO Inlet Duct - TOC Concentration - Run 2
PPMVW (as propane)
1000
900
800
700
600
500
400
300
200
100
0
7/30 10:15:04
7/30 10:29:28
7/30 10:43:52
7/30 10:58:16
7/30 11:12:40
7/30 11:27:04
7/30 11:41:28
7/30 11:55:52

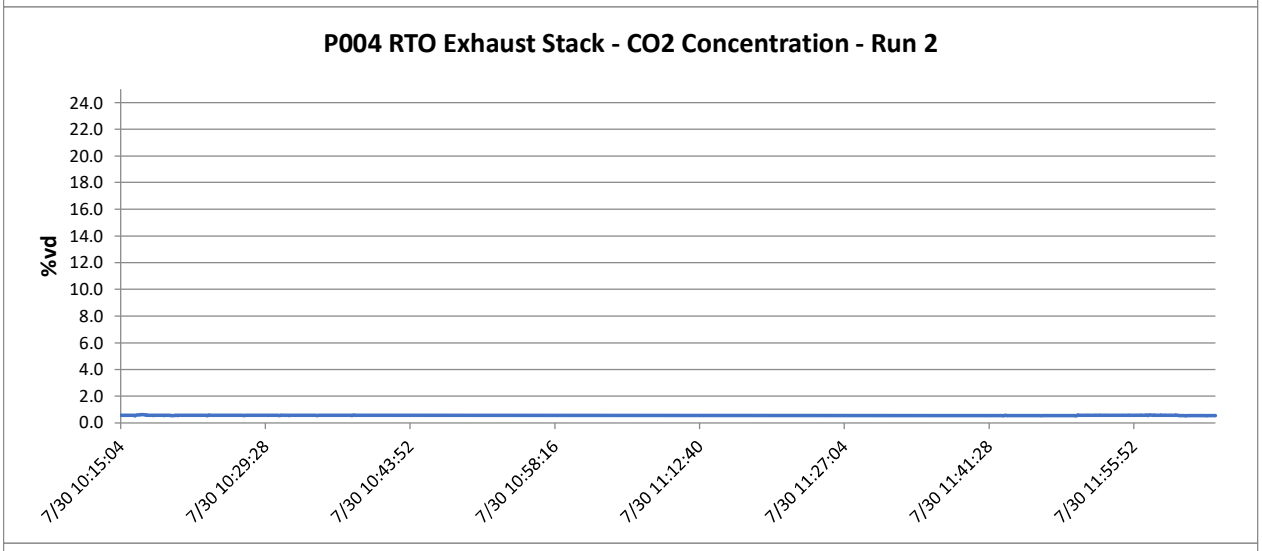

P004 RTO Inlet Duct - TOC Concentration - Run 3
PPMVW (as propane)
1000
900
800
700
600
500
400
300
200
100
0
7/30 12:40:04
7/30 12:47:16
7/30 12:54:28
7/30 13:01:40
7/30 13:08:52
7/30 13:16:04
7/30 13:23:16
7/30 13:30:28
7/30 13:37:40

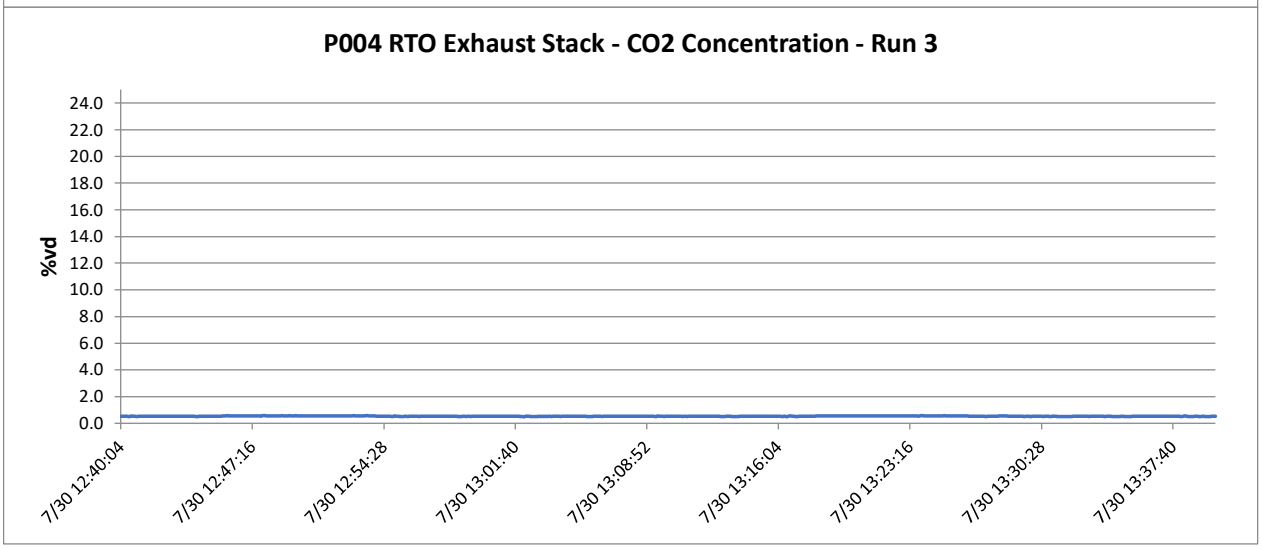

P004 RTO Exhaust Stack - O2 Concentration - Run 1
%vd
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
7/30 8:38:04
7/30 8:45:16
7/30 8:52:28
7/30 8:59:40
7/30 9:06:52
7/30 9:14:04
7/30 9:21:16
7/30 9:28:28
7/30 9:35:40

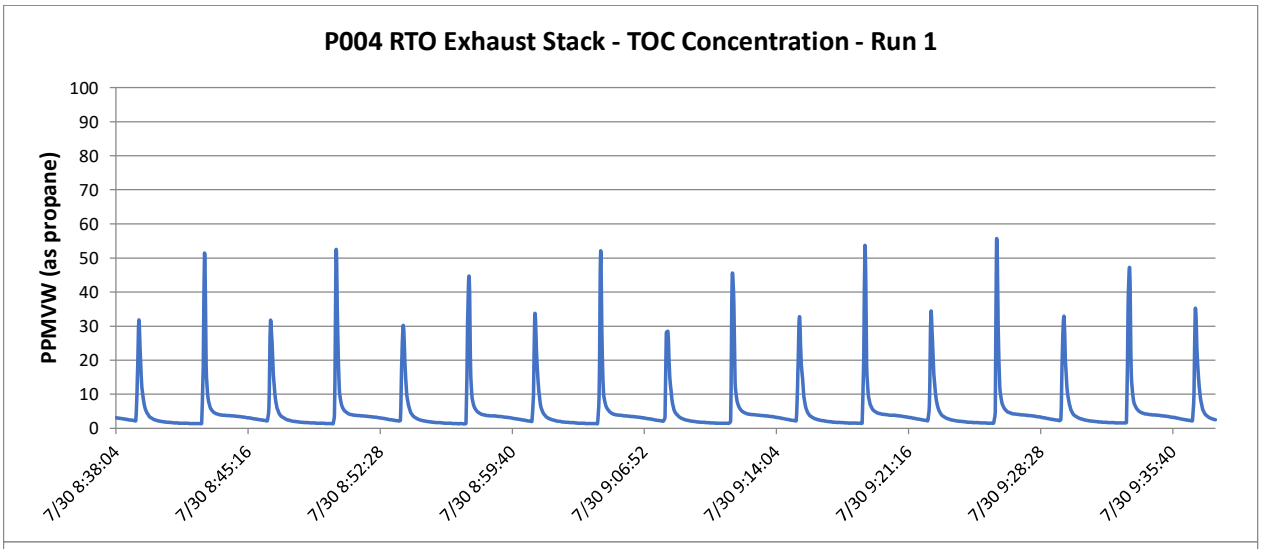

P004 RTO Exhaust Stack - O2 Concentration - Run 2
%vd
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
7/30 10:15:04
7/30 10:29:28
7/30 10:43:52
7/30 10:58:16
7/30 11:12:40
7/30 11:27:04
7/30 11:41:28
7/30 11:55:52

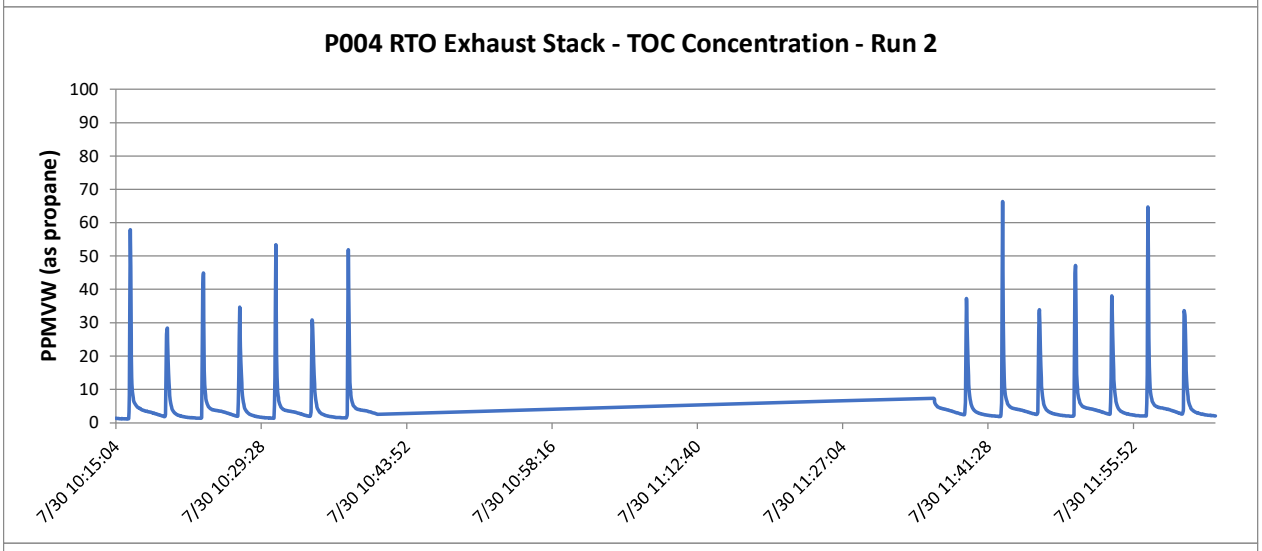

P004 RTO Exhaust Stack - O2 Concentration - Run 3
%vd
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
7/30 12:40:04
7/30 12:47:16
7/30 12:54:28
7/30 13:01:40
7/30 13:08:52
7/30 13:16:04
7/30 13:23:16
7/30 13:30:28
7/30 13:37:40

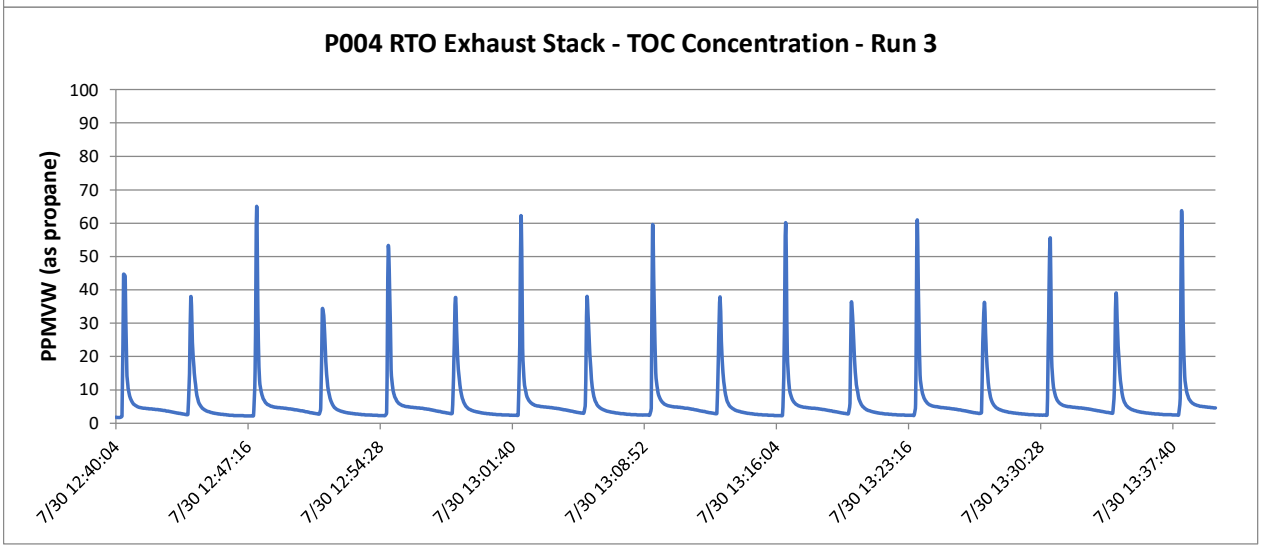

P004 RTO Exhaust Stack - CO2 Concentration - Run 1
%vd
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
7/30 8:38:04
7/30 8:45:16
7/30 8:52:28
7/30 8:59:40
7/30 9:06:52
7/30 9:14:04
7/30 9:21:16
7/30 9:28:28
7/30 9:35:40


P004 RTO Exhaust Stack - CO2 Concentration - Run 2
%vd
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
7/30 10:15:04
7/30 10:29:28
7/30 10:43:52
7/30 10:58:16
7/30 11:12:40
7/30 11:27:04
7/30 11:41:28
7/30 11:55:52


P004 RTO Exhaust Stack - CO2 Concentration - Run 3
%vd
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
7/30 12:40:04
7/30 12:47:16
7/30 12:54:28
7/30 13:01:40
7/30 13:08:52
7/30 13:16:04
7/30 13:23:16
7/30 13:30:28
7/30 13:37:40


P004 RTO Exhaust Stack - TOC Concentration - Run 1
PPMVW (as propane)
100
90
80
70
60
50
40
30
20
10
0
7/30 8:38:04
7/30 8:45:16
7/30 8:52:28
7/30 8:59:40
7/30 9:06:52
7/30 9:14:04
7/30 9:21:16
7/30 9:28:28
7/30 9:35:40


P004 RTO Exhaust Stack - TOC Concentration - Run 2
PPMVW (as propane)
100
90
80
70
60
50
40
30
20
10
0
7/30 10:15:04
7/30 10:29:28
7/30 10:43:52
7/30 10:58:16
7/30 11:12:40
7/30 11:27:04
7/30 11:41:28
7/30 11:55:52


P004 RTO Exhaust Stack - TOC Concentration - Run 3
PPMVW (as propane)
100
90
80
70
60
50
40
30
20
10
0
7/30 12:40:04
7/30 12:47:16
7/30 12:54:28
7/30 13:01:40
7/30 13:08:52
7/30 13:16:04
7/30 13:23:16
7/30 13:30:28
7/30 13:37:40

CEMS Run Log

Page:____ of _____

Company Name:	LG Chemical	CEMS Probe ID: T-CPR- 010/009	
Job ID:	PROJ-070363	Heated Sample Line ID(s): T-HSL- 501/502	
Location:	P004 Inlet Duct / Exhaust Stack	Sample Conditioner ID(s): T-SCU- 009/008	

Analyzer ID/Serial No.:	T-02CO2A-002		T-FID-018	T-02CO2A-001		T-FID-023	
Target Pollutant:	O2	CO2	THC	O2	CO2	THC	
Span (ppm /%):	21.89	21.65	8.50	21.89	21.65	85	
DAQ Data Column:	1	2	3	4	5	6	
Primary / Back-Up:	P	P	P	P	P	P	
Dilution Ratio:	—	—	—	—	—	—	
Sample Type (wet/dry):	dry	dry	wet	dry	dry	wet	
Points Traversed:	~~3~~ CE 7-30-26	~~3~~	—	~~3~~ CE 7-30-26	~~3~~	—	

Date	Run	Start	Stop	Pause Times/Process Notes/Comments/Concentrations
7-29-26		16:05	16:22	[✓] EPA Method 205 Audit
7-30-26		0712	07:55	[_] ~~EPA Method 7E Converter Efficiency~~ Initial Calibrations
		08:00	08:25	[_] Startification Test Initial Calibrations O2/CO2 25A
	1	08:38	09:38	
		0940	0949	Drift check O2/CO2
		0951	10:11	Drift check 25A
	2-1	10:15	~~11:15~~ CE 7-30-26	10:41 Pause - Lost Power Resume: 11:30
		10:59	11:16	Drift check 25A
		1118	1126	Drift Check
	2-2	11:30	12:04	
		12:05	1218	Drift check O2/CO2
		12:21	12:35	Drift check ~~O2/CO2~~ CE 7-30-26 25A
	3	12:40	13:40	
		13:43	13:55	Drift check O2/CO2
		1358	1412	Drift Check M25A

QA/QC Check: Completeness [✓] Accuracy [✓] Specifications [✓]

Checked by: _____

001AS-QMS-TM-68 Effective 4/22/2026

EPA M25A-THC Bias/Drift Sheet

Page ____ of _____

Company	LG Chemical	System Response Time (RT), secs	
Job ID:	PROJ-070363	Run 1 -	90
Location:	P004 (Inlet Duct) / Exhaust Stack	Run 2 -	90
Analyzer Mfg and ID: CAI / T-FID 021		Run 3 -	90
Analyzer Model/Serial No.: 700 /		Average	90
Technician: CE			

	Actual/Target Value (%)	Pressure (psig)	Expiration (mm/dd/yy)	Cylinder ID
Zero-Level Gas Cylinder	0	1200	3/6/2034	5047086
Mid-Level Gas Cylinder	2908/500	500	7/31/2033	SX090267
High-Level Gas Cylinder	2908/850	500	7/31/2033	SX010267
EPA Method 205 Cylinder				See 205 Sheet

	Run Number	1	2-1	2-2	3	
	Run Date	7-30-26	7-30-26	7-30-26	7-30-26	
	Analyzer Span (ppmv)	1000	1000	1000	1000	
System Calibration Response for Zero Gas	Time (hh:mm)	~~07:33~~ 07:46	07:46	07:46	07:46	
	Response (%)	~~0.09~~ CE 7-30-26	0.36	0.36	0.36	
System Calibration Response for High Level Gas	Time (hh:mm)	07:50	07:50	07:50	07:50	
	Response (%)	850.15	850.15	850.15	850.15	
System Calibration Response for Low Level Gas	Time (hh:mm)	07:53	07:53	07:53	07:53	
	Response (%)	304.52	304.52	304.52	304.52	
System Calibration Response for Mid-Level Gas	Time (hh:mm)	07:55	07:55	07:55	07:55	
	Response (%)	509.07	509.07	509.07	509.07	
System Calibration Response for Zero Gas	Time (hh:mm)	10:07	~~11:01~~ 1113	1224	1406	
	Response (%)	0.08	~~0.30~~	24.43	25.19	
System Calibration Response for Mid-Level Gas	Time (hh:mm)	10:11	11:16	1227	1412	
	Response (%)	53.17	531.27	530.05	538.28	

QA/QC Check: Completeness [✓] Accuracy [✓] Specifications [✓] * CE 7-30-26 26.47 Checked by: [signature]

011AS-QMS-TM-74

Onterris Air Quality Services, LLC

https://onterris-my.sharepoint.com/personal/jhicks_montrose-env_com/Documents/Desktop/Project Management/Onterris Data Sheets/ 011AS-CEMS Methods Effective-04.22.26-JH-EPA Method 25A-THC

EPA M3A-O_2 Bias/Drift Sheet

Page ____ of _____

Company	LG Chemical	System Response Time (RT), secs	
Job ID:	PROJ-070363	Run 1 -	90
Location:	P004 Inlet Duct/ Exhaust Stack	Run 2 -	90
Analyzer Mfg and ID:	P-02C02A-001 / Servomex	Run 3 -	90
Analyzer Model/Serial No.:	1440 / 01440D1/4766	Average	90
Technician:	CE		

	Actual/Target Value (%)	Pressure (psig)	Expiration (mm/dd/yy)	Cylinder ID
Zero-Level Gas Cylinder	0	800	3/12/2031	003394602
Mid-Level Gas Cylinder	21.89/16.93	1200	2/24/2034	EB0124182
High-Level Gas Cylinder	21.89	1200	2/24/2034	EB0124182
EPA Method 205 Cylinder				See 205 Sheet

	Run Number	1	2-1	2-2	3	
	Run Date	7-30-26	7-30-26	7-30-26	7-30-26	
	Analyzer Span (%)	21.89	21.89	21.89	21.89	
Analyzer Calibration Response for Zero Gas	Time (hh:mm)	08:14	08:14	08:14	08:14	
	Response (%)	0.10	0.10	0.10	0.10	
Analyzer Calibration Response for High Level Gas	Time (hh:mm)	08:17	08:17	08:17	08:17	
	Response (%)	~~21.68~~ CE 7-30-26	21.92	21.92	21.92	
Analyzer Calibration Response for Mid-Level Gas	Time (hh:mm)	08:19	08:19	08:19	08:19	
	Response (%)	~~10.90~~ CE 7-30-26 11.07	11.07	11.07	11.07	
Initial System Calibration Response for Zero Gas	Time (hh:mm)	08:22	09:41	1124	12:15	
	Response (%)	-0.17	-0.46	-0.48	-0.49	
Initial System Calibration Response for Upscale Gas	Time (hh:mm)	09:25	0944	1126	1218	
	Response (%)	10.69	10.81	10.56	10.66	
	Ambient Temp. (°F)			1215		
Final System Calibration Response for Zero Gas	Time (hh:mm)	0941	1124	~~1220~~ CE 7-30-26	1351	
	Response (%)	-0.46	-0.48	-0.49	-0.49	
Final System Calibration Response for Upscale Gas	Time (hh:mm)	0944	1126	1218	1355	
	Response (%)	10.81	~~10.98~~ CE 7-30-26 10.56	10.66	10.64	
	Ambient Temp. (°F)					

QA/QC Check: Completeness [✓] Accuracy [✓] Specifications [✓]

Checked by: _____

001AS-QMS-TM-69

EPA M3A-CO_2 Bias/Drift Sheet

Page ____ of _____

Company	LG Chemical	System Response Time (RT), secs	
Job ID:	PROJ-070363	Run 1 -	90
Location:	P004 (Inlet Duct) / ~~Exhaust Stack~~	Run 2 -	90
Analyzer Mfg and ID:	Servomex / T-02CO2A-001	Run 3 -	90
Analyzer Model/Serial No.:	1440 / 1440D1-4766	Average	90
Technician:	CE		

	Actual/Target Value (%)	Pressure (psig)	Expiration (mm/dd/yy)	Cylinder ID
Zero-Level Gas Cylinder	0	500	3/12/2031	003394 602
Mid-Level Gas Cylinder	21.65/10.93	1200	2/24/2034	EB0124192
High-Level Gas Cylinder	21.65/16.93	1200	2/24/2034	EB0124182
EPA Method 205 Cylinder				See 205 Sheet

	Run Number	1	2-1	2-2	3	
	Run Date	7-30-26	7-30-26	7-30-26	7-30-26	
	Analyzer Span (%)	21.65	21.65	21.65	21.65	
Analyzer Calibration Response for Zero Gas	Time (hh:mm)	08:14	08:14	08:14	08:14	
	Response (%)	0.20	0.20	0.20	0.20	
Analyzer Calibration Response for High Level Gas	Time (hh:mm)	08:17	08:17	08:17	08:17	
	Response (%)	CE 7-30-26 ~~21.68~~	21.68	21.68	21.68	
Analyzer Calibration Response for Mid-Level Gas	Time (hh:mm)	08:19	08:19	08:19	08:19	
	Response (%)	~~10.90~~ CE 7-30-26	10.90	10.90	10.90	
Initial System Calibration Response for Zero Gas	Time (hh:mm)	08:22	09:41	11:24	12:55	
	Response (%)	0.22 ~~0.17~~ CE 7-30-26	0.23	0.23	0.23	
Initial System Calibration Response for Upscale Gas	Time (hh:mm)	08:25	09:44	11:26	1218	
	Response (%)	11.09	10.87	10.98	11.48	
	Ambient Temp. (°F)					
Final System Calibration Response for Zero Gas	Time (hh:mm)	09:41	1124	1215	1351	
	Response (%)	0.23	0.23	0.23	0.20	
Final System Calibration Response for Upscale Gas	Time (hh:mm)	09:44	1126	1218	1355	
	Response (%)	10.87	10.98	11.49	11.04	
	Ambient Temp. (°F)					

QA/QC Check: Completeness [✓] Accuracy [✓] Specifications [✓]

Checked by: _____

011AS-QMS-TM-70

EPA M25A-THC Bias/Drift Sheet

Page ____ of _____

Company	LG Chemical	System Response Time (RT), secs	
Job ID:	PROJ-070363	Run 1 -	90
Location:	P004 Inlet Duct / Exhaust Stack	Run 2 -	90
Analyzer Mfg and ID:	CAI / T-FID-023	Run 3 -	90
Analyzer Model/Serial No.:	7001	Average	90
Technician:	CE		

	Actual/Target Value (%)	Pressure (psig)	Expiration (mm/dd/yy)	Cylinder ID
Zero-Level Gas Cylinder	0	1200	3/6/2024	SO47086
Mid-Level Gas Cylinder	375.4/50	200	3/17/2024	SX57552
High-Level Gas Cylinder	375.4/95	200	3/17/2024	SX87552
EPA Method 205 Cylinder				See 205 Sheet

	Run Number	1	2-1	2-2	3	
	Run Date	7-30-26	7-30-26	7-30-26	7-30-26	
	Analyzer Span (ppmv)	100	100	100	100	
System Calibration Response for Zero Gas	Time (hh:mm)	07:15	07:15	07:15	07:15	
	Response (%)	0.03	0.03	0.03	0.03	
System Calibration Response for High Level Gas	Time (hh:mm)	07:20	07:20	07:20	07:20	
	Response (%)	84.97	84.97	84.97	84.97	
System Calibration Response for Low Level Gas	Time (hh:mm)	07:23	07:23	07:23	07:23	
	Response (%)	31.33	31.33	31.33	31.33	
System Calibration Response for Mid-Level Gas	Time (hh:mm)	07:25	07:25	07:25	07:25	
	Response (%)	52.31	52.31	52.31	52.31	
System Calibration Response for Zero Gas	Time (hh:mm)	09:56	11:01	12:32	1359	
	Response (%)	15.04	-0.30	0.18	-0.30	
System Calibration Response for Mid-Level Gas	Time (hh:mm)	10:04	11:03	12:35	1401	
	Response (%)	527.02	52.19	52.82	51.63	

QA/QC Check: Completeness [✓] Accuracy [✓] Specifications [✓]

Checked by: [signature]

011AS-QMS-TM-74

EPA M3A-O_2 Bias/Drift Sheet

Page ____ of _____

Company	LG Chemical	System Response Time (RT), secs	
Job ID:	PROJ-070363	Run 1 -	60
Location:	P004 Inlet Duct / Exhaust Stack	Run 2 -	60
Analyzer Mfg and ID:	Servomex / T-02L02H-002	Run 3 -	60
Analyzer Model/Serial No.:	1440 / 0144001-4926	Average	60
Technician:	CK		

	Actual/Target Value (%)	Pressure (psig)	Expiration (mm/dd/yy)	Cylinder ID
Zero-Level Gas Cylinder	0	500	3/12/2031	003394602
Mid-Level Gas Cylinder	21.89/10.93	1200	2/24/2034	EB0124182
High-Level Gas Cylinder	21.89	1200	2/24/2034	EB0124182
EPA Method 205 Cylinder				See 205 Sheet

	Run Number	1	2-1	2-2	3	
	Run Date	7-30-26	7-30-26	7-30-26	7-30-26	
	Analyzer Span (%)	21.89	21.89	21.89	21.89	
Analyzer Calibration Response for Zero Gas	Time (hh:mm)	08:00	08:00	08:00	08:00	
	Response (%)	0.11	0.11	0.11	0.11	
Analyzer Calibration Response for ~~High Level~~ Mid Gas CK 7-30-26	Time (hh:mm)	08:05	08:05	08:05	08:05	
	Response (%)	11.08	11.08	11.08	11.08	
Analyzer Calibration Response for ~~Mid-Level~~ High Gas CK 7-30-26	Time (hh:mm)	08:03	08:03	08:03	08:03	
	Response (%)	21.93	21.93	21.93	21.93	
Initial System Calibration Response for Zero Gas	Time (hh:mm)	08:08	09:46	11:19	12:07	
	Response (%)	0.13	0.16	0.17	0.12	
Initial System Calibration Response for Upscale Gas	Time (hh:mm)	08:10	0949	1121	12:11	
	Response (%)	10.94	10.93	10.81	10.88	
	Ambient Temp. (°F)					
Final System Calibration Response for Zero Gas	Time (hh:mm)	09:46	11:19	1207	13:45	
	Response (%)	0.16	0.17	0.12	0.15	
Final System Calibration Response for Upscale Gas	Time (hh:mm)	0949	1121	1211	13:48	
	Response (%)	10.93	10.81	10.88	10.85	
	Ambient Temp. (°F)					

QA/QC Check: Completeness [✓] Accuracy [✓] Specifications [✓]

Checked by: CK

011AS-QMS-TM-69

EPA M3A-CO_2 Bias/Drift Sheet

Page ____ of _____

Company	LG Chemical	System Response Time (RT), secs	
Job ID:	PROJ-070363	Run 1 -	60
Location:	P004 Inlet Duct / Exhaust Stack	Run 2 -	60
Analyzer Mfg and ID:	Servomex / T-02C02A-002	Run 3 -	60
Analyzer Model/Serial No.:	1440 / 0144001-426	Average	60
Technician:	CE		

	Actual/Target Value (%)	Pressure (psig)	Expiration (mm/dd/yy)	Cylinder ID
Zero-Level Gas Cylinder	0	500	3/12/2031	003394602
Mid-Level Gas Cylinder	21.65 / 10.93	1200	2/24/2034	EB0124192
High-Level Gas Cylinder	21.65	1200	2/24/2034	EB0124182
EPA Method 205 Cylinder				See 205 Sheet

	Run Number	1	2-1	2-2	3	
	Run Date	7-30-26	7-30-26	7-30-26	7-30-26	
	Analyzer Span (%)	21.65	21.65	21.65	21.65	
Analyzer Calibration Response for Zero Gas	Time (hh:mm)	08:00	08:00	08:00	08:00	
	Response (%)	0.13	0.13	0.13	0.13	
Analyzer Calibration Response for High Level Gas	Time (hh:mm)	08:03	08:03	08:03	08:03	
	Response (%)	21.63	21.63	21.63	21.63	
Analyzer Calibration Response for Mid-Level Gas	Time (hh:mm)	08:05	08:05	08:05	08:05	
	Response (%)	11.11	11.11	11.11	11.11	
Initial System Calibration Response for Zero Gas	Time (hh:mm)	08:08	09:46	11:19	12:07	
	Response (%)	0.16	0.15	0.14	0.13	
Initial System Calibration Response for Upscale Gas	Time (hh:mm)	08:10	09:49	11:21	12:11	
	Response (%)	10.91	10.92	10.52	10.94	
	Ambient Temp. (°F)					
Final System Calibration Response for Zero Gas	Time (hh:mm)	09:46	11:19	12:07	13:45	
	Response (%)	0.15	0.14	0.13	0.11	
Final System Calibration Response for Upscale Gas	Time (hh:mm)	09:49	11:21	12:11	13:48	
	Response (%)	10.92	10.52	10.94	10.74	
	Ambient Temp. (°F)					

QA/QC Check: Completeness [✓] Accuracy [✓] Specifications [✓]

Checked by: _____

001AS-QMS-TM-70

Onterris

EPA Method 205 Field Datasheet

Page _____ of _____

Project Information

Date 7/29/26 Project # PROJ-070363

Customer / Facility L4 Chemical

Unit ID / Sample Location P004 RTO Exhaust/Inlet

Operator

Notes:

Equipment Information

Calibration gas diluter ID/SN 5982 Calibration expiration date 8/4/26

Audited dilution device (DD) ☑ DD1 ☑ DD2 ☐ DD 3 ☐ DD 4 ☐ DD 5 ☐ DD 6 ☐ DD 7 ☐ DD 8

DDs used to generate cal gases ☑ DD1 ☑ DD2 ☐ DD 3 ☐ DD 4 ☐ DD 5 ☐ DD 6 ☐ DD 7 ☐ DD 8

Total flow rate, LPM 3 Analyzer ID/SN T-02C02A-001 Analyte O_2 Span value 21.89

Calibration Gas Information

	Tag Value	Units (ppm or %)	Cylinder ID	Pressure (PSI)	Expiration Date
Dilution Level 1 Cylinder	21.89	%	EB0124182	1200	2/24/2034
Dilution Level 2 Cylinder	21.89	%	EB0124182	1200	2/24/2034
Direct Inject Cylinder*	10.93	%	~~SX057327~~ * SX057327	1600	4/2/2034

Performance Data

	Predicted Diluted Value**	Units (ppm or %)	Analyzer Response						
			Time	Injection 1	Time	Injection 2	Time	Injection 3	Average
Dilution Level 1	10.93	%	16:06	10.92	16:12	10.90	16:18	10.89	10.90
Dilution Level 2	5.00	%	16:08	5.05	16:14	5.01	16:20	5.00	5.02
Direct Inject Gas	10.93	%	16:10	10.92	16:16	10.90	16:22	10.89	10.90

Calculations

DI	Injection 1	Injection 2	Injection 3
Dilution Level 1	0.15%	-0.03%	-0.12%
Dilution Level 2	0.59%	-0.20%	-0.40%
Direct Inject	0.15%	-0.03%	-0.12%

DL		
Dilution Level 1	Dilution Level 2	Direct Inject
0.24%	-0.40%	0.24%

DI - Difference of each injection from the average analyzer response

DI% = (I - R / I) * 100

DL - Difference from predicted for each dilution level

DL% = (P - R / P) * 100

I - Each individual injection

R - Average Response

P - Predicted diluted value

DI must be within 2% of the average instrument response for that dilution.

DL must be within 2% of predicted value.

* The Direct Inject Gas must be independent of the Dilution Level gases.

** One of the Dilution Levels must be within 10% of the Direct Inject gas tag value

All injection responses must be within 2% of the average instrument response for that dilution.

For each level of dilution the average concentration output from the analyzer must be within 2% of the predicted value.

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ * 8/21/26 per JH/CE

Checked by: Team Leader:

001AS-QMS-WB-EPA205

EPA Method 205 Field Datasheet

Project Information

Date 7/29/2026 Project # PROJ-070363

Customer / Facility LG Chemical America, Inc.

Unit ID / Sample Location P004 RTO

Operator CE

Notes:

Equipment Information

Calibration gas diluter ID/SN 5982 Calibration expiration date 8/4/2026

Audited dilution device (DD) ☑ DD1 ☑ DD2 ☐ DD 3 ☐ DD 4 ☐ DD 5 ☐ DD 6 ☐ DD 7 ☐ DD 8

DDs used to generate cal gases ☑ DD1 ☑ DD2 ☐ DD 3 ☐ DD 4 ☐ DD 5 ☐ DD 6 ☐ DD 7 ☐ DD 8

Total flow rate, LPM 3 Analyzer ID/SN T-O2CO2A-001 Analyte O2 Span value 21.89

Calibration Gas Information

	Tag Value	Units (ppm or %)	Cylinder ID	Pressure (PSI)	Expiration Date
Dilution Level 1 Cylinder	21.89	%	EB0124182	1200	2/24/2034
Dilution Level 2 Cylinder	21.89	%	EB0124182	1200	2/24/2034
Direct Inject Cylinder*	10.93	%	SX067327	1600	4/2/2034

Performance Data

	Predicted Diluted Value**	Units (ppm or %)	Analyzer Response						
			Time	Injection 1	Time	Injection 2	Time	Injection 3	Average
Dilution Level 1	10.93	%	16:06	10.92	16:12	10.90	16:18	10.89	10.90
Dilution Level 2	5.00	%	16:08	5.05	16:14	5.01	16:20	5.00	5.02
Direct Inject Gas	10.93	%	16:10	10.92	16:16	10.90	16:22	10.89	10.90

Calculations

DI	Injection 1	Injection 2	Injection 3
Dilution Level 1	0.15%	-0.03%	-0.12%
Dilution Level 2	0.59%	-0.20%	-0.40%
Direct Inject	0.15%	-0.03%	-0.12%

DL	Dilution Level 2	Direct Inject
0.24%	-0.40%	0.24%

DI - Difference of each injection from the average analyzer response

DI% = (I - R / I) * 100

DL - Difference from predicted for each dilution level

DL% = (P - R / P) * 100

I - Each individual injection

R - Average Response

P - Predicted diluted value

DI must be within 2% of the average instrument response for that dilution.

DL must be within 2% of predicted value.

* The Direct Inject Gas must be independent of the Dilution Level gases.

** One of the Dilution Levels must be within 10% of the Direct Inject gas tag value

All injection responses must be within 2% of the average instrument response for that dilution.

For each level of dilution the average concentration output from the analyzer must be within 2% of the predicted value.

QA/QC Check: Completeness ___ Legibility ___ Accuracy ___ Specifications ___

Checked by: _____ Team Leader: _____

001AS-QMS-WB-EPA205R1

Appendix A5 Example Calculations

EPA Method Method 4/25A Sampling Train
Nomenclature and Sample Calculations

Customer	LG Chemical America, Inc.	**Project Number**	PROJ-070363
Run Number	1		

Constants

CO_2F_{wt}= 44.0	in wg= 0.073529	NO_2F_{wt}= 46.01	$HClF_{wt}$= 36.46
O_2F_{wt}= 32.0	gr= 0.00014286	COF_{wt}= 28.01	SO_2F_{wt}= 64.06
CON_2F_{wt}= 28.0	MMBtu= 1000000 Btu	$H_2SO_4F_{wt}$= 98.08	Cl_2F_{wt}= 70.91
H_2OF_{wt}= 18.015	CF_{wt}= 12.011	T_{std}= 527.67	P_{std}= 29.92
ArF_{wt}= 39.95	PF_{wt}= 44.0962		

Stack Variables

pitot tube coefficient (dimensionless)	0.84	Cp
barometric pressure, inHg	28.70	Pbar
elevation difference between ground level and meter box, ft	4	Ebox
elevation difference between ground level and sampling ports, ft	7	Esam
gamma, dry gas meter calibration factor (dimensionless)	1.0108	g
net run time, minutes	60.0	q
total mass of liquid collected in impingers, g	22.9	Vlc
percent CO_2 by volume, dry basis, dimensionless, %	0.05	$\%CO_2$
percent O_2 by volume, dry basis, dimensionless, %	21.10	$\%O_2$
percent CO by volume, dry basis, dimensionless, %	0.00	%CO
percent N_2 by volume, dry basis, dimensionless, %	78.85	$\%N_2$
stack cross-sectional area, ft^2	3.1154	A
flue gas static pressure, inH_2O	10.88	Pg
average absolute flue gas temperature, 459.67°R+tsavg °F, R	550.36	Tsavg
average square root DP, inH_2O	0.40	SQDPavg
average pressure differential of orifice meter, in. wg	1.50	DH
dry gas meter temperature, 459.67°R+tsavg °F, R	540.56	Tm
volume of metered gas sample, dry actual cubic feet, ft^3	39.05	Vm
sampling nozzle diameter, in.	0.000	Dn

Calculated Stack Variables

Barometric pressure at sampling location
NOTE: Barometric pressure recorded at ground level

$$P_{sam} = P_{bar} - [(E_{sam} / 100 \text{ ft}) * 0.1 \text{ in. Hg}]$$

$$P_{sam} = 28.70 - ((7.0 / 100) * 0.1)$$

$$P_{sam} = 28.69 \text{ in. Hg}$$

Volume of dry gas sampled at standard conditions (dscf)

$$V_{mstd} = g * Vm * [P_{bar} - ([(E_{box} / 100 \text{ ft}) * 0.1 \text{ in. Hg}] + (DH / 13.6)) / P_{std}] * (T_{std} / T_m)$$

$$V_{mstd} = 1.0108 * 39.053 * ((28.70 - ((4.0 / 100) * 0.1) + (1.5000 / 13.6)) / 29.92) * (527.7 / 540.559)$$

$$V_{mstd} = 37.099 \text{ ft}^3$$

EPA Method Method 4/25A Sampling Train
Nomenclature and Sample Calculations

Volume of water vapor at standard conditions (68 °F, scf)

V_{wstd} = (0.04716 ft^3/g) * Vlc

V_{wstd} = (0.04716 * 22.9)

V_{wstd} = 1.1 ft^3

Percent moisture by volume as measured in flue gas

$\%H_2O$ (Measured) = 100 * [V_{wstd} / (V_{wstd} + V_{mstd})]

$\%H_2O$ (Measured) = 100 * (1.080 / (1.080 + 37.099))

$\%H_2O$ (Measured) = 2.83

$\%H_2O$ (Saturated) = (100 / P_{sam}) * 10 ^ (6.6911 - (3144 / (T_{savg} + 390.86 - 460)))

$\%H_2O$ (Saturated) = (100 / 29.492657) * 10 ^ (6.6911 - (3144 / (550.357500 + 390.86 - 460)))

$\%H_2O$ (Saturated) = 4.88

$\%H_2O$ = 2.83

Absolute flue gas pressure

P_s = P_{sam} + (Pg / 13.6)

P_s = 28.69 + (10.88 / 13.6)

P_s = 29.49 in. Hg

Dry mole fraction of flue gas (dimensionless)

M_{fd} = 1 - ($\%H_2O$ / 100)

M_{fd} = 1 - (2.83 / 100)

M_{fd} = 0.972

Dry molecular weight of flue gas (lb/lb-mole)

M_d = [($\%CO_2$ / 100) * 44.0] + [($\%O_2$ / 100) * 32.0] + [((100 - $\%CO_2$ - $\%O_2$) / 100) * 28.0]

M_d = ((0.05 / 100) * 44.0) + ((21.10 / 100) * 32.0) + (((100 - 0.05 - 21.10) / 100) * 28.0)

M_d = 28.85 lb/lb-mole

M_d = 28.85

Wet molecular weight of flue gas (lb/lb-mole)

M_s = M_d * M_{fd} + (H_2OF_{wt} * ($\%H_2O$ / 100))

M_s = 28.851 * 0.972 + 18.02 * (2.83 / 100)

M_s = 28.54 lb/lb-mole

EPA Method Method 4/25A Sampling Train
Nomenclature and Sample Calculations

Average flue gas velocity (ft/sec)

v_s = 85.49 * Cp * ($SQDP_{avg}$) * (T_{savg} / (P_s * M_s))$^{0.5}$

v_s = 85.49 * 0.84 * (0.3984) * (550.36 / (29.493 * 28.545)) ^ 0.5

v_s = 23.13 ft/sec

Wet volumetric flue gas flow rate at actual conditions (acfm)

Q_{aw} = v_s * A * 60 sec/min

Q_{aw} = 23.135 * 3.115 * 60

Q_{aw} = 4,324 ft^3/min

Wet volumetric flue gas flow rate at standard conditions (scfm)

Q_{sdw} = v_s * A * (T_{std} / T_{savg}) * (P_s / P_{std}) * 60 sec/min

Q_{sdw} = 23.135 * 3.115 * (527.7 / 550.358) * (29.493 / 29.92) * 60

Q_{sdw} = 4,087 ft^3/min

Dry volumetric flue gas flow rate at standard conditions (dscfm)

Q_{sd} = M_{fd} * v_s * A * (T_{std} / T_{savg}) * (P_s / P_{std}) * 60 sec/min

Q_{sd} = 0.972 * 23.1347 * 3.1154 * (527.7 / 550.358) * (29.493 / 29.92) * 60

Q_{sd} = 3,971 ft^3/min

Percent Excess Air

%EA = [$\%O_2$ - (0.5) * %CO] / [0.264 * (100 - $\%CO_2$ - $\%O_2$) - ($\%O_2$ - 0.5 * %CO)]

%EA = ((21.10 - (0.5) * 0.00) / (0.264 * (100 - 0.05 - 21.10) - (21.10 - 0.5 * 0.00))) * 100

%EA = -7329.14 %

EPA Method Method 4/25A Sampling Train
Nomenclature and Sample Calculations

Method 25A Calculations

TGO concentration (ppmvw as propane)

TGOppmvw = 465.26 ppmvw as propane

TGO mass emission rate (lb/hr as propane)

MERTGO = (60 min/hr * TGO ppmvw * PFwt * Qsdw) / (385.3 ft^3 * 10^6)

MERTGO = 13.0572 lb/hr (as propane)

Appendix B Facility Process Data

Start Time	End Time	Comments	Production, Kgs
08:38	09:38		8050
10:15	10:41	Power outage at RTO	6600
11:30	12:04		5930
12:40	13:40		6900
08:38	13:40	Overall production	32380

Test Run	Chamber A Temperature, ^{o}F	Chamber B Temperature, ^{o}F
Run 1	1595	1602
Run 2*	1595	1602
Run 3	1595	1603

* Recall that Run 2 was broken up over two periods due to a power outage at the plant.

Appendix C Quality Assurance / Quality Control

Appendix C1 Units and Abbreviations

Units of Measurement

Unit	Description
@ 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
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
% vd	percent by volume, dry basis
% vw	percent by volume, wet basis
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
Btu/ft^3	British thermal units per cubic foot
Btu/gal	British thermal units per gallon
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
dscf/MMBtu	dry standard cubic foot per million British thermal units
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
gal/hr	gallons per hour
gr	grains (7000 grains per pound)
gr/dscf	grains per dry standard cubic feet
GW	gigawatt
GWh	gigawatt-hour
hr	hour

Units of Measurement

Unit	Description
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 or L	liters
lb/hr	pounds per hour
lb/lb-mole	pounds per pound mole
lb/MMBtu	pounds per million Btu
lb/TBtu	pounds per trillion 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	million British thermal 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
MWh	megawatt-hour
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

Units of Measurement

Unit	Description
scf	standard cubic feet
scf/MMBtu	standard cubic foot per million British thermal units
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

Acronym	Description
ACE	analyzer calibration error
AAS	atomic absorption spectroscopy
ACDP	air contaminant discharge permit
AD	absolute difference
ADL	above detection limit
AETB	Air Emissions Testing Body
APCD	air pollution control device
APCS	air pollution control system
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
CARB	California Air Resources Board
CC	confidence coefficient
CD	calibration drift
CE	capture efficiency or collection efficiency
CEM	continuous emissions monitor
CEMS	continuous emissions monitoring system
CERMS	continuous emissions rate monitoring system
CET	calibration error test
CFB	circulating fluidized bed
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
CTS	calibration transfer standard
CVAAS	cold vapor atomic absorption spectroscopy
CVAFS	cold vapor atomic fluorescence spectrometry
De	equivalent diameter
DE	destruction efficiency
DGM	dry gas meter
Dioxins	polychlorinated dibenzo-p-dioxins (PCDDs)
DLL	detection level limited
DNCG	dilute non-condensable gas
EAF	electric arc furnace
ECD	electron capture detector
EGU	electric utility steam generating unit
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
ERT	Electronic Reporting Tool
EU	emission unit
FB	field blank
FCCU	fluid catalytic cracking unit
FGD	flue gas desulfurization
FI	flame ionization

Abbreviations

Acronym	Description
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
HI	heat input
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
ICR	information collection request
IR	infrared radiation
ISDL	in-stack detection limit
ISE	ion-specific electrode
ISO	International Standards Organization
kW	kilowatts
LEE	low emitting EGU
LFG	landfill gas
LHV	lower heating value
LPG	liquified petroleum gas
LRGC/LRMS	low-resolution gas chromatography/low-resolution mass spectroscopy
MACT	maximum achievable control technology
MATS	Mercury and Air Toxics Standard
MDI	methylene diphenyl diisocyanate
MDL	method detection limit
MNOC	maximum normal operating conditions
MRL	method reporting limit
MS	mass spectrometry
MSW	municipal solid waste
MWC	municipal waste combustor
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
NDO	natural draft opening
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
NMEOC	non-methane, non-ethane organic compounds
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

Abbreviations

Acronym	Description
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl compounds
PCWP	plywood and composite wood products
PE	Professional Engineer
PEMS	predictive emission monitoring system
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
PMS	parametric monitoring system
PPE	personal protective equipment
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 Test Individual
QSTO	Qualified Source Test Observer
RA	relative accuracy
RAA	relative accuracy audit
RACT	reasonably available control technology
RATA	relative accuracy test audit
RCA	response correlation audit
RB	reagent blank
RCTO	rotary concentrator thermal oxidizer
RE	removal or reduction efficiency
RICE	stationary reciprocating internal combustion engine
RM	reference method
RRA	relative response audit
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
SI ICE	spark ignition internal combustion engine
SLU	scattered light units
SNCR	selective noncatalytic reduction
SRM	standard reference material
SSI	sewage sludge incineration
STMS	sorbent trap monitoring system
TAP	toxic air pollutant
TBD	to be determined
TCA	thermal conductivity analyzer
TCD	thermal conductivity detector
TEF	toxic equivalency factor
TEQ	toxic equivalency quotient
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

Abbreviations

Acronym	Description
TSP	total suspended particulate matter
TTE	temporary total enclosure
ULSD	ultra-low sulfur diesel
US EPA	United States Environmental Protection Agency
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

Acronym	Description
Ag	silver
As	arsenic
Ba	barium
Be	beryllium
Br2	bromine
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
C_6H_{14}	hexane
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
HBr	hydrogen bromide
HCl	hydrogen chloride
HF	hydrogen fluoride
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
Se	selenium
SO_2	sulfur dioxide
SO_3	sulfur trioxide
SO_X	sulfur oxides
TCDD	tetrachlorodibenzodioxin
TCDF	tetrachlorodibenzofuran

Chemical Nomenclature

Acronym	Description
TGOC	total gaseous organic concentration
THC	total hydrocarbons
Tl	thallium
TRS	total reduced sulfur compounds
Zn	zinc

Appendix C2 Manual Test Method QA/QC Data

Sample Train Audit

Parameter/Units	Run 1	Run 2	Run 3
Post-Test Leak Rate Observed (cfm)	0.000	0.000	0.000
Applicable Method Allowable Leak Rate (cfm)	0.020	0.020	0.020
Acceptable (Yes/No)	YES	YES	YES
Volume of Dry Gas Collected (dscf)	37.099	37.440	36.598
Target Volume of Dry Gas Collected (dscf)	21.000	21.000	21.000
Acceptable (Yes/No)	YES	YES	YES

Sample Train Dry Gas Meter (DGM) Audit

Parameter/Units			
Pre-Test DGM Calibration Factor (Y)			1.0108
Average Post-Test DGM Calibration Check Value (Yqa)			1.035
Post-Test DGM Calibration Check Value Difference from Pre-Test Calibration Factor (%)			-2.389
Applicable Method Allowable Difference (%)			5.00

Sample Train Audit

Parameter/Units	Run 1	Run 2	Run 3
Post-Test Leak Rate Observed (cfm)	0.000	0.000	0.000
Applicable Method Allowable Leak Rate (cfm)	0.020	0.020	0.020
Acceptable (Yes/No)	YES	YES	YES
Volume of Dry Gas Collected (dscf)	35.836	37.447	35.960
Target Volume of Dry Gas Collected (dscf)	21.000	21.000	21.000
Acceptable (Yes/No)	YES	YES	YES

Sample Train Dry Gas Meter (DGM) Audit

Parameter/Units			
Pre-Test DGM Calibration Factor (Y)			0.9881
Average Post-Test DGM Calibration Check Value (Yqa)			1.007
Post-Test DGM Calibration Check Value Difference from Pre-Test Calibration Factor (%)			-1.879
Applicable Method Allowable Difference (%)			5.00

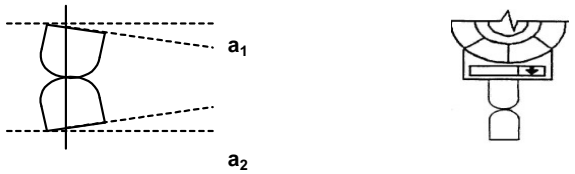
Onterris

Pitot/Probe Tube Inspection 2026

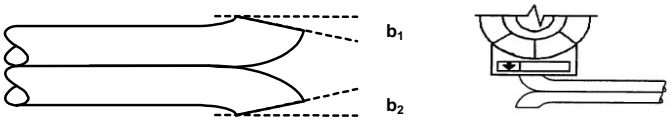
Protractor ID: C- DPR1-005
Caliper ID: C- CLP3-005

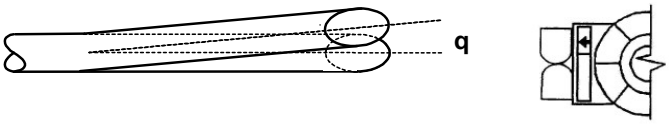
Inspected By: CE
Date: 7/28/2026

Alignment and Tubing Dimensions

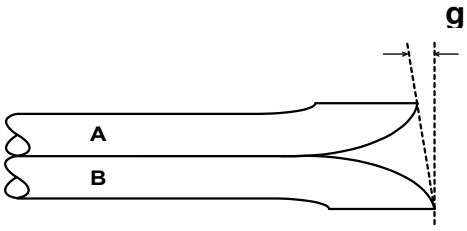


Degree indicating level position for determining a_1 and a_2.



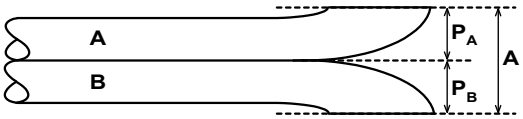


Degree indicating level position for determining q.

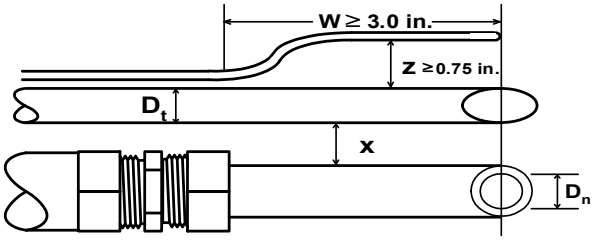


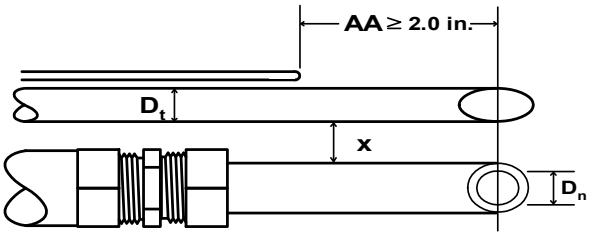
Degree indicating level position for determining g then calculating Z.

Probe / Pitot ID	T - PIT- -471
Modular Pitot ID	
M201A PM10 Assembly ID	NA
M201A PM2.5 Assembly ID	NA
Level and Perpendicular	Yes
No Obstructions	No Obstructions
No Damage	No Damage
a_1 ($-10° < a_1 < +10°$)	0.4
a_2 ($-10° < a_2 < +10°$)	0.7
b_1 ($-5° < b_1 < +5°$)	0.6
b_2 ($-5° < b_2 < +5°$)	0.1
g	1.8
q	0.0
A	0.9340
z= A tan g (± 0.125")	0.029
w= A tan q (± 0.03125")	0.000
D_t (0.1875" < D_t < 0.375")	0.3750
P_A ($1.05D_t < P_A < 1.5D_t$)	0.4670
P_B ($1.05D_t < P_B < 1.5D_t$)	0.4670
$P_A = P_B \pm 0.0625$	0.0000

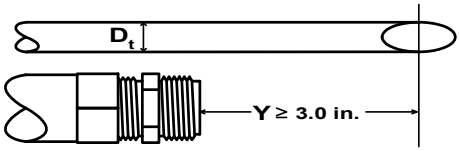


Assembly Inter-Component Spacing Requirements





Effective Length (in.)	42.00
W (³ 3.0")	5.000
-or- AA (³ 2.0")	
X	
D_n	
X / D_n (³ 1.5)	-
Y (³ 3.0")	
Z ³ 0.75"	0.750



Onterris

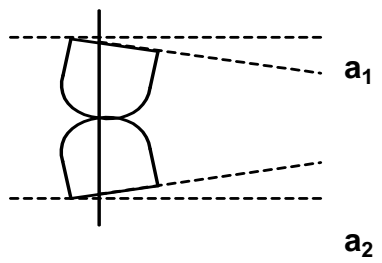
Pitot/Probe Tube Inspection

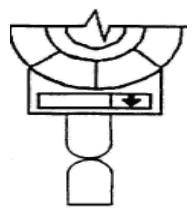
2026

Protractor ID: C- DPR1-005
Caliper ID: C- CLP3-005

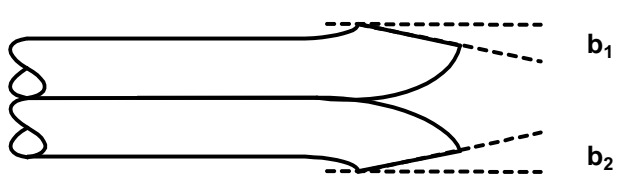
Inspected By: AG
Date: 7/24/2026

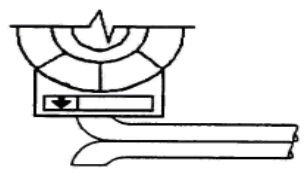
Alignment and Tubing Dimensions

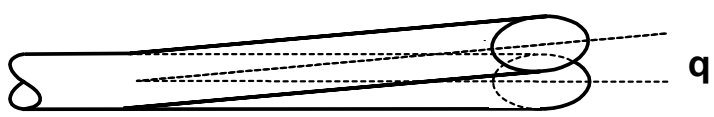


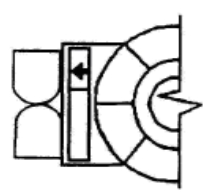


Degree indicating level position for determining a_1 and a_2.

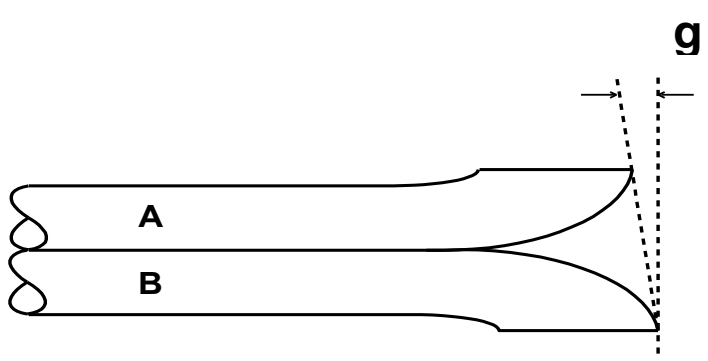








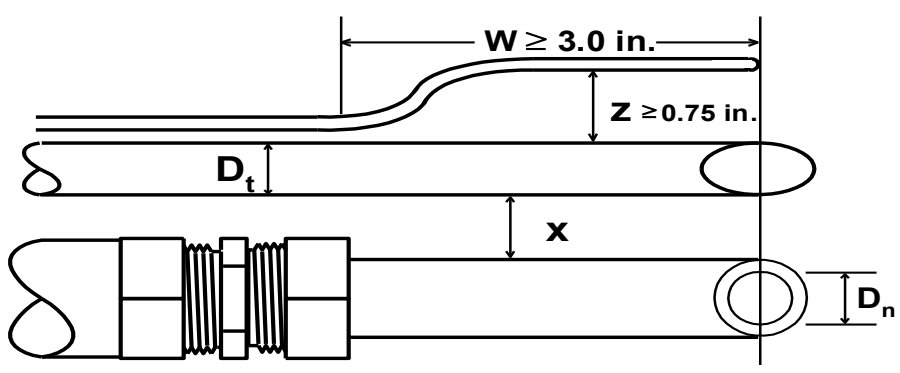
Degree indicating level position for determining q.

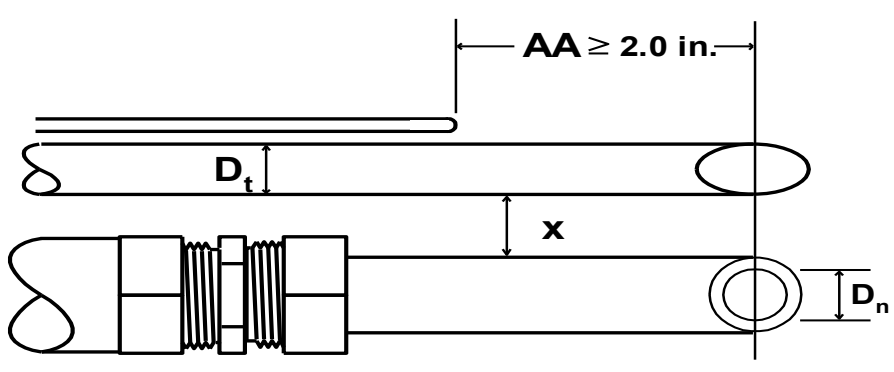


Degree indicating level position for determining g then calculating Z.

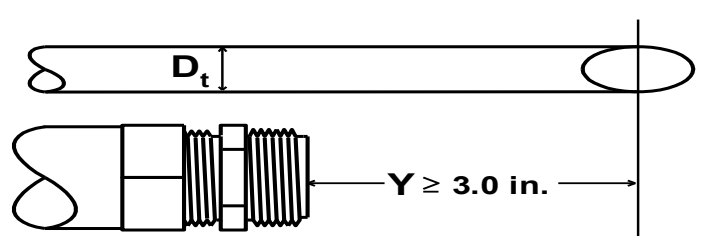
Probe / Pitot ID	T - PIT- -608
Modular Pitot ID	
M201A PM10 Assembly ID	NA
M201A PM2.5 Assembly ID	NA
Level and Perpendicular	Yes
No Obstructions	No Obstructions
No Damage	No Damage
a_1 ($-10° < a_1 < +10°$)	0.3
a_2 ($-10° < a_2 < +10°$)	0.6
b_1 ($-5° < b_1 < +5°$)	0.2
b_2 ($-5° < b_2 < +5°$)	1.0
g	0.7
q	0.0
A	0.9080
z= A tan g (± 0.125")	0.011
w= A tan q (± 0.03125")	0.000
D_t (0.1875" < D_t < 0.375")	0.3750
P_A ($1.05D_t < P_A < 1.5D_t$)	0.4540
P_B ($1.05D_t < P_B < 1.5D_t$)	0.4540
$P_A = P_B \pm 0.0625$	0.0000

Assembly Inter-Component Spacing Requirements





Effective Length (in.)	71.50
W (³ 3.0")	
-or- AA (³ 2.0")	2.500
X	
D_n	
X / D_n (³ 1.5)	-
Y (³ 3.0")	
Z ³ 0.75"	



Onterris Air Quality Services, LLC
Brecksville, Ohio

M:\Production\DistrictOffice\011 Cleveland\Equipment\Test Equipment\Calibrations\Pitot and Probes\Inspections\6 Foot\T-PIT-608\excel files 2026\
26-0724-Type S Pitot Tube Inspection

NE011AS-070363-RT-2828

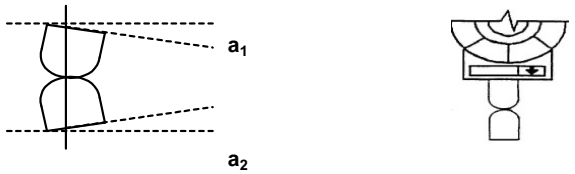
Onterris

Pitot/Probe Tube Inspection 2026

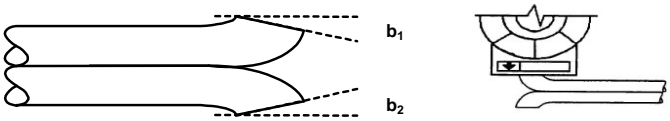
Protractor ID: C- DPR1-005
Caliper ID: C- CLP3-005

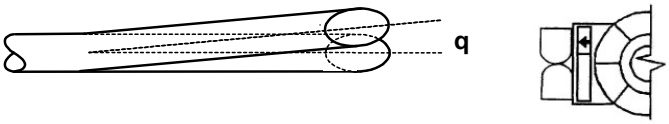
Inspected By: CE
Date: 8/4/2026

Alignment and Tubing Dimensions

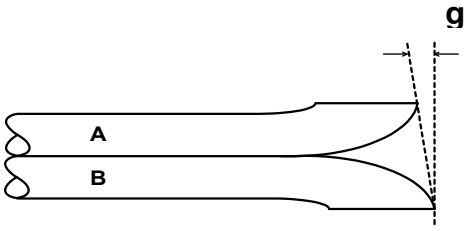


Degree indicating level position for determining a_1 and a_2.



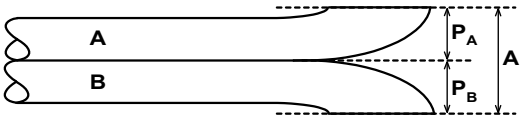


Degree indicating level position for determining q.

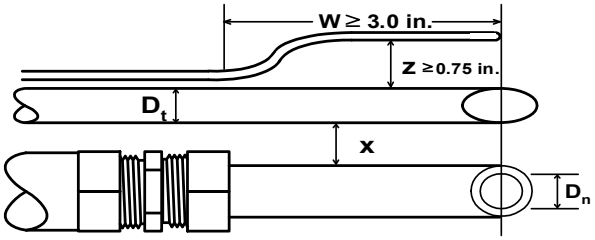


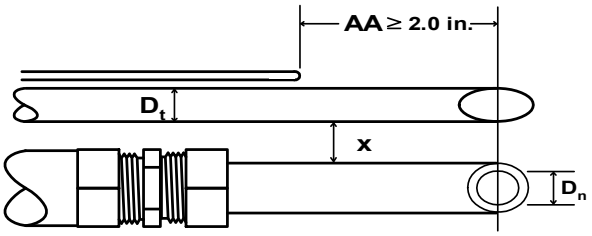
Degree indicating level position for determining g then calculating Z.

Probe / Pitot ID	T - PIT- -471
Modular Pitot ID	
M201A PM10 Assembly ID	NA
M201A PM2.5 Assembly ID	NA
Level and Perpendicular	Yes
No Obstructions	No Obstructions
No Damage	No Damage
a_1 ($-10° < a_1 < +10°$)	0.3
a_2 ($-10° < a_2 < +10°$)	0.8
b_1 ($-5° < b_1 < +5°$)	0.7
b_2 ($-5° < b_2 < +5°$)	1.5
g	1.5
q	0.0
A	0.9320
z= A tan g (± 0.125")	0.024
w= A tan q (± 0.03125")	0.000
D_t (0.1875" < D_t < 0.375")	0.3750
P_A ($1.05D_t < P_A < 1.5D_t$)	0.4660
P_B ($1.05D_t < P_B < 1.5D_t$)	0.4660
$P_A = P_B \pm 0.0625$	0.0000

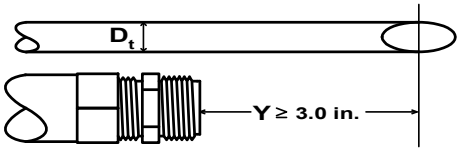


Assembly Inter-Component Spacing Requirements





Effective Length (in.)	42.00
W (³ 3.0")	5.000
-or- AA (³ 2.0")	
X	
D_n	
X / D_n (³ 1.5)	-
Y (³ 3.0")	
Z ³ 0.75"	0.800



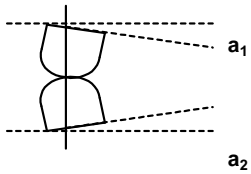
Onterris

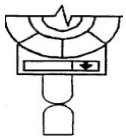
Pitot/Probe Tube Inspection 2026

Protractor ID: C- DPR1-005
Caliper ID: C- CLP3-005

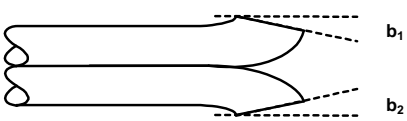
Inspected By: CE
Date: 8/4/2026

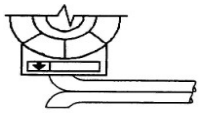
Alignment and Tubing Dimensions

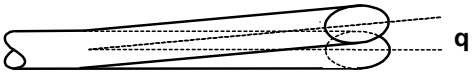


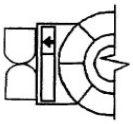


Degree indicating level position for determining a_1 and a_2.

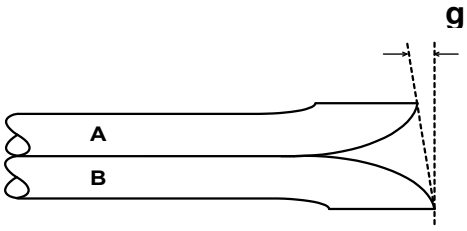






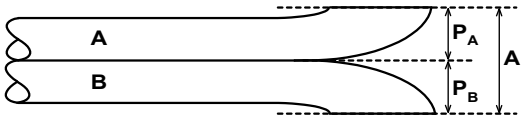


Degree indicating level position for determining q.

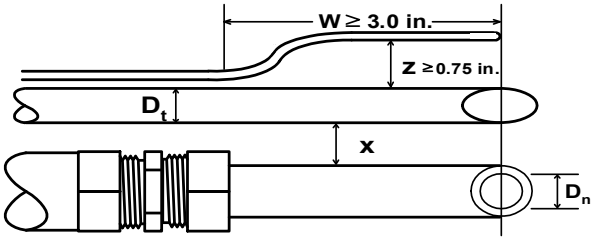


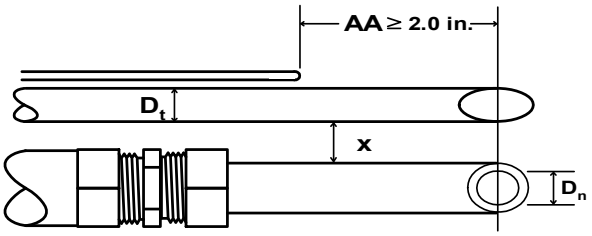
Degree indicating level position for determining g then calculating Z.

Probe / Pitot ID	T - PIT- -608
Modular Pitot ID	
M201A PM10 Assembly ID	NA
M201A PM2.5 Assembly ID	NA
Level and Perpendicular	Yes
No Obstructions	No Obstructions
No Damage	No Damage
a_1 ($-10° < a_1 < +10°$)	0.9
a_2 ($-10° < a_2 < +10°$)	0.5
b_1 ($-5° < b_1 < +5°$)	0.8
b_2 ($-5° < b_2 < +5°$)	0.1
g	1.3
q	0.0
A	0.9090
z= A tan g (± 0.125")	0.021
w= A tan q (± 0.03125")	0.000
D_t (0.1875" < D_t < 0.375")	0.3750
P_A ($1.05D_t < P_A < 1.5D_t$)	0.4550
P_B ($1.05D_t < P_B < 1.5D_t$)	0.4540
$P_A = P_B \pm 0.0625$	0.0010

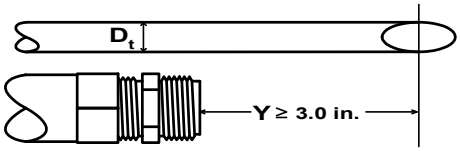


Assembly Inter-Component Spacing Requirements





Effective Length (in.)	71.40
W (³ 3.0")	
-or- AA (³ 2.0")	2.800
X	
D_n	
X / D_n (³ 1.5)	-
Y (³ 3.0")	
Z ³ 0.75"	



Pre-Test Orifice Meter Field Audit

Page ____ of _____

Company :	LG Chemical		
Job ID:	PROJ-070363	Sample Train:	Inlet
Technician:	AG	Date:	7/29/26

[✓] Assemble the meter box (MTB), level, and zero the manometer.

[✓] Warm up the MTB-Dry Gas Meter (DGM) at DH@ for at least **10 minutes**.

[✓] Verify Meter box exhaust fan is running

[✓] Verify flow through the Method 3 flowmeter.

Meter Box ID:	**T-MTB-** 010
Pump ID:	**T-PMP-** 013
Calibration Date:	6/25/26
Calibration Expiration Date:	8/24/26
Gamma (g):	1.0108
DH@:	1.9205
Barometer ID:	**C-BAR-** 001
Barometric Pressure (mmHg):	727

Time (min)	Meter Volume (ft^3)
0	687.263
10	694.769

Time (min)	Meter In (°F)	Meter Out (°F)
2	—	76
4	—	77
6	—	77
8	—	77
10	—	77
Avg.	—	77

7.506

[✓] Calculate the DGM (g_c)

[✓] Determine if $g_c = g \pm 3\%$.

[✓] Pass

QA/QC Check: Completeness [✓] Accuracy [✓] Specifications [✓] Checked by: JJ

Onterris Air Quality Services, LLC

https://onterris-my.sharepoint.com/personal/jhicks_montrose-env_com/Documents/Desktop/Project Management/Onterris Data Sheets/

011AS-Manual Methods-Effective-04.22.26-JH -Field DGM Audit

Pre-Test In-Field Meter Orifice Check

Meter Box ID	T-MTB-010
Calibration Date	6/25/2026
Gamma (Y) =	1.0108
ΔH@ =	1.981
Barometric Pressure, $Pbar_{mmHg}$ (mmHg)	727
Barometric Pressure, $Pbar_{inHg}$ (inHg)	28.62

Time (min)	Meter Volume (ft^3)
0	687.263
10	694.769
Net Volume, Vm (ft^3)	7.506

Time (min)	Meter In (°F)	Meter Out (°F)
2	-	76
4	-	77
6	-	77
8	-	77
10	-	77
	Average, Tm (°F)	77

Dry Gas Meter Calibration (γ_c) Calculation

$$Yc = (10 / Vm) * [0.0319 * ((Tm + 460) / Pbar_{inHg})]^{1/2}$$

$$0.97 \times Y < Yc < 1.03 \times Y$$

0.9805 < 1.0305 < 1.0411 **PASS**

Pre-Test Orifice Meter Field Audit

Page ____ of _____

Company :	LG Chemical		
Job ID:	PROJ-070363	Sample Train:	Exhaust
Technician:	AG	Date:	7/29/26

[✓] Assemble the meter box (MTB), level, and zero the manometer.

[✓] Warm up the MTB-Dry Gas Meter (DGM) at DH@ for at least **10 minutes**.

[✓] Verify Meter box exhaust fan is running

[✓] Verify flow through the Method 3 flowmeter.

Meter Box ID:	**T-MTB-** 012
Pump ID:	**T-PMP-** 022
Calibration Date:	6/25/26
Calibration Expiration Date:	8/24/26
Gamma (g):	0.9881
DH@:	2.1039
Barometer ID:	**C-BAR-** 001
Barometric Pressure (mmHg):	727

Time (min)	Meter Volume (ft^3)
0	920.047
10	927.776

Time (min)	Meter In (°F)	Meter Out (°F)
2	—	75
4	—	75
6	—	75
8	—	75
10	—	75
Avg.	—	75

7.729

[✓] Calculate the DGM (g_c)

[✓] Determine if g_c = g ±3%.

[✓] Pass

QA/QC Check: Completeness [✓] Accuracy [✓] Specifications [✓] Checked by: [signature]

Onterris Air Quality Services, LLC

https://onterris-my.sharepoint.com/personal/jhicks_montrose-env_com/Documents/Desktop/Project Management/Onterris Data Sheets/

011AS-Manual Methods-Effective-04.22.26-JH -Field DGM Audit

Pre-Test In-Field Meter Orifice Check

Meter Box ID	T-MTB-012
Calibration Date	6/15/2026
Gamma (Y) =	0.9881
ΔH@ =	2.104
Barometric Pressure, $Pbar_{mmHg}$ (mmHg)	727
Barometric Pressure, $Pbar_{inHg}$ (inHg)	28.62

Time (min)	Meter Volume (ft^3)
0	920.047
10	927.776
Net Volume, Vm (ft^3)	7.729

Time (min)	Meter In (°F)	Meter Out (°F)
2	-	75
4	-	75
6	-	75
8	-	75
10	-	75
	Average, Tm (°F)	75

Dry Gas Meter Calibration (γ_c) Calculation

$$Yc = (10 / Vm) * [0.0319 * ((Tm + 460) / Pbar_{inHg})]^{1/2}$$

$$0.97 \times Y < Yc < 1.03 \times Y$$

0.9585 < 0.9991 < 1.0177 **PASS**

Onterris

2026

60-Day Meter Box Calibration

Meter Box ID: T-MTB-010 | Y: 1.0108 | PASS | Calibrated by: CE
Pump ID: T-PMP-015 | ΔH@: 1.9805 | Calibration Date (m/d/yyyy): 6/25/2026

Meter Box (T-MTB-010) Trendicator Audit

Tolerance, °F: ± 2
Reference Thermometer (THR) ID: RF-THR-001

Trendicator	Probe	Stack	Filter	Exit	Auxiliary
0 °F	48	48	48	48	48
100 °F	98	98	98	98	98
200 °F	198	198	198	199	199
300 °F	300	300	300	298	299
400 °F	400	400	398	--	400
600 °F	--	600	--	--	--
800 °F	--	800	--	--	--
1,000 °F	--	1,002	--	--	--
1,500 °F	--	1,499	--	--	--

Meter Box (T-MTB-010) Leak Check

	Leak Check	Leak Rate	Pass/Fail
Manometer (ΔH) Leak Check, in-H_2O:	@ 5" - 7" (1-min)	0	Pass
Manometer DGM Leak Check:	@ 15" Vacuum (1-min)	0	Pass

Meter Box (T-MTB-010) Dry Gas Meter (DGM) Audit

Reference (Standard) DGM ID: RF-DGM-007
Reference DGM Temp. Sensor ID: RF-DGM-007 | Reference DGM Calibration Date: 2/19/2026
Reference DGM S/N: A2209642 | Reference DGM Calibration Expiration Date: 2/19/2027

Reference DGM Gamma, Yc: 1.000
Reference Barometer ID: RF-DPG-001

		Time min	RF-DGM-007 scf	T-MTB-010 scf	Time min	RF-DGM-007 Meter-In, °F	RF-DGM-007 Meter-Out, °F	T-MTB-010 Meter-In, °F	T-MTB-010 Meter-Out, °F
ΔH, in.-H_2O	1	0	0.000	227.681	4	73 °F	74 °F	-	74 °F
MTB Vacuum, in-Hg	5	12	6.544	234.189	8	73 °F	74 °F	-	74 °F
Pbar, mm-Hg	732				12	73 °F	74 °F	-	74 °F
		Net Volume (>5	6.544	6.508	Average	74		74	
ΔH, in.-H_2O	2	0	0.000	234.189	4	74 °F	75 °F	-	75 °F
MTB Vacuum, in-Hg	5	12	9.191	243.284	8	74 °F	75 °F	-	75 °F
Pbar, mm-Hg	732				12	74 °F	75 °F	-	76 °F
		Net Volume (>5	9.191	9.095	Average	75		75	
ΔH, in.-H_2O	3	0	0.000	243.284	4	74 °F	75 °F	-	77 °F
MTB Vacuum, in-Hg	5	12	11.437	254.456	8	74 °F	75 °F	-	77 °F
Pbar, mm-Hg	732				12	74 °F	75 °F	-	78 °F
		Net Volume (>5	11.437	11.172	Average	75		77	

Meter Box (T-MTB-010) Dry Gas Meter (DGM) Console Calibration

Calculations and QA

ΔH, in-H20	1	2	3	Average
Yc	1.000	1.000	1.000	
Pbar, mm-Hg	732	732	732	
Pbar, in-Hg	28.82	28.82	28.82	
DGM, scf	6.508	9.095	11.172	
DGM, °F	74	75	77	
DGM, °R	534	535	537	
RF-DGM, scf	6.544	9.191	11.437	
RF-DGM, °F	74	75	75	
RF-DGM, °R	534	535	535	
Time, min	12	12	12	
Y-DGM	1.0039	1.0070	1.0213	1.0108
Tolerance, ±0.02	-0.00684	-0.00374	0.01057	
Pass/Fail	Pass	Pass	Pass	PASS
ΔH@	1.9839	2.0139	1.9437	1.9805
Tolerance, ±0.2	0.00339	0.03340	-0.03679	
Pass/Fail	Pass	Pass	Pass	Pass

Onterris

2026

60-Day Meter Box Calibration

Meter Box ID: T-MTB-012 Y: 0.9881 PASS Calibrated by: CE
Pump ID: T-PMP-015 ΔH@: 2.1039 Calibration Date (m/d/yyyy): 6/25/2026

Meter Box (T-MTB-012) Trendicator Audit

Tolerance, °F: ± 2
Reference Thermometer (THR) ID: RF-THR-001

Trendicator	Probe	Stack	Filter	Exit	Auxiliary
0 °F	48	48	48	48	48
100 °F	98	98	98	98	98
200 °F	198	198	198	199	199
300 °F	300	300	300	298	299
400 °F	400	400	398	--	400
600 °F	--	600	--	--	--
800 °F	--	800	--	--	--
1,000 °F	--	1,002	--	--	--
1,500 °F	--	1,499	--	--	--

Meter Box (T-MTB-012) Leak Check

	Leak Check	Leak Rate	Pass/Fail
Manometer (ΔH) Leak Check, in-H_2O:	@ 5" - 7" (1-min)	0	Pass
Manometer DGM Leak Check:	@ 15" Vacuum (1-min)	0	Pass

Meter Box (T-MTB-012) Dry Gas Meter (DGM) Audit

Reference (Standard) DGM ID: RF-DGM-007
Reference DGM Temp. Sensor ID: RF-DGM-007 Reference DGM Calibration Date: 2/19/2026
Reference DGM S/N: A2209642 Reference DGM Calibration Expiration Date: 2/19/2027

Reference DGM Gamma, Yc: 1.000
Reference Barometer ID: RF-DPG-001

		Time min	RF-DGM-007 scf	T-MTB-012 scf	Time min	RF-DGM-007 Meter-In, °F	RF-DGM-007 Meter-Out, °F	T-MTB-012 Meter-In, °F	T-MTB-012 Meter-Out, °F
ΔH, in.-H_2O	1	0	0.000	64.670	4	70 °F	70 °F	-	72 °F
MTB Vacuum, in-Hg	5	12	6.362	71.089	8	71 °F	70 °F	-	72 °F
Pbar, mm-Hg	732				12	71 °F	70 °F	-	73 °F
		Net Volume (>5	6.362	6.419	Average	70		72	
ΔH, in.-H_2O	2	0	6.362	71.089	4	71 °F	71 °F	-	74 °F
MTB Vacuum, in-Hg	5	12	15.240	80.093	8	72 °F	71 °F	-	74 °F
Pbar, mm-Hg	732				12	72 °F	71 °F	-	75 °F
		Net Volume (>5	8.879	9.004	Average	71		74	
ΔH, in.-H_2O	3	0	15.240	80.093	4	72 °F	71 °F	-	76 °F
MTB Vacuum, in-Hg	5	12	26.208	91.237	8	72 °F	71 °F	-	76 °F
Pbar, mm-Hg	732				12	72 °F	71 °F	-	77 °F
		Net Volume (>5	10.967	11.144	Average	72		76	

Meter Box (T-MTB-012) Dry Gas Meter (DGM) Console Calibration

Calculations and QA

ΔH, in-H20	1	2	3	Average
Yc	1.000	1.000	1.000	
Pbar, mm-Hg	732	732	732	
Pbar, in-Hg	28.82	28.82	28.82	
DGM, scf	6.419	9.004	11.144	
DGM, °F	72	74	76	
DGM, °R	532	534	536	
RF-DGM, scf	6.362	8.879	10.967	
RF-DGM, °F	70	71	72	
RF-DGM, °R	530	531	532	
Time, min	12	12	12	
Y-DGM	0.9923	0.9866	0.9855	0.9881
Tolerance, ±0.02	0.00412	-0.00153	-0.00259	
Pass/Fail	Pass	Pass	Pass	PASS
ΔH@	2.0810	2.1367	2.0940	2.1039
Tolerance, ±0.2	-0.02291	0.03279	-0.00988	
Pass/Fail	Pass	Pass	Pass	Pass

Onterris

Post-Test Meter Box Audit 2026

Job ID: PROJ-070363

Meter Box:	T-MTB-010	MTB-Y: 1.0108	Yqa: 1.0340	Audited by:	CE
Pump:	T-PMP-013			Audit Date (m/d/yyyy):	8/4/2026

Meter Box (T-MTB-010) Post-Test Leak Check (ALT-009) Criteria

		Allowable
Post-Test/Pre-Test Calibration Factor Difference (%)	-2.3 %	±5 %
Manometer (ΔH) Leak Check, 5 - 7 in-H2O @ (1-min):	0	Pass

Meter Box (T-MTB-010) Thermocouple Audit

Reference Thermometer ID: T-THR-001

Umbilical	T-M2U-	205				
Umbilical	T-UMC-	106				
	Thermocouple ID		TC °F	T-REF °F	ΔT (±2)	Pass/Fail
Stack (Ts)	T-PIT-	471	71 °F	72 °F	-1 °F	Pass
	T-UMA-	60	73 °F	72 °F	1 °F	Pass

Onterris Air Quality Services, Inc.
Brecksville, Ohio
M:\Production\DistrictOffice\011 Cleveland\Equipment\Test Equipment\Calibrations\Meterbox\2-Post Cal\T-MTB-010\2026\
26-0804 MTB-010 070363-DGMPost

Onterris

Post-Test Meter Box Audit 2026

Job ID: PROJ-070363

Meter Box:	T-MTB-010	MTB-Y: 0.9881	Yqa: 1.0070	Audited by:	CE
Pump:	T-PMP-013			Audit Date (m/d/yyyy):	8/4/2026

Meter Box (T-MTB-010) Post-Test Leak Check (ALT-009) Criteria

		Allowable
Post-Test/Pre-Test Calibration Factor Difference (%)	-1.9 %	±5 %
Manometer (ΔH) Leak Check, 5 - 7 in-H2O @ (1-min):	0	Pass

Meter Box (T-MTB-010) Thermocouple Audit

Reference Thermometer ID: T-THR-001

Umbilical	T-M2U-	404				
Umbilical	T-UMC-	605				
	Thermocouple ID		TC °F	T-REF °F	ΔT (±2)	Pass/Fail
Stack (Ts)	T-PIT-	608	72 °F	71 °F	1 °F	Pass
	T-UMA-	30	70 °F	71 °F	-1 °F	Pass

Onterris Air Quality Services, Inc.
Brecksville, Ohio
M:\Production\DistrictOffice\011 Cleveland\Equipment\Test Equipment\Calibrations\Meterbox\2-Post Cal\T-MTB-012\Excel-2026\
26-0804 MTB-012 070363-DGMPost

Onterris

Calibration Kit Audit

2026

PROJ- 070363
Calibration Kit ID: C-CKT-001

Calibrated By: JB
Date (m/d/yyyy): 8/20/2026

Hygrometer (HGR)

Hygrometer ID: RF-HGR-007

Temperature (°F):	72
Relative Humidity (%):	64

Caliper (CLP)

Tolerance, in.: ±0.001
Reference BLK ID: RF-BLK-001

CLP ID: C-CLP-001

Reference	As Found	Pass/Fail
0.500-in.		
0.500-in.		
1.000-in.		

Digital Protractor (DPR)

Tolerance, ° : ±1
Reference BLK ID: RF-DPR-001
CLP ID: C-CLP-064

DPR1 ID: C-DPR1-001

Reference	As Found	Pass/Fail	Adjusted (Y/N)	As Left
5.0°	**4.5°**	Pass	**No**	**Same**
10.0°	**9.5°**	Pass	**No**	**Same**
20.0°	**19.5°**	Pass	**No**	**Same**

DPR2 ID: C-DPR2-001

Reference	As Found	Pass/Fail	Adjusted (Y/N)	As Left
5.0°	**4.1°**	Pass	**No**	**Same**
10.0°	**9.1°**	Pass	**No**	**Same**
20.0°	**19.2°**	Pass	**No**	**Same**

Digital Thermometer (THR)

Tolerance, °F: 50-100 ± 2
200-300 ± 5
400-1,500 ± 8
Reference THR ID: RF-THC-009

THR ID: C-THR-001

Reference	As Found	Pass Fail	Adjusted (Y/N)	As Left
50°F			**No**	**Same**
100°F			**No**	**Same**
200°F			**No**	**Same**
300°F			**No**	**Same**
400°F			**No**	**Same**
600°F			**No**	**Same**
800°F			**No**	**Same**
1,000°F			**No**	**Same**
1,500°F			**No**	**Same**

Digital Barometer (DPG)

Tolerance, mmHg : ±2
Reference BLK ID: RF-DPG-001

DPG ID: C-BAR-001

	Reference	As Found	Pass Fail	Adjusted (Y/N)	As Left
Pbar, mmHg	**732**	**731.0**	Pass	**No**	**Same**

RICE LAKE Certificate of Weight Calibration

ISO/IEC 17025:2017 & ANSI/NCSL-Z540-1-1994 ACCREDITED

Traceable Certificate Number: 4006301
Contractor: MONTROSE AIR QUALITY SERVICES LLC
10060 BRECKSVILLE RD
BRECKSVILLE, OH 44141
Purchase Order Number: PO-097452
Client: MONTROSE AIR QUALITY SERVICES LLC
10060 BRECKSVILLE RD
BRECKSVILLE, OH 44141
Date Received: 29 Jan 2026
Date Calibrated: 02 Feb 2026 to 03 Feb 2026
Recalibration Date: 02 Feb 2027
NIST Certificate Number: 684/O-0000046697
If there are two NIST numbers, one or both may apply
Calibrated By: 17
Procedure: WI05-0095 Rev. F
Condition of Weights: Acceptable for Calibration
Description of Weights: 500 g Polished Weight, ASTM Class 1, S/N 6006, ID# C-W500-001
Comments:

Traceable to the SI through the National Institute of Standards and Technology
TMAP
RICE LAKE WEIGHING SYSTEMS

Key Notes

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

Cleaning Levels

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

Material Abbreviations

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

Check with your local state agency for certification of compliance on Legal-for-Trade items. The weight accuracy class is referenced in the Description of Weights. Unless otherwise noted, the weights calibrated meet the requirements of the accuracy class. Results relate only to weights calibrated. The Surface Finishes of weights are evaluated visually. Weights are screened for magnetism using work instruction WI05-0035 when they are new, when requested by the customer or when weights are suspected of not meeting specifications. Density if measured is measured using OIML R111-1 (2004) method A2. Conventional Mass is reported based on a reference density of 8.0 g/cm^3. The Uncertainty of Measurement is included in the determination of Maximum Permissible Error (MPE) Pass/Fail Criteria. The specifications for Maximum Permissible Error (MPE) can be found in NIST Handbook 105-1 (2019), NIST Handbook 105-1 (1990), ASTM E617-23 or OIML R111-1 (2004), manufacturer specifications or customer specifications.

The Uncertainty assigned to the Conventional Mass values are the result of the root-sum-square of the type A and type B components, calculated in accordance with NIST SOP 29 and the Guide to the expression of uncertainty in measurement, with coverage factor (k=2), to express the expanded uncertainty with an approximate 95.45% confidence level. This report is not to be used to claim product certification, approval, or endorsement by NVLAP, NIST, A2LA, or any government agency. **This document and all data within, shall not be reproduced, except in full, without the written approval of Rice Lake Weighing Systems.**

Dan Demers, Metrologist

NVLAP® CALIBRATION
NVLAP LAB CODE 105001-0

ilac-MRA

Prepared By:
Rice Lake Weighing Systems®●PN 64784●6/25
230 West Coleman Street●Rice Lake, WI 54868●USA
TEL: 715-234-9171●FAX: 715-234-6967
Definitions: http://certs.ricelake.com/certs/0354_Term_Cert_Weight_Cal_Rev1.pdf

03 Feb 2026
Issued Date:

ilac-MRA
A2LA ACCREDITED
Certificate #4363.01

RICE LAKE Certificate of Weight Calibration

ISO/IEC 17025:2017 & ANSI/NCSL-Z540-1-1994 ACCREDITED

Traceable Certificate Number: 4006301
Client: MONTROSE AIR QUALITY SERVICES
Date Calibrated: 02 Feb 2026 to 03 Feb 2026

Temperature Range: 22.13 °C to 22.20 °C
Pressure Range: 733.44 mmHg to 738.69 mmHg
Relative Humidity Range: 53 % to 55 %

As Left Data (As Found Data is undifferentiated from As Left Data unless listed in As Found Data table)

Nominal Value	Unique ID	True Mass (Same UOM as Nom.)	True Mass Corr. (mg)	Conv. Mass (Same UOM as Nom.)	Conv. Mass Corr. (mg)	(*k*=2) Unc. (± mg)	MPE (± mg)	MPE Pass (Y=Pass N=Fail)	Assumed Density (g/cm^3)	Assumed Material	Const. Type	Balance Used	Reference Standard Set Used	Air Density (mg/cm^3)	Clean Level
500 g	**6006**	500.001254	1.254	**500.000783**	**0.783**	0.073	1.2	Y	7.95	SS	II	699Q	L595Q	1.1561	A

As Found Data

Nominal Value	Unique ID	True Mass (Same UOM as Nom.)	True Mass Corr. (mg)	Conv. Mass (Same UOM as Nom.)	Conv. Mass Corr. (mg)	(*k*=2) Unc. (± mg)	MPE (± mg)	MPE Pass (Y=Pass N=Fail)	Assumed Density (g/cm^3)	Assumed Material	Const. Type	Balance Used	Reference Standard Set Used	Air Density (mg/cm^3)	Clean Level
500 g	**6006**	499.999222	-0.778	**499.998750**	**-1.250**	0.073	1.2	N ☒	7.95	SS	II	699Q	L595Q	1.1472	A

Tektronix®

Certificate of Calibration
C006653855

Instrument Identification

Company ID: ACC-1803795

Onterris Inc

10060 Brecksville Rd
Brecksville, Ohio 44141-3293 United States

PO Number: PO - ONTPO00006246

Manufacturer: MITUTOYO

Customer ID: RF-DPR-001

Tek ID: UID5137558

Description: PROTRACTOR; DIGITAL

Model Number: PRO360

Serial Number: 12111032

Certificate Information

Reason for Service: Calibration

Type of Cal: Z540.1 w/data

As Found Condition: In Tolerance

As Left Condition: In Tolerance

Procedure: CSWW-CP-DIGITAL PROTRACTOR Revision 6

Remarks: Complete

Technician: Tumminaro, Peter

Cal Date: 18-Aug-2026

Cal Due Date: 18-Aug-2027

Interval: 1 Years

Temperature: 20.63 C

Humidity: 51.46 %

Tektronix certifies the performance of the above instrument has been verified using test equipment of known accuracy, which is traceable to the International System of Units (SI) through a National Metrology Institute such as NIST, NPL, PTB, or derived from ratio type measurements, compared to reference materials or recognized consensus standards. The methods and procedures used comply with ANSI/NCSL Z540.1-1994.
The quality system complies with ISO9001.

This certificate and associated attachments relate only to the items calibrated. No representation is made about the long-term stability of this unit. Any number of factors can influence the calibration that may cause the unit to drift out of specification before the calibration interval has expired. Calibration due dates appearing on the certificate or label are determined by the customer for administrative purposes and do not imply continued conformance to specifications.

This certificate shall not be reproduced, except in full, without the written consent of Tektronix.

Data Report attached.

Approved By: Tumminaro, Peter
Service Representative

Issue Date: 18-Aug-2026 12:24 PM

Calibration Standards

NIST Traceable#	Inst. ID#	Description	Manufacturer	Model	Cal Date	Date Due
18389970	UID353	SURFACE PLATE	GENERIC	12 X 18 Surface Plate	18-Sep-2023	18-Sep-2028
C005827135	UID4137076	SINE BAR	WILLRICH PRECISION	1 IN X 10 IN SINE BAR	15-Aug-2025	15-Sep-2026

9639 Interocean Drive Dock #2
Cincinnati,Ohio 45246 United States

C006261547	UID2238881	GAGE BLOCK SET	MITUTOYO	516-402-26	08-Apr-2026	08-May-2027
C006333679	UID5122326	TEMP & HUMIDITY / DEW POINT; CHART/RECORDER / DATALOGGER; ≤ 2% RH	ONSET	MX1101	21-Apr-2026	21-Apr-2027

Tektronix®

Certificate Number: C006653855

Manufacturer: Mitutoyo
ID / Asset Number: RF-DRP-001

Model Number: PRO 360
Calibration Date: 8/18/2026

Function / Range	Nominal Value	As Found	Result	As Left	Result	Min	Max	Units
Level Indication Calibration								
Position 1	0.0	0.0	Pass	Same	Pass	-0.1	0.1	°
Position 2	0.0	0.1	Pass	Same	Pass	-0.1	0.1	°
Position 3	0.0	0.0	Pass	Same	Pass	-0.1	0.1	°
Position 4	0.0	0.0	Pass	Same	Pass	-0.1	0.1	°
Angle Indication Calibration								
Position 1	5.0	5.0	Pass	Same	Pass	4.9	5.1	°
	15.0	15.0	Pass	Same	Pass	14.8	15.2	°
	30.0	29.9	Pass	Same	Pass	29.8	30.2	°
	45.0	44.9	Pass	Same	Pass	44.8	45.2	°
Position 2	5.0	5.0	Pass	Same	Pass	4.9	5.1	°
	15.0	15.0	Pass	Same	Pass	14.8	15.2	°
	30.0	29.9	Pass	Same	Pass	29.8	30.2	°
	45.0	45.0	Pass	Same	Pass	44.8	45.2	°
Position 3	5.0	5.0	Pass	Same	Pass	4.9	5.1	°
	15.0	15.0	Pass	Same	Pass	14.8	15.2	°
	30.0	29.9	Pass	Same	Pass	29.8	30.2	°
	45.0	45.0	Pass	Same	Pass	44.8	45.2	°
Position 4	5.0	5.0	Pass	Same	Pass	4.9	5.1	°
	15.0	15.0	Pass	Same	Pass	14.8	15.2	°
	30.0	29.9	Pass	Same	Pass	29.8	30.2	°
	45.0	45.0	Pass	Same	Pass	44.8	45.2	°
Position 5	90.0	89.9	Pass	Same	Pass	89.9	90.1	°
	85.0	85.0	Pass	Same	Pass	84.9	85.1	°
	75.0	75.0	Pass	Same	Pass	74.8	75.2	°
	60.0	60.0	Pass	Same	Pass	59.8	60.2	°
	45.0	45.0	Pass	Same	Pass	44.8	45.2	°
Position 6	90.0	89.9	Pass	Same	Pass	89.9	90.1	°
	85.0	85.0	Pass	Same	Pass	84.9	85.1	°
	75.0	75.0	Pass	Same	Pass	74.8	75.2	°
	60.0	60.0	Pass	Same	Pass	59.8	60.2	°
	45.0	45.0	Pass	Same	Pass	44.8	45.2	°
Position 7	90.0	89.9	Pass	Same	Pass	89.9	90.1	°
	85.0	84.9	Pass	Same	Pass	84.9	85.1	°
	75.0	75.0	Pass	Same	Pass	74.8	75.2	°
	60.0	59.9	Pass	Same	Pass	59.8	60.2	°
	45.0	45.0	Pass	Same	Pass	44.8	45.2	°
Position 8	90.0	90.0	Pass	Same	Pass	89.9	90.1	°
	85.0	85.0	Pass	Same	Pass	84.9	85.1	°
	75.0	75.0	Pass	Same	Pass	74.8	75.2	°
	60.0	60.0	Pass	Same	Pass	59.8	60.2	°
	45.0	45.0	Pass	Same	Pass	44.8	45.2	°

Accredited Calibration Datasheets may contain measurements that are not covered by the Scope of Accreditation. These measurements are indicated by a pound sign (#).
Measurements with an (*) indicates an Indeterminate Guardband Pass or Fail - Guardbanding is determined by the Measurement Uncertainty Method

********END OF MEASUREMENT REPORT********

7410 Worthington-Galena Rd
Worthington, Ohio 43085
Phone: (614) 436-4933

Industrial Environmental Monitoring Instruments, Inc.

Website: www.ierents.com

Thermocouple Meter Certificate of Calibration

Instrument: Omega CL23A
Serial#: T-259207 / RF-THC-001

Cal Date: 5/1/2026
Technician: Sam Shults
Cal Due: 5/1/2027

Montrose

Meter Mode Data Fahrenhiet

Type K		Type J	
Standard	Actual reading	Standard	Actual reading
32.0	32.0	32.0	31.9
212.0	211.9	250.0	249.8
500.0	499.8	500.0	499.8
1800.0	1799.3	1400.0	1399.4

Calibrator Mode Data Fahrenhiet

Type K		Type J	
Standard	Actual reading	Standard	Actual reading
32.0	32.2	32.0	33.0
212.0	212.1	250.0	251.0
500.0	500.2	500.0	500.9
1800.0	1799.9	1400.0	1401.0

Allowable Tolerance +\- 1.0 F

Reference Standards
PIE 525B sn. 116765 Cal Due: 11/14/2026

Instrument must be calibrated and operated according to manufacturers specifications
The calibration standards used are NIST traceable

7410 Worthington-Galena Rd
Worthington, Ohio 43085
Phone: (614) 436-4933

Industrial Environmental Monitoring Instruments, Inc.

Website: www.ierents.com

Thermocouple Meter Certificate of Calibration

Instrument: Omega CL23A
Serial#: T-301230 / RF-THC-009

Date: 7/1/2026
Technician: Sam Shults

Montrose

Meter Mode Data Fahrenhiet

Type K		Type J	
Standard	Actual reading	Standard	Actual reading
32.0	31.8	32.0	32.2
212.0	211.7	250.0	250.4
500.0	499.7	500.0	500.4
1800.0	1799.3	1400.0	1400.5

Calibrator Mode Data Fahrenhiet

Type K		Type J	
Standard	Actual reading	Standard	Actual reading
32.0	32.5	32.0	31.8
212.0	212.5	250.0	249.7
500.0	500.6	500.0	499.7
1800.0	1800.9	1400.0	1399.4

Allowable Tolerance +\- 1.0 F

Reference Standards
PIE 525B sn. 116765 Cal Due: 11/14/2026

Instrument must be calibrated and operated according to manufacturers specifications
The calibration standards used are NIST traceable

Tektronix®

Certificate of Calibration
C006653854

Instrument Identification

Company ID: ACC-1803795

PO Number: PO - ONTPO00006246

Onterris Inc

10060 Brecksville Rd
Brecksville, Ohio 44141-3293 United States

Manufacturer: OMEGA

Model Number: DPG1000ADA_80 PSI

Customer ID: RF-DPG-001

Serial Number: 7113804001

Tek ID: UID5138158

Description: GAUGE/MANOMETER; DIGITAL; PRESSURE, GAUGE, 10 TO <100 PSI (69K TO < 690KPA); 0.25 TO 1% FS

Certificate Information

Reason for Service: Calibration

Technician: Justice, Christopher

Type of Cal: Z540.1

Cal Date: 31-Jul-2026

As Found Condition: In Tolerance

Cal Due Date: 31-Jul-2027

As Left Condition: In Tolerance

Interval: 12 Months

Procedure: CSWW-CP-Pressure Gauge Revision 2

Temperature: 20.40 C

Humidity: 49.40 %

Remarks: N/A

Tektronix certifies the performance of the above instrument has been verified using test equipment of known accuracy, which is traceable to the International System of Units (SI) through a National Metrology Institute such as NIST, NPL, PTB, or derived from ratio type measurements, compared to reference materials or recognized consensus standards. The methods and procedures used comply with ANSI/NCSL Z540.1-1994.
The quality system complies with ISO9001.

This certificate and associated attachments relate only to the items calibrated. No representation is made about the long-term stability of this unit. Any number of factors can influence the calibration that may cause the unit to drift out of specification before the calibration interval has expired. Calibration due dates appearing on the certificate or label are determined by the customer for administrative purposes and do not imply continued conformance to specifications.

This certificate shall not be reproduced, except in full, without the written consent of Tektronix.

Approved By: Justice, Christopher
Service Representative

Issue Date: 31-Jul-2026 04:43 AM

Calibration Standards

NIST Traceable#	Inst. ID#	Description	Manufacturer	Model	Cal Date	Date Due
C006096363	UID3693186	PRESSURE CALIBRATOR; QUAD TRANSDUCER; 0.01 - 0.05% RNG	MENSOR	CPC6050	28-Jan-2026	28-Feb-2027
C006333679	UID5122326	TEMP & HUMIDITY / DEW POINT; CHART/RECORDER / DATALOGGER; ≤ 2% RH	ONSET	MX1101	21-Apr-2026	21-Apr-2027

9639 Interocean Drive Dock #2
Cincinnati,Ohio 45246 United States

OCS TECHNOLOGIES
An AccreditedLabs Company

14901 Emery Ave; Cleveland, OH 44135
www.accreditedlabs.com 216-741-0224

Certificate of Calibration

CUSTOMER:
MONTROSE AIR QUALITY SERVICES, LLC-BRECKSVII
10060 BRECKSVILLE ROAD
BRECKSVILLE, OH 44141

ANAB
ANSI National Accreditation Board
ACCREDITED
ISO/IEC 17025
CALIBRATION AND DIMENSIONAL MEASUREMENT

ASSET NUMBER:	**RF-BLK-001**	**PERFORMED ON:**	**16 Aug 2025**
OWNER ASSET #:	PNA011	**DATE DUE:**	**16 Aug 2026**
UNIT UNDER TEST:	STARRETT 1"/ID STACK (0.5") GAGE BLOCK SET	TEST RESULT:	PASS
		DATA TYPE	FOUND-LEFT
		TEMP / HUMIDITY:	68.6 °F / 51 %RH
SERIAL NUMBER:	PNA011	SERVICE SITE:	OCS
LOCATION:		CALIBRATED BY:	WILL GATLIN
PROCEDURE NAME:	ASME B89.1.9	APPROVED BY:	

Unless Otherwise Noted: OCS Technologies, Inc. certifies that the above listed instrument has been tested using standards that are traceable to the International System of Units (SI) through the National Institute of Standards & Technology (NIST) or through another National Metrology Institute (NMI). The item tested meets or exceeds all specifications as stated in the referenced procedure solely at the time of calibration. Measurement uncertainty if reported has been calculated at k=2 providing a 95% confidence interval and has been excluded from the Pass/Fail Result above. OCS is ISO/IEC 17025 accredited by ANAB (Cert#L1152-1). Calibration performed in accordance with ISO/IEC 17025:2017 and ISO 10012:2003. This report may only be reproduced in full. Temperature and Humidity for on-site work may be reported above as the mean of high and low values recorded for all items on the day of service. If the data type is FOUND-LEFT then the As Found and As Left data are the same. If PO# listed then PO requirements met.

Remarks: .

Standards Used

Asset	Traceable Through	Description	Cal Date	Cal Due Date
SQUARE	25-69821-B	STARRETT B89 GRADE 00 GAGE BLOCK SET	27 Jan 2025	27 Jan 2027
LA-003	LMUA-25030-2025-03-18	PRATT & WHITNEY 1000A LABMASTER UNIVERSAL	18 Mar 2025	18 Mar 2026
TE-065	CERT#541386	SS SHT8HT-SHT8 TEMPERATURE/HUMIDITY METER	10 Feb 2025	10 Feb 2026

Test Results

Tolerance/Grade Used: Readings Only

NOMINAL (in)	DEVIATION (uin)	RESULT	REMARK
1.0000	-3	PASS	PNA011
0.5000	69	PASS	ID STACK
0.5000	7	PASS	PNA012
0.5000	9	PASS	PNA013

Uncertainty of Measurement is (5.6 + 3.1L)uin from 0.01 to 4 inches and (4+3.1L)uin from 5 to 12 inches where L is the nominal length in inches.

Coefficients of Thermal Expansion (uin/in/°F):Steel=6.4 - Ceramic=5.5 - Chrome Carbide=4.7
Uncertainty of Measurement accounts for material. Blocks were measured in the horizontal pos

Unless otherwise noted - block was within tolerance without taking measurement uncertainty into account.

PASS* - Indicates that the block was within tolerance using the Stringent Rejection/Relaxed Acceptance as defined in ASME B89.7.3.1. The block passes with the normal tolerance added or subtracted to or from our uncertainty.

FAIL - indicates the block was outside of the range of the normal tolerance plus or minus our uncertainty. Block has been removed from set.
Tested in accordance with ASME B89.1.9-2002.Sections 3.3, 8.4.1-8.4.3, 8.4.5-8.4.6

Certificate # E6FA0029A945A34DB85F358E25A7EF4D
Issue Date:: 19 Aug 2025 Form No.: 133 Rev 01/2025 Page 1 of 1

Appendix C3 Instrumental Test Method QA/QC Data

LG Chemical America, Inc.
PROJ-070363
P004 RTO Inlet Duct

EPA Method 3A (O_2) Calibration Audit

Parameter/Units	Run 1	Valid	Run 2	Valid	Run 3	Valid
Analyzer Span During Test Run, %	21.89	YES	21.89	YES	21.89	YES
Initial System Calibration Response for Zero Gas, %	-0.17	N/A	-0.46	N/A	-0.49	N/A
Final System Calibration Response for Zero Gas, %	-0.46	N/A	-0.49	N/A	-0.49	N/A
Actual Concentration of the High-Level Calibration Gas, %	10.93	N/A	10.93	N/A	10.93	N/A
Initial System Calibration Response for Upscale Gas, %	10.69	N/A	10.81	N/A	10.66	N/A
Final System Calibration Response for Upscale Gas, %	10.81	N/A	10.66	N/A	10.64	N/A
Initial System Calibration Bias for Zero Gas, % of Span	-1.23	YES	-2.56	YES	-2.70	YES
Final System Calibration Bias for Zero Gas, % of Span	-2.56	YES	-2.70	YES	-2.70	YES
Initial System Calibration Bias for Upscale Gas, % of Span	-1.74	YES	-1.19	YES	-1.87	YES
Final System Calibration Bias for Upscale Gas, % of Span	-1.19	YES	-1.87	YES	-1.96	YES
System Drift for Zero Gas, % of Span	-1.32	YES	-0.14	YES	0.00	YES
System Drift for Upscale Gas, % of Span	0.55	YES	-0.69	YES	-0.09	YES
Analyzer Calibration Error for Zero Gas, % of Span	0.46	YES	0.46	YES	0.46	YES
Analyzer Calibration Error for Mid-Level Gas, % of Span	0.64	YES	0.64	YES	0.64	YES
Analyzer Calibration Error for High-Level Gas, % of Span	0.14	YES	0.14	YES	0.14	YES

EPA Method 3A (CO_2) Calibration Audit

Parameter/Units	Run 1	Valid	Run 2	Valid	Run 3	Valid
Analyzer Span During Test Run, %	21.65	YES	21.65	YES	21.65	YES
Initial System Calibration Response for Zero Gas, %	0.22	N/A	0.23	N/A	0.23	N/A
Final System Calibration Response for Zero Gas, %	0.23	N/A	0.23	N/A	0.20	N/A
Actual Concentration of the High-Level Calibration Gas, %	21.65	N/A	21.65	N/A	21.65	N/A
Initial System Calibration Response for Upscale Gas, %	11.09	N/A	10.87	N/A	11.48	N/A
Final System Calibration Response for Upscale Gas, %	10.87	N/A	11.48	N/A	11.04	N/A
Initial System Calibration Bias for Zero Gas, % of Span	0.09	YES	0.14	YES	0.14	YES
Final System Calibration Bias for Zero Gas, % of Span	0.14	YES	0.14	YES	0.00	YES
Initial System Calibration Bias for Upscale Gas, % of Span	0.88	YES	-0.14	YES	2.68	YES
Final System Calibration Bias for Upscale Gas, % of Span	-0.14	YES	2.68	YES	0.65	YES
System Drift for Zero Gas, % of Span	0.05	YES	0.00	YES	-0.14	YES
System Drift for Upscale Gas, % of Span	-1.02	YES	2.82	YES	-2.03	YES
Analyzer Calibration Error for Zero Gas, % of Span	0.92	YES	0.92	YES	0.92	YES
Analyzer Calibration Error for Mid-Level Gas, % of Span	-0.14	YES	-0.14	YES	-0.14	YES
Analyzer Calibration Error for High-Level Gas, % of Span	0.14	YES	0.14	YES	0.14	YES

LG Chemical America, Inc.
PROJ-070363
P004 RTO Inlet Duct

EPA Method 25A Calibration Audit (ppmv as propane)

Parameter/Units	Run 1	Valid	Run 2	Valid	Run 3	Valid
Analyzer Span During Test Run, ppmv	1,000	Yes	1,000	Yes	1,000	Yes
Average Stack Gas Concentration, ppmv	465.3	--	513.9	--	547.4	--
Zero Drift, % of Span	1.47	Yes	2.41	Yes	2.48	Yes
Calibration Drift for Mid-Level Gas, % of Span	1.80	Yes	2.10	Yes	2.92	Yes
Calibration Error for Low-Level Gas, % of Tag Value	-1.51	Yes	-1.51	Yes	-1.51	Yes
Calibration Error for Mid-Level Gas, % of Tag Value	-1.81	Yes	-1.81	Yes	-1.81	Yes

LG Chemical America, Inc.
PROJ-070363
P004 RTO Exhaust Stack

EPA Method 3A (O_2) Calibration Audit

Parameter/Units	Run 1	Valid	Run 2	Valid	Run 3	Valid
Analyzer Span During Test Run, %	21.89	YES	21.89	YES	21.89	YES
Initial System Calibration Response for Zero Gas, %	0.13	N/A	0.16	N/A	0.12	N/A
Final System Calibration Response for Zero Gas, %	0.16	N/A	0.12	N/A	0.15	N/A
Actual Concentration of the High-Level Calibration Gas, %	10.93	N/A	10.93	N/A	10.93	N/A
Initial System Calibration Response for Upscale Gas, %	10.94	N/A	10.93	N/A	10.88	N/A
Final System Calibration Response for Upscale Gas, %	10.93	N/A	10.88	N/A	10.85	N/A
Initial System Calibration Bias for Zero Gas, % of Span	0.09	YES	0.23	YES	0.05	YES
Final System Calibration Bias for Zero Gas, % of Span	0.23	YES	0.05	YES	0.18	YES
Initial System Calibration Bias for Upscale Gas, % of Span	-0.64	YES	-0.69	YES	-0.91	YES
Final System Calibration Bias for Upscale Gas, % of Span	-0.69	YES	-0.91	YES	-1.05	YES
System Drift for Zero Gas, % of Span	0.14	YES	-0.18	YES	0.14	YES
System Drift for Upscale Gas, % of Span	-0.05	YES	-0.23	YES	-0.14	YES
Analyzer Calibration Error for Zero Gas, % of Span	0.50	YES	0.50	YES	0.50	YES
Analyzer Calibration Error for Mid-Level Gas, % of Span	0.69	YES	0.69	YES	0.69	YES
Analyzer Calibration Error for High-Level Gas, % of Span	0.18	YES	0.18	YES	0.18	YES

EPA Method 3A (CO_2) Calibration Audit

Parameter/Units	Run 1	Valid	Run 2	Valid	Run 3	Valid
Analyzer Span During Test Run, %	21.65	YES	21.65	YES	21.65	YES
Initial System Calibration Response for Zero Gas, %	0.16	N/A	0.15	N/A	0.13	N/A
Final System Calibration Response for Zero Gas, %	0.15	N/A	0.13	N/A	0.11	N/A
Actual Concentration of the High-Level Calibration Gas, %	21.65	N/A	21.65	N/A	21.65	N/A
Initial System Calibration Response for Upscale Gas, %	10.91	N/A	10.92	N/A	10.94	N/A
Final System Calibration Response for Upscale Gas, %	10.92	N/A	10.94	N/A	10.74	N/A
Initial System Calibration Bias for Zero Gas, % of Span	0.14	YES	0.09	YES	0.00	YES
Final System Calibration Bias for Zero Gas, % of Span	0.09	YES	0.00	YES	-0.09	YES
Initial System Calibration Bias for Upscale Gas, % of Span	-0.92	YES	-0.88	YES	-0.79	YES
Final System Calibration Bias for Upscale Gas, % of Span	-0.88	YES	-0.79	YES	-1.71	YES
System Drift for Zero Gas, % of Span	-0.05	YES	-0.09	YES	-0.09	YES
System Drift for Upscale Gas, % of Span	0.05	YES	0.09	YES	-0.92	YES
Analyzer Calibration Error for Zero Gas, % of Span	0.60	YES	0.60	YES	0.60	YES
Analyzer Calibration Error for Mid-Level Gas, % of Span	0.83	YES	0.83	YES	0.83	YES
Analyzer Calibration Error for High-Level Gas, % of Span	-0.09	YES	-0.09	YES	-0.09	YES

LG Chemical America, Inc.
PROJ-070363
P004 RTO Exhaust Stack

EPA Method 25A Calibration Audit (ppmv as propane)

Parameter/Units	Run 1	Valid	Run 2	Valid	Run 3	Valid
Analyzer Span During Test Run, ppmv	100.0	Yes	100.0	Yes	100.0	Yes
Average Stack Gas Concentration, ppmv	4.83	--	5.27	--	6.21	--
Zero Drift, % of Span	0.05	Yes	0.15	Yes	-0.33	Yes
Calibration Drift for Mid-Level Gas, % of Span	0.86	Yes	0.51	Yes	-0.68	Yes
Calibration Error for Low-Level Gas, % of Tag Value	-4.43	Yes	-4.43	Yes	-4.43	Yes
Calibration Error for Mid-Level Gas, % of Tag Value	-4.62	Yes	-4.62	Yes	-4.62	Yes

MATHESON
The Gas Professionals

Certificate of Analysis

Customer Service Center

To:

Sales Order No:
Purchase Order:

Manufacturing Location
Matheson
1650 Enterprise Parkway
Twinsburg, OH 44087

Shipping Location

Product: Air
Grade: Ultra Zero Certified
Part No: G2001312

Cylinder Size: 1L
Valve: CGA 590BR

Pressure: 2640 psig
Contents: 300 CF

CYLINDER NUMBER(S)

CCC-OK
AX 024886
11T818038
5047086

Component	Specification	Certified Concentration	Units (mol)	Analytical Method
Oxygen	20 - 22	21.54	%	K
THC	<0.1	ND<0.1	ppm	I
Water	<2	1.94	ppm	F
Carbon Dioxide	<1	0.10	ppm	I
Carbon Monoxide	<1	ND<0.1	ppm	I
Nitrogen	Balance			

COMMENTS

Product Composition verified by instrumentation calibrated with at least one of the following: NIST traceable weights, gas mixtures traceable to NIST weights, NIST gas standards such as NTRM's or SRM's, manufacturer NIST calibrations.

Analytical Method Key

A	Trace oxygen analyzer	G	Detector Tube
B	Gas chromatograph with thermal conductivity detector	H	Gas chromatograph with helium ionization detector
C	Gas chromatograph with flame ionization detector	I	Gas chromatograph with discharge ionization detector
D	Trace nitrogen analyzer	J	Specific carbon monoxide analyzer
E	Total hydrocarbon analyzer	K	Percent oxygen analyzer
F	Specific moisture analyzer	L	Specific carbon dioxide analyzer
		M	Binary gas mixture analyzer

Lot No: 065N416901

Fill Date: 3/6/2026

IMPORTANT

The information contained herein has been prepared at your request by qualified experts within Matheson. While we believe that the information is accurate within the limits of the analytical methods employed and is complex to the extent of the specified analysis performed, we make no warranty or representation as to the suitability of the use of the information for any particular purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Matheson arising out of the use of the information contained herein exceed the fee established for providing such information.

The undersigned certifies that the product(s) listed above reflect gas phase by volume (unless otherwise indicated) and meet or exceed the minimum purity specification(s)

Aaron Meade
Analyst

03/12/26
Date

Form effective date - May 27, 2022

MATHESON
The Gas Professionals

Certificate of Batch Analysis

To:

Sales Order No:
Purchase Order:

Manufacturing Location
Matheson
1650 Enterprise Parkway
Twinsburg, OH 44087

Product: Nitrogen
Grade: UHP
Part No: NI UHP 300

Cylinder Size: 1L
Valve: CGA 580BR
Pressure: 2640 psig
Contents: 300 CF

CYLINDER NUMBER(S)

003703339
003394602
003050307

Component	Specification	Certified Concentration	Units (mol)	Analytical Method
Nitrogen	99.999	99.999	%	
Carbon Dioxide	<1	ND<0.10	ppm	I
Carbon Monoxide	<1	0.14	ppm	I
Oxygen	<2	0.36	ppm	A
THC	<0.5	ND<0.10	ppm	I
Water	<3	0.25	ppm	F

COMMENTS

Product Composition verified by instrumentation calibrated with at least one of the following: NIST traceable weights, gas mixtures traceable to NIST weights, NIST gas standards such as NTRM's or SRM's, manufacturer NIST calibrations.

Analytical Method Key

A	Trace oxygen analyzer	G	Detector Tubes
B	Gas chromatograph with thermal conductivity detector	H	Gas chromatograph with helium ionization detector
C	Gas chromatograph with flame ionization detector	I	Gas chromatograph with discharge ionization detector
D	Trace nitrogen analyzer	J	Specific carbon monoxide analyzer
E	Total hydrocarbon analyzer	K	Percent oxygen analyzer
F	Specific moisture analyzer	L	Specific carbon dioxide analyzer
		M	Binary gas mixture analyzer

Lot No: 071N416201

Fill Date: 3/12/2026

IMPORTANT

The information contained herein has been prepared at your request by qualified experts within Matheson. While we believe that the information is accurate within the limits of the analytical methods employed and is complex to the extent of the specified analysis performed, we make no warranty or representation as to the suitability of the use of the information for any particular purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Matheson arising out of the use of the information contained herein exceed the fee established for providing such information.

The undersigned certifies that the product(s) listed above reflect gas phase by volume (unless otherwise indicated) and meet or exceed the minimum purity specification(s)

Analyst

04/02/26
Date

Form effective date - May 27, 2022

MATHESON
The Gas Professionals

1650 Enterprise Parkway
Twinsburg, OH 44087
215-648-4000

Certificate of Analysis – EPA Protocol Mixtures

Customer: Montrose Air Quality Systems
Cylinder Number: SX057327
Cylinder Pressure: 2000 psig
Certification Date: 4/7/2026
Certification Expiration Date: 4/2/2034

Protocol:	Reference #:	Lot#:
G1	870636	109-96-47424

Part #: G 2674797

[redacted]

				REPLICATE RESPONSES
Component: Oxygen				Date: 4/2/2026
Certified Conc:	10.93 %	±	0.06 %	10.96 %
				10.93 %
				10.91 %

Component: Carbon Dioxide				Date: 4/7/2026
Certified Conc:	11.01 %	±	0.08 %	11.02 %
				11.01 %
				11.01 %

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component:	Oxygen	Carbon Dioxide
Standard #:	SRM2658a	SRM2745
Sample # / Cert No.:	72-E-09	9-E-30
Cylinder #:	FF064419	FF065519
Concentration:	9.819±0.015%	15.802±0.0154%
Expires:	3/23/29	5/11/29

CERTIFICATION INSTRUMENTS

Component:	O2	CO2
Make/Model:	Horiba MPA-510	Agilent 7890b
Serial Number:	9XUYXODW	CN16053036
Measurement Principle:	Paramagnetic	TCD
Last Calibration:	3/18/2026	4/3/2026

Notes:

The certification was performed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards May 2012, using procedure G1 and/or G2. U.S EPA Vendor ID Number: D42026, PGVP Participation Date: 01/01/26, PGVP Renewal Date: 01/01/27. The expanded uncertainty listed for each component was calculated at a coverage factor of k=2 and at a level of confidence of 95%. The test results presented in this Certificate of Analysis apply solely to the specific item tested, as identified in this report.

Analyst: Aaron Meek Issued Date: 4/9/2026

Accredited By: ANAB

ANAB
ANSI National Accreditation Board
ACCREDITED
ISO/IEC 17025
TESTING LABORATORY

MATHESON
The Gas Professionals

1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: Matheson Tri-Gas
1650 Enterprise Pkwy
Twinsburg, OH 44087

Customer PO#:
TICKET # 42617867

Part #
G2708563

Protocol:
G1: Oxygen
G2: Carbon Dioxide

Reference #:
868775-01

Lot#:
9306650017

Cylinder Number: EB0124182
Cylinder Pressure: 1900 psig
Certification Date: 2/24/2026
Certification Expiration Date: 2/24/2034

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

				REPLICATE RESPONSES
Component:	Carbon Dioxide			Date: 2/24/2026
				21.67
Certified Conc:	21.65 %	+/- 0.09 %	ABS	21.65
				21.65
Component:	Oxygen			Date: 2/24/2026
				21.89
Certified Conc:	21.89 %	+/- 0.04 %	ABS	21.90
				21.89

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component:	Carbon Dioxide	Component:	Oxygen
Reference Standard:	NTRM	Reference Standard:	SRM
Cylinder #:	AM11349	Cylinder #:	FF64420
Concentration:	19.405 % +/- 0.058 % ABS	Concentration:	9.819 % +/- 0.015 % ABS
Exp. Date:	11/2/2028	Exp. Date:	3/23/2029
SRM or Cert #:	NA	SRM or Cert #:	2658a
Sample #:	171101	Sample #:	72-E-23

CERTIFICATION INSTRUMENTS

Component:	Carbon Dioxide	Component:	Oxygen
Make/Model:	CAI 700	Make/Model:	CAI 700
Serial Number:	1908009	Serial Number:	1904028
Measurement Principle:	NDIR	Measurement Principle:	PARAMAGNETIC
Last Calibration:	2/24/2026	Last Calibration:	2/23/2026

Notes:

The certification was performed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards May 2012, using procedure G1 and/or G2. U.S EPA Vendor ID Number: D62026, PGVP Participation Date: 01/01/26, PGVP Renewal Date: 01/01/27
The expanded uncertainty listed for each component was calculated at a coverage factor of k=2 and at a level of confidence of 95%. The test results presented in this Certificate of Analysis apply solely to the specific item tested, as identified in this report.

Analyst: Ashley Smallwood
Ashley Smallwood

ANAB
ANSI National Accreditation Board
ACCREDITED
ISO/IEC 17025
TESTING LABORATORY

Accredited by:
ANAB

Date: 2/25/2026

MATHESON
The Gas Professionals

1650 Enterprise Parkway
Twinsburg, OH 44087
215-648-4000

Certificate of Analysis – EPA Protocol Mixtures

Customer: Montrose Environmental
Cylinder Number: SX090267
Cylinder Pressure: 2000 psig
Certification Date: 7/31/2025
Certification Expiration Date: 7/31/2033

Protocol:	Reference #:	Lot #:
G1	860652	930-56-46622

Part #: G 2708058

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

Component: Propane

Certified Conc: 2908 ppm ± 7 ppm

REPLICATE RESPONSES

Date: 7/31/2025	Date:
2904 ppm	
2905 ppm	
2913 ppm	

BALANCE GAS: Air

REFERENCE STANDARDS:

Component:	Propane
Standard #:	PRM
Sample # / Cert No.:	C1949210
Cylinder #:	D887433
Concentration:	3504 ppm ± 7 ppm
Expires:	12/21/25

CERTIFICATION INSTRUMENTS

Component:	Propane
Make/Model:	Agilent 7890B FID
Serial Number:	CN16053036
Measurement Principle:	FID
Last Calibration:	7/29/2025

Notes:

The certification was performed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards May 2012, using procedure G1 and/or G2. U.S EPA Vendor ID Number: D42025, PGVP Participation Date: 01/01/25, PGVP Renewal Date: 01/01/26. The expanded uncertainty listed for each component was calculated at a coverage factor of k=2 and at a level of confidence of 95%. The test results presented in this Certificate of Analysis apply solely to the specific item tested, as identified in this report.

Analyst: _____ Issued Date: 7/31/2025

Accredited By:
ANAB

ANAB
ANSI National Accreditation Board
ACCREDITED
ISO/IEC 17025
TESTING LABORATORY

69 Industrial Park Rd E, Tolland CT 06084
https://www.environics.com/service-request
(860) 872-1111 info@environics.com

SERVICE REPORT

ATTN: Peter Hilty, Montrose Air Quality Services LLC

DATE OF SERVICE: 8/4/2025
MODEL NUMBER: 4040
SERIAL NUMBER: 5982

SERVICE TYPE: **RECALIBRATION**
NEXT CALIBRATION DUE: **8/5/2026**

CONDITIONS AS OBSERVED AND WORK PERFORMED:

- Unit powers up properly.
- Unit cleaned and Purged, data verified.
- All valves checked, ok.
- Checked for any software updates
- Voltages checked – 5v, -15v, +15v, 24v.
- Battery replaced, holder added.
- Unit leak tested.
- Tested all MFC's with each port.
- Zeros on each MFC checked/adjusted.
- Spans checked/adjusted on all MFCs.
- All MFCs recalibrated.
- Verified all MFCs @ 5 standard points, passed within 0.5%
- All cables and screw/nuts tightened, ok.

Service Technician

69 Industrial Park Rd E, Tolland CT 06084
https://www.environics.com/service-request
(860) 872-1111 info@environics.com

ENVIRONICS FLOW CONTROLLER CALIBRATION REPORT

Unit Summary		Std Conditions		MFC Summary	
Model #:	4040	Temp:	32°F	MFC #:	1
Unit SN :	5982	Pressure:	29.92 in. Hg	MFC FS Flow:	10000
		Gas:	NITROGEN	MFC S/N:	6943300001

Flow Calibration Data is not performance data. This data is used by the system operating mode to improve the flow accuracy. The Flow Verification Data is performance data.

Flow Calibration Data

	Set Flow	True Flow
5%	500	487.074
10%	1000	986.672
20%	2000	2017.825
30%	3000	3031.575
40%	4000	4049.785
50%	5000	5062.991
60%	6000	6074.203
70%	7000	7101.241
80%	8000	8105.629
90%	9000	9159.634
100%	10000	10237.006

All values in SCCM

Flow Verification Data

	Set Flow	True Flow	% dev
99%	9900	9931.454	0.32%
85%	8500	8528.826	0.34%
55%	5500	5506.614	0.12%
25%	2500	2491.584	-0.34%
10%	1000	996.941	-0.31%

All values in SCCM

This calibration complies with ISO 17025-2005 [non-accredited] and is traceable to the National Institute of Standards and Technology (NIST). Calibration and verification are accomplished exclusively by qualified personnel following controlled procedures under ISO 9001:2015. For questions or concerns, contact Customer Service via our website, email or by phone, weekdays from 8AM - 4PM.

Verified by: Paul Stanse l Date: 8/4/25

69 Industrial Park Rd E, Tolland CT 06084
https://www.environics.com/service-request
(860) 872-1111 info@environics.com

ENVIRONICS FLOW CONTROLLER CALIBRATION REPORT

Unit Summary		Std Conditions		MFC Summary	
Model #:	4040	Temp:	32°F	MFC #:	2
Unit SN :	5982	Pressure:	29.92 in. Hg	MFC FS Flow:	10000
		Gas:	NITROGEN	MFC S/N:	7053700001

Flow Calibration Data is not performance data. This data is used by the system operating mode to improve the flow accuracy. The Flow Verification Data is performance data.

Flow Calibration Data

	Set Flow	True Flow
5%	500	484.521
10%	1000	987.939
20%	2000	1994.901
30%	3000	2999.958
40%	4000	4008.480
50%	5000	5016.659
60%	6000	6041.363
70%	7000	7072.258
80%	8000	8105.069
90%	9000	9167.398
100%	10000	10242.180

All values in SCCM

Flow Verification Data

	Set Flow	True Flow	% dev
99%	9900	9940.532	0.41%
85%	8500	8537.749	0.44%
55%	5500	5503.186	0.06%
25%	2500	2498.076	-0.08%
10%	1000	1004.883	0.49%

All values in SCCM

This calibration complies with ISO 17025-2005 [non-accredited] and is traceable to the National Institute of Standards and Technology (NIST). Calibration and verification are accomplished exclusively by qualified personnel following controlled procedures under ISO 9001:2015. For questions or concerns, contact Customer Service via our website, email or by phone, weekdays from 8AM - 4PM.

Verified by: Paul Stansel Date: 8/4/25

69 Industrial Park Rd E, Tolland CT 06084
https://www.environics.com/service-request
(860) 872-1111 info@environics.com

ENVIRONICS FLOW CONTROLLER CALIBRATION REPORT

Unit Summary		Std Conditions		MFC Summary	
Model #:	4040	Temp:	32°F	MFC #:	3
Unit SN :	5982	Pressure:	29.92 in. Hg	MFC FS Flow:	1000
		Gas:	NITROGEN	MFC S/N:	0036718001

Flow Calibration Data is not performance data. This data is used by the system operating mode to improve the flow accuracy. The Flow Verification Data is performance data.

Flow Calibration Data

	Set Flow	True Flow
5%	50	49.507
10%	100	101.420
20%	200	205.942
30%	300	309.790
40%	400	413.270
50%	500	516.168
60%	600	619.164
70%	700	720.695
80%	800	822.750
90%	900	923.146
100%	1000	1024.879

All values in SCCM

Flow Verification Data

	Set Flow	True Flow	% dev
99%	990	992.706	0.27%
85%	850	850.927	0.11%
55%	550	550.381	0.07%
25%	250	249.944	-0.02%
10%	100	99.824	-0.18%

All values in SCCM

This calibration complies with ISO 17025-2005 [non-accredited] and is traceable to the National Institute of Standards and Technology (NIST). Calibration and verification are accomplished exclusively by qualified personnel following controlled procedures under ISO 9001:2015. For questions or concerns, contact Customer Service via our website, email or by phone, weekdays from 8AM - 4PM.

Verified by: Paul Stansel Date: 8/4/25

69 Industrial Park Rd E, Tolland CT 06084
https://www.environics.com/service-request
(860) 872-1111 info@environics.com

ENVIRONICS FLOW CONTROLLER CALIBRATION REPORT

Unit Summary		Std Conditions		MFC Summary	
Model #:	4040	Temp:	32°F	MFC #:	4
Unit SN :	5982	Pressure:	29.92 in. Hg	MFC FS Flow:	100
		Gas:	NITROGEN	MFC S/N:	0036720001

Flow Calibration Data is not performance data. This data is used by the system operating mode to improve the flow accuracy. The Flow Verification Data is performance data.

Flow Calibration Data

	Set Flow	True Flow
5%	5	5.092
10%	10	10.551
20%	20	21.218
30%	30	31.499
40%	40	41.393
50%	50	51.231
60%	60	60.974
70%	70	70.641
80%	80	80.461
90%	90	90.719
100%	100	101.411

All values in SCCM

Flow Verification Data

	Set Flow	True Flow	% dev
99%	99	98.561	-0.44%
85%	85	84.830	-0.20%
55%	55	54.988	-0.02%
25%	25	24.949	-0.20%
10%	10	9.959	-0.41%

All values in SCCM

This calibration complies with ISO 17025-2005 [non-accredited] and is traceable to the National Institute of Standards and Technology (NIST). Calibration and verification are accomplished exclusively by qualified personnel following controlled procedures under ISO 9001:2015. For questions or concerns, contact Customer Service via our website, email or by phone, weekdays from 8AM - 4PM.

Verified by: Paul Stansel Date: 8/4/25

Appendix C4 Accreditation Information / Certifications

STACK TESTING ACCREDITATION COUNCIL

American Association for Laboratory Accreditation

Accredited Air Emission Testing Body

A2LA has accredited

ONTERRIS AIR QUALITY SERVICES, LLC

In recognition of the successful completion of the joint A2LA and Source Evaluation Society (SES) 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 23rd day of January 2026.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3925.01
Valid to February 29, 2028
Revised April 27, 2026

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

CERTIFICATE OF COMPLETION

Cedric Ebbeler

This document certifies that this individual has passed a comprehensive examination and is now a Qualified Individual (QI) as defined in Section 8.3 of ASTM D7036-04 for the following method(s):

EPA Method 205

Certificate Number: 011-2025-10

Tate Strickler, VP – Quality Systems

EFFECTIVE DATE: 1/31/2025

EXPIRATION DATE: 1/30/2030

MONTROSE ENVIRONMENTAL

CERTIFICATE OF COMPLETION

Cedric Ebbeler

This document certifies that this individual has passed a comprehensive examination and is now a Qualified Individual (QI) as defined in Section 8.3 of ASTM D7036-04 for the following method(s):

Source Evaluation Society Group 1: EPA Manual Gas Volume and Flow Measurements and Isokinetic Particulate Sampling Methods

Certificate Number: 011-2024-14

Tate Strickler, VP – Quality Systems

EFFECTIVE DATE: 11/15/2024

EXPIRATION DATE: 11/14/2029

MONTROSE ENVIRONMENTAL

CERTIFICATE OF COMPLETION

Cedric Ebbeler

This document certifies that this individual has passed a comprehensive examination and is now a Qualified Individual (QI) as defined in Section 8.3 of ASTM D7036-04 for the following method(s):

Source Evaluation Society Group 3: EPA Gaseous Pollutants Instrumental Sampling Methods

Certificate Number: 011-2025-2

Tate Strickler, VP – Quality Systems

EFFECTIVE DATE: 1/29/2025

EXPIRATION DATE: 1/28/2030

MONTROSE ENVIRONMENTAL

Certificate of Completion

Jeremiah Hicks

This document certifies that this individual has passed a comprehensive examination and is now a Qualified Individual (QI) as defined in Section 8.3 of ASTM D7036-04 for the following method(s):

Source Evaluation Society Group 1: *EPA Manual Gas Volume and Flow Measurements and Isokinetic Particulate Sampling Methods*

Certificate Number: 011-2022-3

Tate Strickler, VP – Quality Systems

Date of issue: 03/23/2022

Date of expiration: 03/22/2027

MONTROSE ENVIRONMENTAL

Certificate of Completion

Jeremiah Hicks

This document certifies that this individual has passed a comprehensive examination and is now a Qualified Individual (QI) as defined in Section 8.3 of ASTM D7036-04 for the following method(s):

Source Evaluation Society Group 3: *EPA Gaseous Pollutants Instrumental Sampling Methods*

Certificate Number: 011-2023-15

Tate Strickler, VP – Quality Systems

DATE OF ISSUE: 10/06/2023

DATE OF EXPIRATION: 10/05/2028

MONTROSE ENVIRONMENTAL

Appendix D Regulatory Information

July 14, 2026

Laura Miracle
Akron Regional Air Quality Management District
1867 W. Market Street
Akron, OH 44313

Subject: 2026 Intent-to-Test Notification Form
Onterris Document No.: NE011AS-070363-PP-1425

Dear Laura,

This letter accompanies the attached Intent to Test (ITT) Notification Form that we have completed on behalf of our client, LG Chemical America, Inc. The purpose of the test program is to perform a compliance source emissions test on the Extrusion Process (P004) at the LG Chemical America facility (Facility ID: 16-67-06-0181) located in Ravenna, Ohio. The tests will be conducted to demonstrate compliance with either the VOC emissions limit or destruction efficiency requirement pursuant to Ohio Environmental Protection Agency (OEPA) Permit-to-Install and Operate (PTIO) P0132055.

The specific objectives of the test program are as follows:

- Measure emissions of Total Organic Compounds (TOC) at the P004 Regenerative Thermal Oxidizer (RTO) Inlet Duct and P004 RTO Exhaust Stack
- Determine Volatile Organic Compound (VOC) destruction efficiency (DE) of the P004 RTO
- Conduct the test program with a focus on safety

Please note the following regarding the scope of work:

- Plant personnel are responsible for establishing the test conditions and collecting all applicable operating data.
- EPA Methods 1, 2, 3A and 4 will determine stack gas volumetric flowrate of the P004 RTO Inlet Duct and P004 RTO Exhaust Stack
- EPA Method 25A will measure the concentrations of TOC, as propane, from the P004 RTO Inlet Duct and P004 RTO Exhaust Stack

July 30, 2026, has been selected as the test day with testing equipment set-up occurring the business day before. Run No. 1's start time is targeted for 08:00 AM. If this start time changes, Onterris Air Quality Services or facility personnel will notify you of the new start time.

If you have any questions regarding the scope of this testing project, the scheduled test day, or the process(es) being tested, please do not hesitate to call Richard Schubert, Environmental Health and Safety Manager, at 404.862.7534, or myself, and we would be happy to assist you in any way possible.

Thank you again for your careful consideration, and I am looking forward to working with you on this upcoming compliance testing project.

Sincerely,

Jeremiah Hicks
Client Project Manager

cc: Richard Schubert, LG Chemical America, Inc.

Agency use only	
Assigned	

INTENT TO TEST NOTIFICATION (One Emissions Unit Per Sheet)

Facility Premise No.:	**16-67-06-0181**	Proposed Test Dates	**July 30, 2026**
Emissions Unit PTI No.	**P0132055**	Proposed Start Time	**08:00**
SCC Number	**--**		

A. Facility Contact Information:

Name	**LG Chemical America, Inc.**
Address	**6800 N. Chestnut Street, Ravenna, OH 44266**
Contact Person	**Richard Schubert**
Telephone	**--** **(Cell): 404-862.7534**
E-Mail	**rschubert@lgchem.com**

Testing Firm Information:

Name	**Onterris Air Quality Services, LLC**
Address	**10060 Brecksville Road, Brecksville, OH 44141-0156**
Contact Person	**Jeremiah Hicks**
Telephone	**440-262-3760** **(Cell) 440-340-8189**
E-Mail	**jhicks@onterris.com**

B. Test Location Information

Name	**Same as Facility**	Address	**Same as Facility**
Contact Person	**Same as Facility**	Telephone	**Same as Facility**

C. Test Plan and Emissions Unit Information Table: List the applicable information under each respective column heading.

Emission Unit	Test Location	Control Equipment	Monitoring Equipment	Pollutant(s) to be Tested	EPA Test Method	Number of Sampling Points	Total Time per Test Run (min)	Number of Sampling Runs
Extrusion Process (P004)	P004 RTO Inlet Duct	N/A	N/A	Velocity/Volumetric Flow Rate	1 & 2	Up to 16	~10	3
				O_2 & CO_2	3A	1	60	3
				Moisture	4	1	60	3
				TOC, as propane	25A	1	60	3
	P004 RTO Exhaust Stack	Regenerative Thermal Oxidizer (RTO)	RTO Temperature	Velocity/Volumetric Flow Rate	1 & 2	Up to 16	~10	3
				O_2 & CO_2	3A	1	60	3
				Moisture	4	1	60	3
				TOC, as propane	25A	1	60	3

Are *any* modifications or alternatives as spelled within the test methods being proposed? **Yes** ☒ **No** ☐ If "no", then no modifications or alternatives, however minor, will be accepted. If yes, list each test method and section being modified, and attach a detailed modification description and justification: **Single Point EPA Method 3A and 4 sampling is proposed at P004 RTO Inlet Duct and Exhaust Stack.**

Source is testing to comply with (check all that apply): **State PTI ☒ State PTO ☒ Title V ☐ NSPS ☐ MACT ☐ BIF ☐ Title IV ☐ Other (explain)**_____

D. What is the maximum rated capacity or throughput of the emissions unit given its permit-to-install or permit-to-operate: **TBD**

Has the facility scheduled production or throughput so that the emissions unit can be operated at the maximum capacity given its permit-to-install or permit-to-operate during the test? **Yes ☒ No ☐** if no, attach explanation. _____

Specify how the operating rate will be demonstrated during the testing: **Normal facility process and recordkeeping procedures.**

Sampling Location(s): **Inlet ☒ Outlet ☒ Simultaneous ☒** Will cyclonic flow check(s) be conducted? **Yes ☒ No ☐**_____

Fuel Sampling: **Coal-Proximate ☐ Ultimate ☐ Other ☐** If other specify: **NA**

Emission Rate to be calculated using: **F-Factor ☐ Ultimate Coal Analysis ☐ Other ☒ If other specify: EPA Methods 1, 2, 3A, 4 and 25A calculation algorithms**

Has any maintenance or parts replacement been performed on the emissions unit or the control equipment within the last year? **Yes ☒ No ☐** If yes, briefly describe: **Normal routine maintenance.**

(Note: Some maintenance, such as installing new filter bags in a baghouse, or replacing the activated carbon in an adsorber, may disqualify the emissions unit from a performance test until a sufficient amount of time has elapsed to ensure a test which will be representative of normal operations.)

E. Sample Train Calibration: All affected measuring and monitoring equipment should be calibrated within 60 days of the scheduled testing.

THE FOLLOWING ADDITIONAL INFORMATION SHALL BE SUBMITTED AS ATTACHMENTS:

F. Sample Train Information:

1. A schematic diagram of each sampling train.
2. The type or types of capture media to be used to collect each gas stream pollutant:

EPA Test Method	Capture Media
1 and 2	N/A
3A and 25A (CEMS)	Analyzers providing real-time concentration of the target pollutant on site
4	Impingers containing DI Water or Reagent and Silica Gel

3. Sample tube type, (e.g., glass, teflon, stainless steel, etc):

EPA Test Method	Sample Tube Type
1 and 2	N/A
CEMS	Stainless Steel
4	Glass/Stainless Steel/Teflon

4. Probe cleaning method and solvent to be used, if applicable:

EPA Test Method	Probe Cleaning Method and Solvent
1, 2, 4, and CEMS	N/A

G. Laboratory Analysis:

A description of the laboratory analysis methods to be used to determine the concentration of each pollutant:

EPA Test Method	Laboratory Analysis
1 and 2	N/A
4	Gravimetric
CEMS	Analyzers providing real-time concentration of the target pollutant on site

H. Description of Operations:

- A description of any operation, process, or activity that could vent exhaust gases to the stack being tested. This shall include the description and feed rate of all materials capable of producing pollutant emissions used in each separate operation. Maximum process weight rate, or coating rate, and parameters such as line speed, VOC content etc. should be specifically documented with calculations to confirm worst case scenario emissions.

LG Chemical America operates an extrusion process which includes cooling, pelletizing, and screening. The various particulate emission sources are controlled by Dust Collector DC-1701, while the off-gases from the extruders are controlled by a regenerative thermal oxidizer (RTO)

Note 1: All compliance demonstration testing shall be performed at maximum rate capacity as specified by the equipment manufacturer or at the maximum rate actually used in the emissions unit operation, whichever is greater, or at any other rate as agreed upon with OEPA.

Note 2: If the emissions unit is not operated at maximum capacity, or as close as possible thereto, the emissions unit might be derated to the production capacity achieved during the test.

I. Stack and Vent Description:

- A dimensional sketch or sketches showing the plan and elevation view of the entire ducting and stack arrangement. The sketch should include the relative position of all processes or operations venting to the stack or vent to be tested. It should also include the position of the ports relative to the nearest upstream and downstream gas flow disturbance or duct dimensional change. The sketches should include the relative position, type, and manufacturer's claimed efficiency of all gas cleaning equipment.
- A cross sectional dimensional sketch of the stack or duct at the sampling ports, showing the position of sampling points. In case of a rectangular duct, show division of duct into equal areas.

See attached stack drawings.

J. Safety:

Describe all possible safety hazards including such items as the presence of toxic fumes, high noise levels, areas where eye protection is required, etc. Note: Conditions considered unsafe at the time of the test will cause postponement.

The Plant requires the use of safety glasses, safety shoes, hard hats, long sleeves, and hearing protection (in designated areas). At this time, and to the best of our belief and knowledge, there are no toxic fumes or other hazards expected to be on site at this facility that would cause you to formally prepare for your exposure to them. It is our recommendation however, to consult plant personnel regarding its safety policies before accessing the production areas on this site. Onterris Air Quality Services personnel will be required to wear safety shoes and safety glasses at all times while on site at the facility to comply with our own company policy.

Source: https://epa.ohio.gov/static/Portals/27/files/ITT.pdf

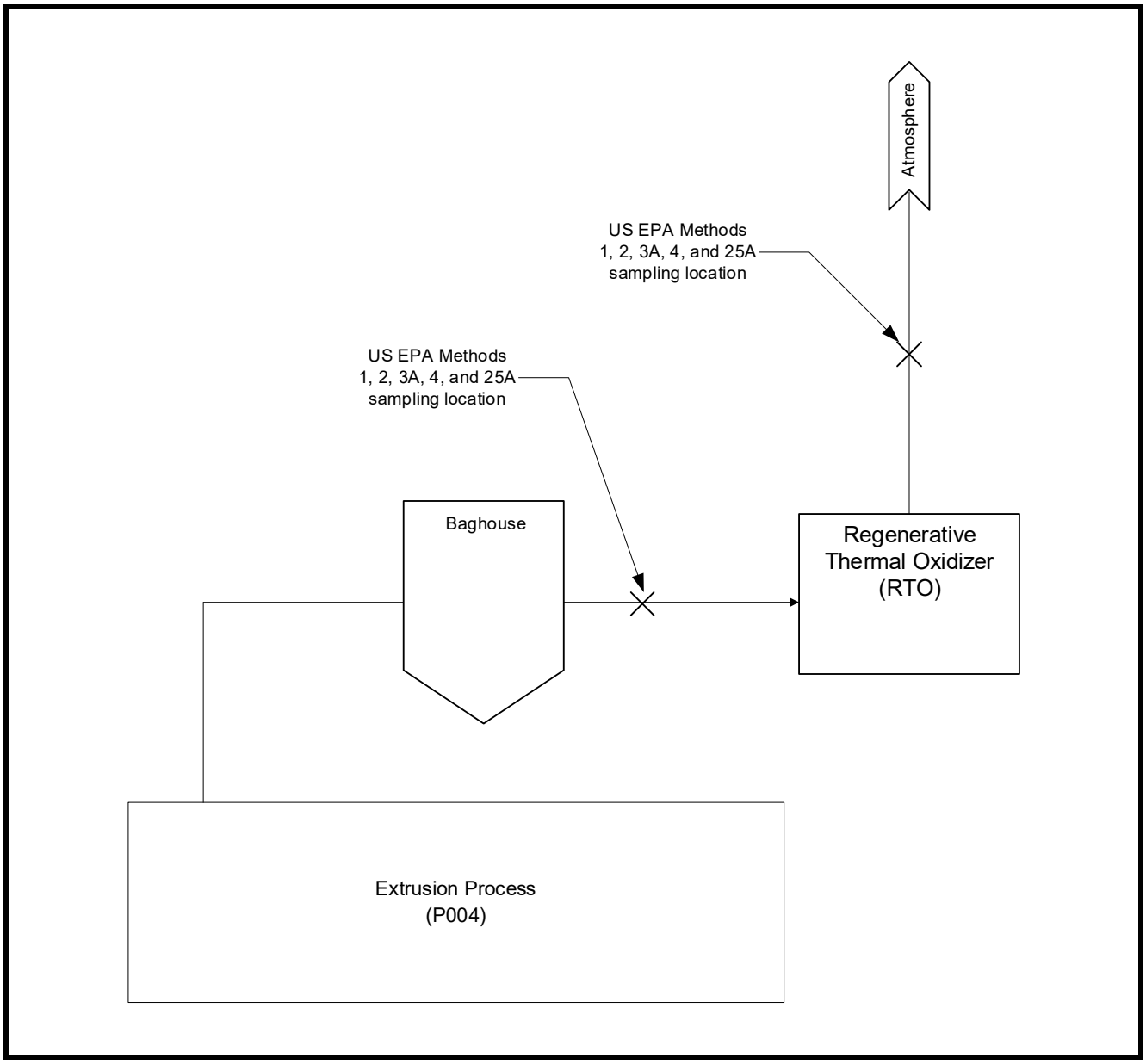
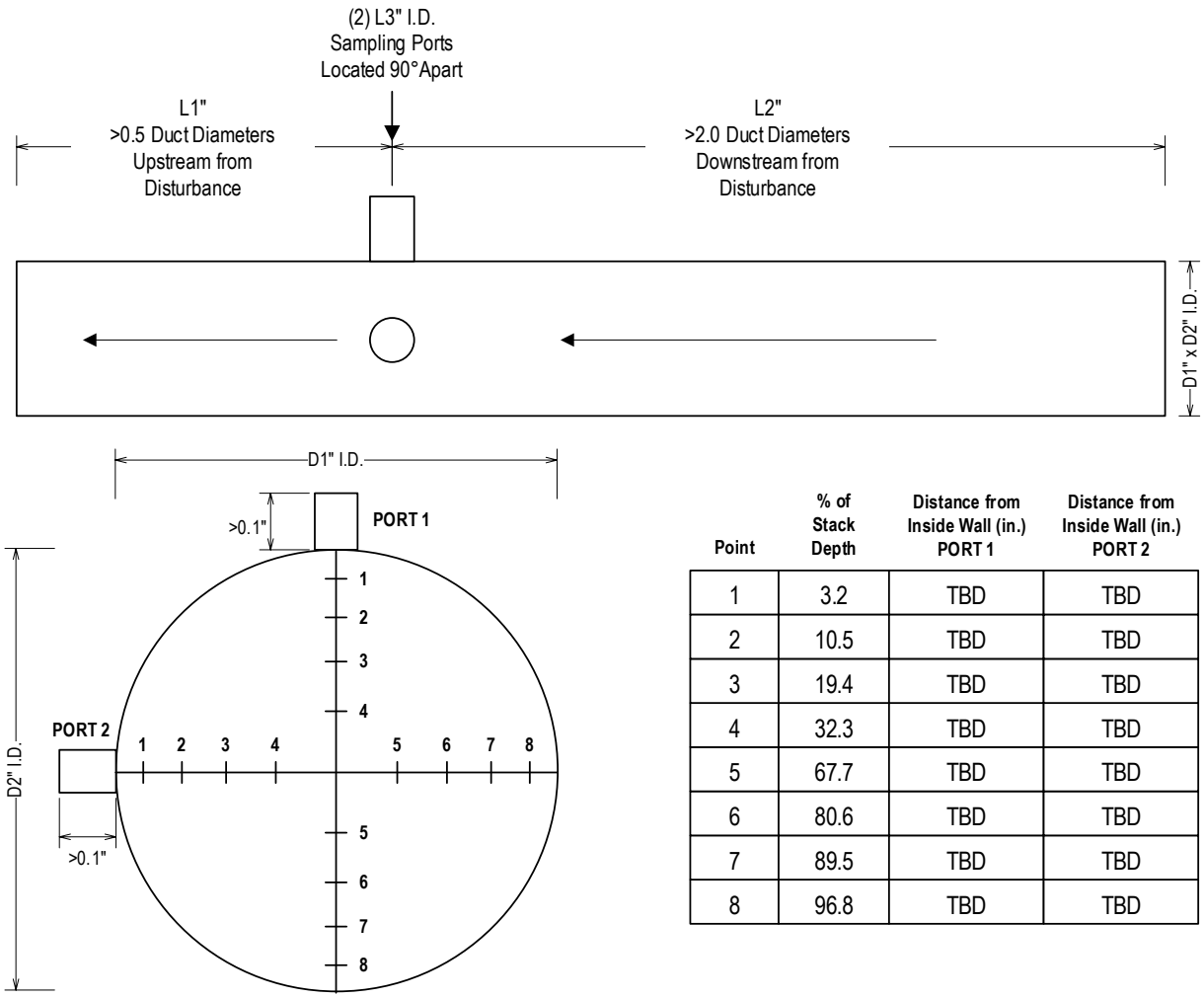


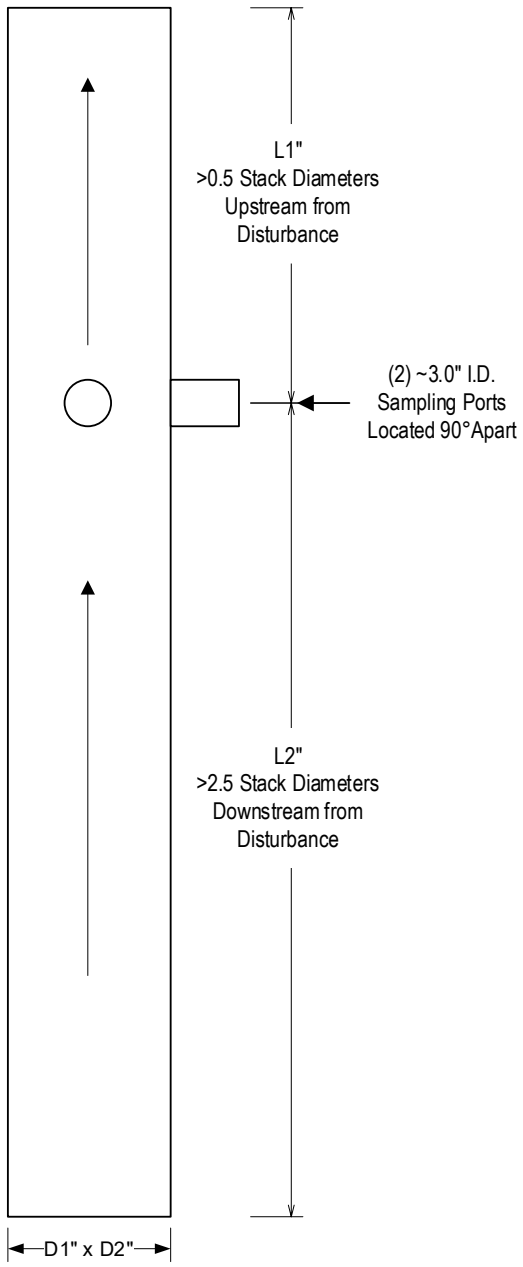
Figure A-1 P004 Sampling Location/Process Flow Schematic

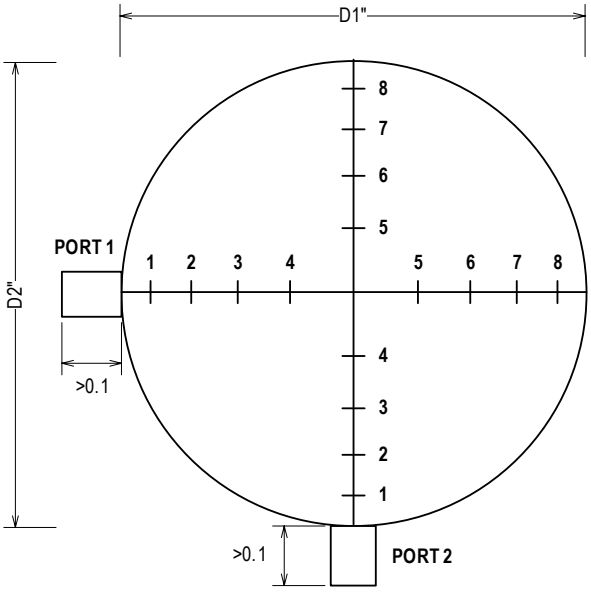


Point	% of Stack Depth	Distance from Inside Wall (in.) PORT 1	Distance from Inside Wall (in.) PORT 2
1	3.2	TBD	TBD
2	10.5	TBD	TBD
3	19.4	TBD	TBD
4	32.3	TBD	TBD
5	67.7	TBD	TBD
6	80.6	TBD	TBD
7	89.5	TBD	TBD
8	96.8	TBD	TBD

Figure A-2 P004 RTO Inlet Duct Traverse Point Schematic*

* Stack dimensions and traverse points will be verified prior to sampling





Point	% of Stack Depth	Distance from Inside Wall (in.) PORT 1	Distance from Inside Wall (in.) PORT 2
1	3.2	TBD	TBD
2	10.5	TBD	TBD
3	19.4	TBD	TBD
4	32.3	TBD	TBD
5	67.7	TBD	TBD
6	80.6	TBD	TBD
7	89.5	TBD	TBD
8	96.8	TBD	TBD

Figure A-3 P004 RTO Exhaust Stack Traverse Point Schematic*

* Stack dimensions and traverse points will be verified prior to sampling

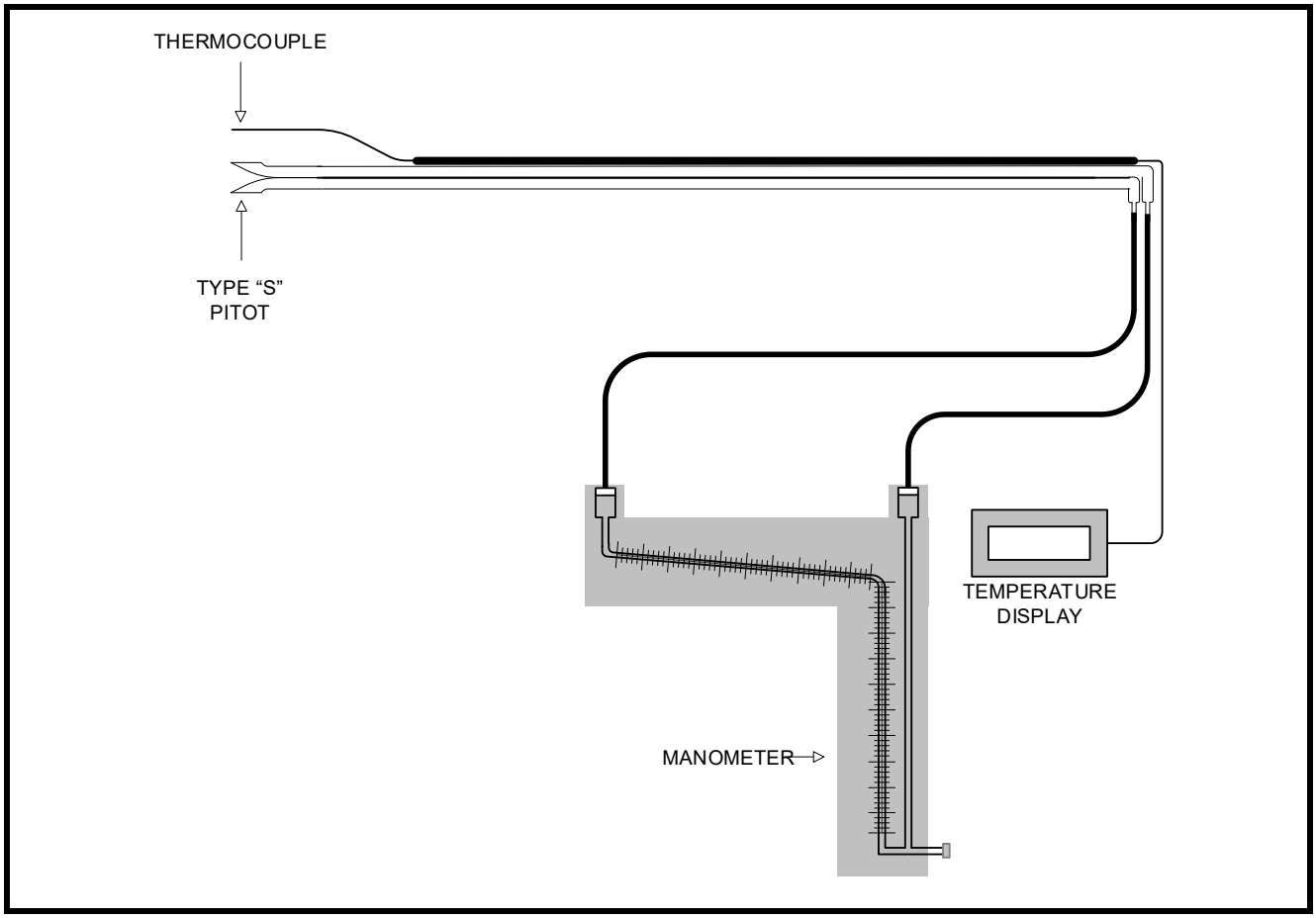


Figure A-4 EPA Method 2 Sampling Train

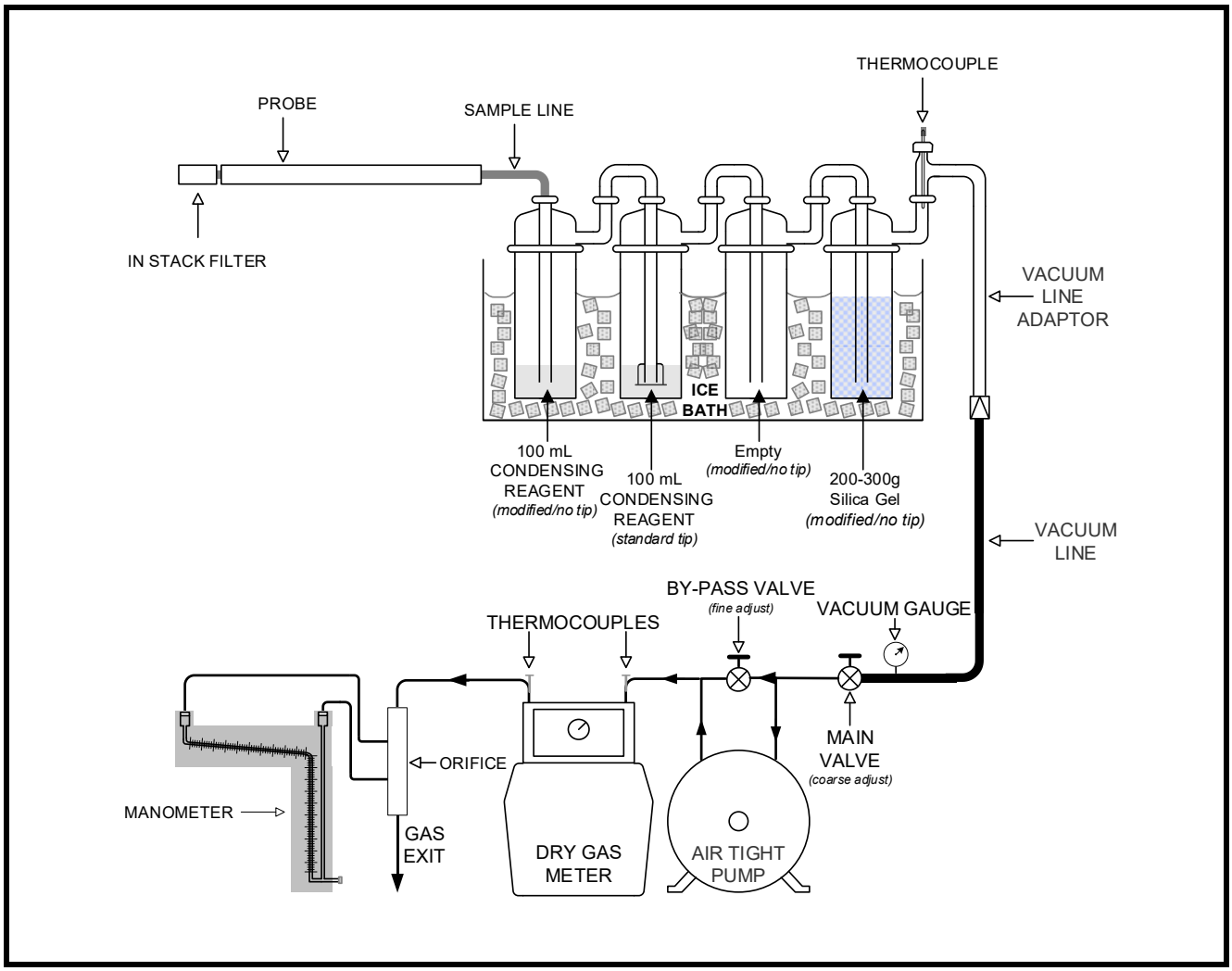


Figure A-5 EPA Method 4 (Detached) Sampling Train

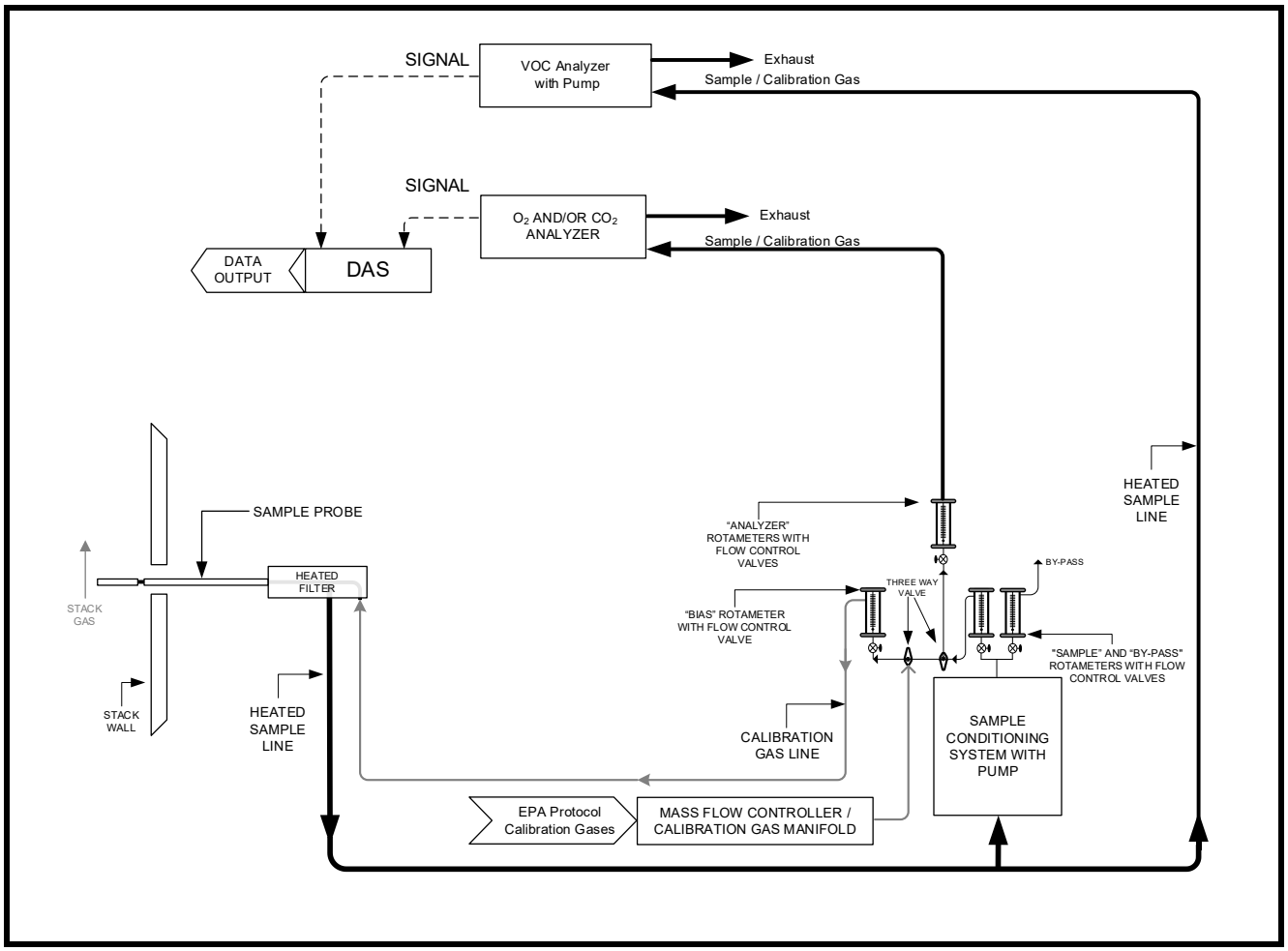


Figure A-6 EPA Methods 3A and 25A Sampling Train Schematic

STAC STACK TESTING ACCREDITATION COUNCIL

A2LA American Association for Laboratory Accreditation

Accredited Air Emission Testing Body

A2LA has accredited

ONTERRIS AIR QUALITY SERVICES, LLC

In recognition of the successful completion of the joint A2LA and Source Evaluation Society (SES) 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 23rd day of January 2026.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3925.01
Valid to February 29, 2028
Revised April 27, 2026

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

Figure A-7 Accreditation Certificate

This is the last page of this document.

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

Jeremiah Hicks
Account Manager
jhicks@onterris.com
440.340.8189

Robert J. Lisy Jr.
District Manager
rlisy@onterris.com
440.262.3760

This is the last page of this document.

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

Jeremiah Hicks
Account Manager
jhicks@onterris.com
440.340.8189

Robert J. Lisy, Jr.
District Manager
rlisy@onterris.com
440.262.3760

Public Notice
Ohio Environmental Protection Agency
Draft State Implementation Plan
VOC Reasonably Available Control Technology (RACT)
for LG Chem Ohio Petrochemical (Facility ID 1667060181)

Portage County

Notice is hereby given that the Director of the Ohio Environmental Protection Agency, (Ohio EPA) is submitting to the United States Environmental Protection Agency (U.S. EPA) Reasonably Available Control Technology (RACT) for LG Chem Ohio Petrochemical (Facility ID 1667060181) for approval into Ohio's state implementation plan (SIP) for the 2015 ozone National Ambient Air Quality Standard (NAAQS).

On March 17, 2025, Ohio submitted a revision to Ohio's SIP to address RACT requirements for the 2015 8-hour ozone NAAQS. As noted in this submittal, OAC rule 3745-21-11(B) requires facilities that have the potential to emit of fifty tons per year or more, but less than one hundred tons per year of volatile organic compounds (VOC) and are located in nonattainment counties to submit a RACT study for sources not controlled by Ohio's CTG regulations in OAC Chapter 3745-21 or by categorical non-CTG RACT in OAC rules 3745-21-12, 3745-21-14, 3745-21-16, 3745-21-21 and 3745-21-25.

Ohio is now submitting source-specific VOC RACT for LG Chem Ohio Petrochemical (Facility ID 1667060181) for approval into Ohio's SIP. This facility is located in the Cleveland 2015 ozone maintenance area and has no prior existing source-specific RACT established in OAC rule 3745-21-09.

The updated RACT Study was submitted per OAC rule 3745-21-11(B). Ohio has determined that the updated RACT study, along with supplemental information submitted subsequently, is sufficient to justify the continued operation of the existing regenerative thermal oxidizer with an overall control efficiency of at least 96%, by weight for VOC, or 7 ppmvd VOC at the outlet of the RTO proposed by the facility to act as RACT under the 2015 ozone standard.

Ohio EPA is now requesting approval of the proposed RACT for LG Chem Ohio Petrochemical into Ohio's SIP.

Ohio EPA is seeking public comment to satisfy U.S. EPA requirements for public involvement in SIP related activities in accordance with 40 CFR 51.102.

The public comment period will run until November 2, 2026. Written comments should be submitted at: https://ohioepa.commentinput.com - Search by entering the permit # (P0141148) in the "Search Projects" search box.

A public hearing on this action may be requested by contacting Kathryn Jobe at 614-728-0671 or kathryn.jobe@epa.ohio.gov no later than 30 days from the draft public notice. If a public hearing is requested, a new notification will be published to identify the time and location of the public hearing. The public hearing will be held at least 30 days after the date of the new notification.

All interested persons are entitled to comment on these changes. All comments submitted to the above address by the close of business 30 days from when the draft public notice is issued will be considered by Ohio EPA prior to final action on this action. Written statements submitted after this time period may be considered as time and circumstances permit but will not be part of the official record.

Questions or comments about this document should be directed to Kathryn Jobe at 614-728-0671 or kathryn.jobe@epa.ohio.gov.

DATE

Ms. Anne Vogel
Regional Administrator
U.S. EPA, Region 5
77 West Jackson Blvd.
Chicago, Illinois 60604

Re: Revision to Ohio's Reasonably Available Control Technology (RACT) State Implementation Plan for the 2015 Ozone National Ambient Air Quality Standards – Source-Specific Volatile Organic Compounds (VOC) RACT for LG Chem Ohio Petrochemical (Facility ID 1667060181)

Dear Administrator Vogel:

On March 17, 2025, Ohio submitted a revision to Ohio's State Implementation Plan (SIP) to address Reasonably Available Control Technology (RACT) requirements for the 2015 8-hour ozone National Ambient Air Quality Standards (NAAQS) for areas classified as serious. As noted in this submittal, Ohio EPA adopted requirements in OAC rule 3745-21-11 for facilities in the nonattainment areas that emit fifty tons per year or more, but less than one hundred tons per year of VOC from sources not controlled by Ohio's CTG regulations in OAC Chapter 3745-21 or by categorical non-CTG RACT in OAC rules 3745-21-12, 3745-21-14, 3745-21-16, 3745-21-21 and 3745-21-25 to submit an updated RACT study within one year of the effective date of the rule. Upon review of the RACT study, Ohio EPA evaluated if the RACT proposed by the facility is appropriate to satisfy RACT requirements under the 2015 ozone standard.

Ohio is now submitting source-specific VOC RACT for LG Chem Ohio Petrochemical (Facility ID 1667060181) for approval into Ohio's SIP. This facility is located in the Cleveland 2015 ozone maintenance area and has no prior existing source-specific RACT established in OAC rule 3745-21-09.

The updated VOC RACT Study was submitted per OAC rule 3745-21-11. Ohio has determined that the updated RACT study, along with supplemental information submitted subsequently, is sufficient to justify the continued operation of the existing regenerative thermal oxidizer with an overall control efficiency of at least 96%, by weight for VOC, or 7 ppmvd VOC at the outlet of the RTO proposed by the facility to act as RACT under the 2015 ozone standard. The RACT study is provided in Appendix A, and the permit that incorporated RACT is provided as Appendix B. Within the permit, we have

DRAFT

highlighted the terms and conditions associated with RACT and request only those provisions are subject to this SIP revision request. Appendix C provides the permit strategy write-up for the permit.

Ohio held a public comment period on Ohio's RACT determination from October 1 to November 2, 2026. Appendix D contains the public notice. ***[Ohio's response to comments received during the public comment period is in Appendix E/No comments were received during the public comment period].***

This SIP does not include the relaxation of any existing requirements and therefore will not interfere with the attainment or maintenance of the NAAQS in accordance with section 110(l) of the CAA.

Ohio EPA is now requesting approval of the proposed RACT for LG Chem Ohio Petrochemical into Ohio's SIP.

Ohio EPA is submitting this SIP via U.S. EPA's State Planning Electronic Collaboration System (SPeCS). If you have questions, please contact Jennifer Van Vlerah in our Division of Air Pollution Control at (614) 644-3696.

Sincerely,

John Logue
Director

Cc: Bob Hodanbosi, Chief, Division of Air Pollution Control, Ohio EPA

Enclosures

DRAFT