SOUTH COAST AQMD
CLERK OF THE BOARDS
2025 DEC 19 AM 10: 27

PETITION FOR VARIANCE
BEFORE THE HEARING BOARD OF THE
SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

PETITIONER: SpaceX _____ CASE NO: 6284-1 _____

_____ FACILITY ID: 191558 _____

FACILITY ADDRESS: 3901 Jack Northrop Avenue, _____
[location of equipment/site of violation; specify business/corporate address, if different, under Item 2, below]

City, State, Zip: Hawthorne, CA 90250 _____

1. TYPE OF VARIANCE REQUESTED (more than one box may be checked; see Attachment A, Item 1, before selecting)

☒ INTERIM ☐ SHORT ☐ REGULAR ☒ EMERGENCY ☐ EX PARTE EMERGENCY

2. CONTACT: Name, title, company (if different than Petitioner), address, and phone number of persons authorized to receive notices regarding this Petition (no more than two authorized persons).

Nicholas Engebretson
SpaceX
1 Rocket Road
Hawthorne, CA Zip 90250
☎ (310) 8442952 Ext.
Fax ( )

Peter Hsiao
King & Spalding LLP
633 W. Fifth Street, Suite 1600
Los Angeles, CA Zip 90071
☎ (213) 444-4379 Ext.
Fax ( )

Persons with disabilities may request this document in an alternative format by contacting the Clerk of the Board at 909-396-2500 or by e-mail at clerkofboard@aqmd.gov.

If you require disability-related accommodations to facilitate participating in the hearing, contact the Clerk of the Board at least five (5) calendar days prior to the hearing.

[ALL DOCUMENTS FILED WITH CLERK'S OFFICE BECOME PUBLIC RECORD]

E-mail Nicholas.engebretson@spacex.com *E-mail* phsiao@kslaw.com

3. RECLAIM Permit ☐ Yes ☒ No Title V Permit ☐ Yes ☒ No

4. **GOOD CAUSE:** Explain why your petition was not filed in sufficient time to issue the required public notice. (Required only for Emergency and Interim Variances; see Attachment A, Item 4)

SpaceX respectfully submits this petition for an Emergency and Interim Variance immediately after receiving notice from District Staff on December 17, 2025 that its pending applications for permits to operate four wax burnoff/shell preheat furnaces at its Hawthorne facility (FID 191558) were denied. Space X immediately contacted and communicated with District Staff who advised that the furnaces could no longer be operated unless a variance was sought and obtained. Space X prepared and filed this variance petition on the next day, December 18, 2025, seeking permission to continue the critical operation of this equipment and prevent the shutdown of its facility operations pending review of District Staff of a corrected and updated permit application which will be submitted on December 18, 2025. These corrections and additions address each of the District's Staff's concerns regarding the completeness of the permit applications and if approved, should result in the issuance of the requested permits. Variance relief, or in the alternative, the Application Shield in District Rule 202(c), should provide sufficient additional time for District Staff's review.

SpaceX has worked closely with the District Staff regarding this existing equipment that formerly operated under valid District permits to operate. When the equipment was moved to a new location, District Staff directed Space X to submit applications for new permits to operate, including information to comply with District Rule 1147 regarding NOx and CO emissions limits and new source testing. Space X submitted the new applications in January 2025 with the assistance of its expert consultants at Yorke Engineering and operated under District Rule 202(c).

Subsequently, the District amended Rule 1147 to reduce the permitted emission limits. This required additional source testing and submission of new test protocols. Subsequent source testing demonstrated that the four furnaces comply with the source testing limits. SpaceX proceeded on a testing schedule that it believed was acceptable to the District based upon their consultations with District Staff. The supporting data and analysis will be provided to District Staff with the amended permit application on December 18, 2025, the same day of the filing of this petition.

These developments, particularly the denial and the immediate resubmission of an amended permit application, and the need for immediate relief establish good cause for why this petition was not filed in sufficient time to issue the required public notice.

5. Briefly describe the type of business and processes at your facility.

SpaceX's facility in Hawthorne, California produces advanced rocket engines for a portfolio of public and government parties, including production of the "Starship" spacecraft and "Raptor" rocket engines for NASA's Artemis program. Housed processes include raw material inputs, subassembly, primary assembly, and final integration of hardware. Once assembled, hardware is sent to launch sites for testing and operations.

6. List the equipment and/or activity(s) that are the subject of this petition (see Attachment A, Item 6, Example #1). **Attach copies of the Permit(s) to Construct and/or Permit(s) to Operate for the subject equipment. For RECLAIM or Title V facilities, attach *only* the relevant sections of the Facility Permit showing the equipment or process and conditions that are subject to this petition. You must bring the entire Facility Permit to the hearing.**

Equipment/Activity	Application/ Permit No.	RECLAIM Device No.	Date Application/Plan Denied (if relevant)*
Wax Burnoff Furnace	658071	N/A	12/17/2025
Wax Burnoff Furnace	658073	N/A	12/17/2025
Wax Burnoff Furnace	658076	N/A	12/17/2025
Wax Burnoff Furnace	658077	N/A	12/17/2025

*Attach copy of denial letter

7. Briefly describe the activity or equipment, and why it is necessary to the operation of your business. A schematic or diagram may be attached, in addition to the descriptive text.

SpaceX operates four wax burnoff/preheat furnaces to facilitate investment casting of its Raptor engine. These furnaces prepare and preheat wax molds to receive and cast molten nickel superalloys – a critical step in

foundry operations which pours engine parts. Without the ability to operate these furnaces, all production and operations will cease at locations in California and downstream at our test and launch facilities.

SpaceX's Raptor engine is a critical component in a $4.05 Billion dollar contract with NASA to return American astronauts to the moon in 2027. Denial of these permit applications and interruption of these manufacturing activities create undue risk to that program, to the company's contractual obligations and duties, and potentially to national security. SpaceX is also building and flying Raptor engines to meet additional contractual milestones with the Department of Defense, the U.S. Space Force, and the Space Development Agency.

8. Is there a regular maintenance and/or inspection schedule for this equipment? Yes ☒ No ☐

If yes, how often: Monthly Date of last maintenance and/or inspection 12/13/2025

Describe the maintenance and/or inspection that was performed.

Furnaces were tuned by oven technicians to meet emission standards on 12/13/2025.

9. List all District rules, and/or permit conditions [indicating the specific section(s) and subsection(s)] from which you are seeking variance relief (if requesting variance from Rule 401 or permit condition, see Attachment A). Briefly explain how you are or will be in violation of each rule or condition (see Attachment A, Item 9, Example #2).

Rule	Explanation
1313(b)	Pursuant to Rule 1313(b) the applications for permits to operate shall, for the purposes of Regulation XIII, be considered applications for permits to construct.
1147(d)(6)	New units to comply with applicable NOx and CO limits before operation.
210(a)	Permit application to contain all necessary information to determine compliance with District Rule
1303(b)(4)	Permit to Construct requires compliance with all applicable rules. (District Letter dated December 16, and delivered on December 17, 2025, attached.)

10. Are the equipment or activities subject to this request currently under variance coverage? Yes ☐ No ☒

Case No.	Date of Action	Final Compliance	Explanation

[YOU MAY ATTACH ADDITIONAL PAGES IF NECESSARY]

		Date	

11. Are any other equipment or activities at this location currently (or within the last six months) under variance coverage? Yes ☐ No ☒

Case No.	Date of Action	Final Compliance Date	Explanation

12. Were you issued any Notice(s) of Violation or Notice(s) to Comply concerning this equipment or activity within the past year? Yes ☐ No ☒

If yes, you must attach a copy of each notice.

13. Have you received any complaints from the public regarding the operation of the subject equipment or activity within the last six months? Yes ☐ No ☒

If yes, you should be prepared to present details at the hearing.

14. Explain why it is beyond your reasonable control to comply with the rule(s) and/or permit condition(s). Provide specific event(s) and date(s) of occurrence(s), if applicable.

The missing information identified by the District Staff in the permit applications will be submitted with a revised permit application on December 18, 2025, concurrently with the filing of this petition. This information will demonstrate compliance and show the subject equipment will operate within the emission thresholds of Rule 1147, and within the proposed amended permit conditions contained in the permit applications originally submitted February 2025.

SpaceX conducted source testing on December 16, 17, and 18, 2025. These dates and the proposed schedule of work was shared in advance with the District. The District issued its denial of the pending applications on December 16, 2025. SpaceX performed the testing and submitted the results to the District at the earliest possible time, and followed up with a revised permit application to address the remaining information requested by the District. SpaceX is able to comply with all permit conditions regarding operation of the equipment. The granting of this variance petition will provide District Staff with reasonable additional time to review and analyze this additional information, and it is beyond SpaceX's reasonable control to comply with the new proposed permit until District Staff completes its review. Alternatively, Space X can proceed to operate under the Application Shield in District Rule 203(c) based upon the submission of its revised permit application on the same date as the filing of this petition.

15. When and how did you first become aware that you would not be in compliance with the rule(s) and/or permit condition(s)? Provide specific event(s) and date(s) of occurrence(s).

SpaceX became aware of the need for a variance on December 17, 2025, the day before this petition will be filed, because of the denial of its then pending permit applications. SpaceX communicated its plan to provide the District the requested materials and acted in good faith with due diligence to schedule and carry out testing on December 16th – 18th as shared with District Staff. SpaceX committed to this timeline and did not understand District Staff to object to this timeline. SpaceX believes the source test results, new protocols and adherence to the new proposed permit conditions has established its compliance from a technical review with the applicable emission limits.

16. List date(s) and action(s) you have taken since that time to achieve compliance. That the Petition Form HB-V, and any related instructions, include requirement that the Petitioner include a timeline in suitable, chronological format to address the events, dates, and actions called for by Questions 15 and 16, including the dates of communication with the South Coast AQMD to notify them of the occurrence(s) giving rise to the requested variance.

[YOU MAY ATTACH ADDITIONAL PAGES IF NECESSARY]

SpaceX has diligently conducted emissions source testing on the four furnaces to verify compliance with the NOx and CO emissions limits outlined in Rule 1147.

Testing for the first furnace was completed on October 15, 2025, with results confirming full compliance. In response to the meeting with District Staff on November 7, 2025, SpaceX promptly prioritized and executed testing on the remaining three furnaces, which took place on December 16, 2025; December 17, 2025; and December 18, 2025.

As of December 18, 2025, emissions data from all four furnaces demonstrate compliance with Rule 1147's requirements for NOx and CO emissions.

Detailed Timeline of Significant Actions to Achieve Compliance with Rule 1147:

- **October 15, 2025**: Emissions source testing conducted on Wax Burnoff Furnace (Cerberus) (PREHEAT3) (AN 658076) by Montrose Air Quality Group. Results confirmed compliance with NOx and CO limits.
- **November 7, 2025**: SpaceX and Yorke Engineering requested a summary of the October 15, 2025, test results from Montrose Air Quality Group via email.
- **November 19, 2025**: SpaceX and Yorke Engineering followed up with another request for a summary of the October 15, 2025, test results from Montrose Air Quality Group via email.
- **November 20, 2025**: Montrose Air Quality Group confirmed via email that SpaceX would receive the draft report for the October 15, 2025, test by the first week of December.
- **November 26, 2025**: SpaceX notified the South Coast Air Quality Management District (SCAQMD) of plans to proceed with source testing on the remaining furnaces.
- **December 3, 2025**: SpaceX notified SCAQMD of prior source test dates and the status of pending reports.
- **December 3, 2025**: SpaceX and Yorke Engineering requested a summary of the October 15, 2025, test results from Montrose Air Quality Group via email.
- **December 4, 2025**: SpaceX and Yorke Engineering sent another request for a summary of the October 15, 2025, test results from Montrose Air Quality Group via email.
- **December 8, 2025**: Montrose Air Quality Group confirmed the testing schedule for the remaining three furnaces on December 16, 17, and 18, 2025.
- **December 9, 2025**: SpaceX communicated its plan to provide SCAQMD the requested materials and was acting in good faith to schedule and carry out testing on December 16, 17, and 18, 2025. SpaceX did not understand from these communications that SCAQMD sought to shorten the proposed timeline for this work.
- **December 11, 2025**: SpaceX and Yorke Engineering requested a summary of the October 15, 2025, test results from Montrose Air Quality Group via email.
- **December 11, 2025**: Montrose Air Quality Group provided SpaceX with a summary confirming passing NOx and CO results for the Wax Burnoff Furnace (Cerberus) (PREHEAT3) (AN 658076).
- **December 13, 2025**: The furnaces were tuned and verified to demonstrate compliance with Rule 1147 NOx and CO emissions limits.
- **December 15, 2025**: SpaceX submitted an updated source testing protocol to SCAQMD, requesting expedited review.
- **December 16, 2025**: Emissions source testing conducted on Wax Burnoff Furnace (Cerberus) (PREHEAT1) (AN 658071) by Montrose Air Quality Group. Results confirmed compliance with NOx and CO limits.
- **December 17, 2025**: Emissions source testing conducted on Wax Burnoff/Shell Preheat Furnace No. 3 (BURNOUT 1) (AN 658073) by Montrose Air Quality Group. Results confirmed compliance with NOx and CO limits.
- **December 18, 2025**: Emissions source testing conducted on Wax Burnoff/Shell Preheat Furnace No. 3 (BURNOUT 2) (AN 658075) by Montrose Air Quality Group. Results confirmed compliance with NOx and CO limits.
- **December 18, 2025**: In response to SCAQMD's denial letter received on December 17, 2025, SpaceX immediately submitted new permit applications for all four furnaces, including preliminary source testing results showing passing NOx and CO limits for three furnaces, and paid the required permitting fees.
- **December 18, 2025**: Upon SCAQMD's notification that the applications must be resubmitted as Class 1, SpaceX promptly resubmitted them accordingly.

17. What would be the harm to your business during **and/or after** the period of the variance if the variance were not granted?

Economic losses: SpaceX's contractual obligations for the production of the subject hardware is at risk, with the contract amount of $4 Billion. The actual measurable economic losses would depend on a number of factors including the length of any shutdown of the furnaces.

Number of employees laid off (if any):_____55 Direct – 1200 Downstream_____

Provide detailed information regarding economic losses, if any, (anticipated business closure, breach of contracts, hardship on customers, layoffs, and/or similar impacts).

SpaceX operates four wax burnoff/preheat furnaces to facilitate investment casting of its Raptor engine. These furnaces prepare and preheat wax molds to receive molten metal alloys – a critical step in foundry operations which pours engine parts. Without the ability to operate these furnaces, all downstream Raptor production and operations will cease at the factory, and 55 employees who directly operate the foundry equipment and furnaces will be unable to fulfil their job roles.

SpaceX's Raptor engine is a critical component in a $4.05 Billion dollar contract NASA to return American astronauts to the moon in 2027. Halting production will cause irreparable harm to SpaceX's business, employees, and also cause unacceptable delays to America's space program and national goals. In addition SpaceX is also building and flying Raptor engines to meet additional contractual milestones with the Department of Defense, the U.S. Space Force, and the Space Development Agency. These milestones will also be at risk and present the same impacts to SpaceX, its employees, and the USA's space program.

The production of this sensitive hardware cannot be performed by any other company due to international trade, arms control and security restrictions.

18. Can you curtail or terminate operations in lieu of, or in addition to, obtaining a variance? Please explain.

SpaceX considered the shutdown of its furnaces but could not cease these operations without ceasing the raw material used to supply the entire production operations of the entire facility.

19. Estimate excess emissions, if any, on a daily basis, including, if applicable, excess opacity (the percentage of total opacity above 20% during the variance period). If the variance will result in no excess emissions, insert "N/A" here and skip to No. 20.

Pollutant	(A) Total Estimated Excess Emissions (lbs/day)	(B) Reduction Due to Mitigation (lbs/day)	(C)* Net Emissions After Mitigation (lbs/day)
None, because the operations during the variance period will comply with all applicable emission limits and permit conditions. See District Rule 203(c)			

* Column A minus Column B = Column C

Excess Opacity:_____%

20. Show calculations used to estimate quantities in No. 19, **or** explain why there will be no excess emissions.

N/A

21. Explain how you plan to reduce (mitigate) excess emissions during the variance period to the maximum extent feasible, or why reductions are not feasible.

N/A

22. How do you plan to monitor or quantify emission levels from the equipment or activity(s) during the variance period, and to make such records available to the District? **Any proposed monitoring does not relieve RECLAIM facilities from applicable missing data requirements.**

N/A

23. How do you intend to achieve compliance with the rule(s) and/or permit condition(s)? Include a detailed description of any equipment to be installed, modifications or process changes to be made, permit conditions to be amended, etc., dates by which the actions will be completed, and an estimate of total costs.

During the variance period, all equipment will be operated in compliance with all District rules and permit conditions. The variance is sought to provide District Staff with sufficient time to consider, comment upon and determine any additional steps required to issue the permits to operate.

[YOU MAY ATTACH ADDITIONAL PAGES IF NECESSARY]

24. State the date you are requesting the variance to begin: 12/18/2025; and the date by which you expect to achieve final compliance: District Staff is anticipated to make a permit determination in an expedited permit review process requested by SpaceX. If additional time is required after issuance of an interim variance, SpaceX will consult with District Staff and be prepared to seek a Regular Variance for additional relief.

If the regular variance is to extend beyond one year, you **must** include a **Schedule of Increments of Progress**, specifying dates or time increments for steps needed to achieve compliance. See District Rule 102 for definition of Increments of Progress (see Attachment A, Item 24, Example #3).

List Increments of Progress here:

N/A

25. List the names of any District personnel with whom facility representatives have had contact concerning this variance petition or any related Notice of Violation or Notice to Comply.

David Lui Ext. 2438

Sinae Kim Ext. 2397

26. If the petition was completed by someone other than the petitioner, please provide their name and title below.

Name Company Title

The undersigned, under penalty of perjury, states that the above petition, including attachments and the items therein set forth, is true and correct.

Executed on 12/18/2025, at Hawthorne, California

Nicholas Engebretson
Signature

Nicholas Engebretson
Print Name

Title: Lead EHS Engineer

THIS SECTION IS FOR SMALL BUSINESSES ONLY

[YOU MAY ATTACH ADDITIONAL PAGES IF NECESSARY]

South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 • www.aqmd.gov

December 16, 2025

DENIED

Mr. Nicholas Engebretson
Lead EHS Engineer
Space Exploration Technologies (Facility ID 191558)
1 Rocket Road
Hawthorne, CA 90250

RE: Application Nos. 658071, 658073, 658076, and 658077 – Permits to Operate Four Relocated Wax Burnoff Furnaces at 3901 Jack Northrop Ave., Hawthorne, CA 90250

Dear Mr. Engebretson:

After review of the submitted materials and all information made available to the South Coast Air Quality Management District (South Coast AQMD) staff, Application Nos. 658071, 658073, 658076, and 658077 are denied for the following reasons:

1. Rule 1147(d)(6) requires that a new unit comply with the applicable NOx and CO emission limits in Table 2 before it may operate. Because the furnaces were relocated to the current location after May 6, 2022, all four furnaces are considered new units under this rule.

   To date, Space Exploration Technologies (SpaceX) has not provided manufacturer guarantees or valid source test results demonstrating compliance with the Table 2 emission limits (30 ppmvd @ 3% O_2 or 0.036 lb/MMBtu for NOx, and 1,000 ppmvd @ 3% O_2 for CO) at the current location. Available source test data from the previous location indicate NOx emission levels above the applicable limits for certain units, and no approved demonstration of compliance has been provided for any of the furnaces as installed and operated at the new location.

2. Rule 210(a) requires each permit application to include all information necessary for the Executive Officer to determine compliance with applicable rules. Demonstration of compliance with Rule 1147 is required before South Coast AQMD staff can complete the evaluation.

   SpaceX has not submitted the documentation necessary for this determination, including an approved source test protocol or source test reports for the relocated equipment. Although SpaceX indicated that two furnaces were recently tested, no source test reports have been submitted for South Coast AQMD review.

3. Rule 1303(b)(4) requires the denial of a Permit to Construct unless the facility complies with all applicable South Coast AQMD rules and regulations. Pursuant to Rule 1313(b), the applications for Permits to Operate shall, for purposes of Regulation XIII, be considered applications for Permits to Construct. Because SpaceX has not demonstrated compliance with Rule 1147, the applications do not satisfy the requirements of Rule 1303(b)(4).

South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 • www.aqmd.gov

IMPORTANT INFORMATION CONCERNING DENIALS

A letter of denial is a form of legal action and is considered as such by the South Coast Air Quality Management District (South Coast AQMD).

The information contained herein is provided to emphasize the importance of taking the proper steps without delay after receiving a letter of denial. This information is not intended to take the place of competent legal advice.

You are advised that the Hearing Board of the South Coast AQMD has been established by law to hear appeals of actions of the Executive Officer. Should you elect to file a petition to appeal a denial, it is recommended that you familiarize yourself with the Rules and Regulations of the South Coast AQMD and provisions of the California Health & Safety Code pertaining to Hearing Boards (Div. 26, Part 3, Ch. 8) and Enforcement (Div. 26. Part 4, Ch. 4).

After receiving a letter of denial, you have the following options:

1. File an appeal with South Coast AQMD's Hearing Board within 30 (thirty) days after the receipt of this denial, OR

2. File a petition with South Coast AQMD's Hearing Board for a variance to allow operation of the equipment while the air pollution problem is being resolved, OR

3. Suspend construction or operation of all equipment involved and file a new application with South Coast AQMD which corrects the identified deficiencies stated as the reasons for the denial, OR

4. Abandon construction or operation of all equipment involved in the denial.

In all cases, since the permit for this equipment has now been denied, construction or operation of all equipment involved must be suspended completely until either a valid Permit to Construct or a Permit to Operate has been issued by South Coast AQMD or a variance has been granted by South Coast AQMD's Hearing Board. In no way can the filing of either a new application with South Coast AQMD or a petition with South Coast AQMD's Hearing Board be construed as permission to continue the construction or operation of the equipment involved.

Existing laws state that every person who builds, erects, alters, uses, or operates any source capable of emitting or controlling air contaminants without first obtaining the necessary permits is guilty of a misdemeanor and that every day during which such violation occurs is a separate offense.

Should construction or operation continue after receipt of a denial, the Executive Officer will take whatever legal action is deemed necessary, as prescribed by existing laws and regulations.

James Chavez

From: Jessica McLellan <Jessica.McLellan@spacex.com>
Sent: Friday, December 19, 2025 10:06 AM
To: Clerk of Board
Cc: Ruthie Bruch; Nicholas Engebretson; Jordan Buss; Sinae Kim; David Lui
Subject: [EXTERNAL] FW: SpaceX Petition for Emergency and Interim Variance
Attachments: Previous Operating Permits FID 184509.zip; SpaceX Denial.pdf; New Class 1 Apps.zip

Thank you for our discussion this morning on the phone.

Per our conversation, SpaceX is requesting a formal submittal modification for an Ex-Parte Emergency & Interim Variance Petition. To support this request, I've attached the following additional documentation:

- Previous Operating Permits (Facility ID 184509)
- Denial of Permit Applications (Received 12/17)
- New Class 1 Permit Applications (Submitted 12/18)

Please confirm receipt of these materials and provide an electronic payment request at your earliest convenience.

Best regards,
Jessica

Jessica McLellan | **Manager Environmental Health and Safety Engineer**

SPACEX

1 Rocket Rd, Hawthorne CA 90250
M: 213-733-6692
W: 310-682-8859
E: Jessica.McLellan@spacex.com

From: Jessica McLellan
Sent: Thursday, December 18, 2025 11:52 PM
To: 'clerkofboard@aqmd.gov' <clerkofboard@aqmd.gov>
Cc: Ruthie Bruch <Ruthanne.Bruch@spacex.com>; Nicholas Engebretson <Nicholas.Engebretson@spacex.com>; Jordan Buss <Jordan.Buss@spacex.com>
Subject: SpaceX Petition for Emergency and Interim Variance

Attached is the variance of petition submitted by SpaceX. We will call the Clerk of the Boards to confirm payment now.

Thank you,
Jessica

Jessica McLellan | **Manager Environmental Health and Safety Engineer**

SPACEX

1 Rocket Rd, Hawthorne CA 90250
M: 213-733-6692
W: 310-682-8859
E: Jessica.McLellan@spacex.com

SpaceX
1 Rocket Road
Hawthorne, CA 90250

December 18, 2025

South Coast Air Quality Management District
Permit Services
Diamond Bar, CA 91765
Work: (909) 396-3385
E-mail: PermitServicesOnline@aqmd.gov

Subject: Permit Application for Four Wax Burnoff Furnaces

Dear Permit Services:

Space Exploration Technologies (SpaceX) is submitting this application for permits to construct for four Wax Burnoff/Preheat furnaces at the HT27 facility at 3901 Jack Northrop Ave, Hawthorne (Facility ID: 191558). Permit applications were originally filed in February 2025 for equipment operating without a permit. The Sinae Kim/SCAQMD issued a Denial Letter on December 16, 2025 (communicated December 17, 2025) stating that documentation is required that the equipment meets the requirements of Rule 1147. The equipment complies with Rule 1147.

Documents are being submitted to show compliance with Rule 1147:

- A source test protocol was submitted to SCAQMD on December 15, 2025. Expedited review was requested with David Lui;
- A complete source test report for Preheat 3 (test date 10/15/2025) from Montrose is undergoing final edits;
- Source tests were performed on all furnaces. Table 1 summarizes results. Attachment 4 is a summary of results. Reports will be submitted as soon as possible.

Table 1: Furnace Source Test Results

Source Name	Location	Test Date	App. No.	Test Results		
				Test Condition	NO_X (ppm @3% O_2)	CO (ppm @3% O_2)
Wax Burnoff Furnace (PREHEAT1)	South Foundry/Pump Line	12/16/25	658071	Low-Fire	17.7	272.1
				High-Fire	17.1	260.9
Wax Burnoff Furnace (BURNOUT 1)	South Foundry/Pump Line	12/17/25	658073	Low-Fire	23.6	411.0
				High-Fire	25.4	217.3
Wax Burnoff Furnace (BURNOUT 2)	North Foundry/TCA Line	12/18/25	658075	Low-Fire	27.6	387
				High-Fire	29.3	237.2
Wax Burnoff Furnace (PREHEAT3)	North Foundry/TCA Line	10/15/25	658076	Low-Fire	24.1	36.0
				High-Fire	23.0 (0.017 lb/MMBtu)	38 (0.017 lb/MMBtu)

Permit filing fees were paid. Attachment 2 is the payment voucher and receipt of payment.

Equipment/Item	Area	A/N	Rule 301 Table IA/IB Description	Sched.	Explanation	Fee
Wax Burnoff Furnace (PREHEAT1)	South Foundry (Pump Line)	658071	Furnace, Burn Off, Wax	C	Permit Processing	$6,259.78
Wax Burnoff/Shell Preheat Furnace No. 3 (BURNOUT 1)	South Foundry (Pump Line)	658073	Furnace, Burn Off, Wax	Identical Equipment	301(c)(1)(E) (50%)	$3,129.89
Wax Burnoff Furnace (Cerberus) (PREHEAT3)	North Foundry (TCA Line)	658076	Furnace, Burn Off, Wax	Identical Equipment	301(c)(1)(E) (50%)	$3,129.89
Wax Burnoff/Shell Preheat Furnace No. 3 (BURNOUT 2)	North Foundry (TCA Line)	658075	Furnace, Burn Off, Wax	Identical Equipment	301(c)(1)(E) (50%)	$3,129.89
					Subtotal	**$15,649.45**
			Equipment Operating without a Permit	**301(c)(1)(C)**	50% subtotal	**$7,824.74**
					Total	**$23,474.19**

Should you have any questions please contact Nicholas Engebretson (310) 844-2952, or Ruthanne Bruch (414) 429-1511.

Sincerely,

Nicholas Engebretson

Nicholas Engebretson
Lead EHS Engineer
SpaceX

Attachments:

1. Application Forms
2. Fee Voucher and Payment Receipt
3. Source Test Protocol
4. Preliminary Source Test Results

South Coast Air Quality Management District

Form 400-A

Application Form for Permit or Plan Approval

List only one piece of equipment or process per form.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

1. **Facility Name** (Business Name of Operator to Appear on the Permit): Space Exploration Technologies

2. **Valid AQMD Facility ID** (Available On Permit Or Invoice Issued By AQMD): 191558

3. **Owner's Business Name** (If different from Business Name of Operator):

Section B - Equipment Location Address

4. **Equipment Location Is:** (●) Fixed Location ( ) Various Location
(For equipment operated at various locations, provide address of initial site.)

3901 Jack Northrop Avenue
Street Address

Hawthorne , CA 90250
City Zip

Nicholas Engebretson Lead EHS Engineer
Contact Name Title

(310) 844-2952 Ext. Fax #
Phone #

E-Mail: Nicholas.Engebretson@spacex.com

Section C - Permit Mailing Address

5. **Permit and Correspondence Information:**
☐ Check here if same as equipment location address

1 Rocket Road
Address

Hawthorne , CA 90250
City State Zip

Nicholas Engebretson Lead EHS Engineer
Contact Name Title

(310) 844-2952 Ext. Fax #
Phone #

E-Mail: Nicholas.Engebretson@spacex.com

Section D - Application Type

6. **The Facility Is:** (●) Not In RECLAIM or Title V ( ) In RECLAIM ( ) In Title V ( ) In RECLAIM & Title V Programs

7. **Reason for Submitting Application** (Select only ONE):

7a. New Equipment or Process Application:

- (●) New Construction (Permit to Construct)
- ( ) Equipment On-Site But Not Constructed or Operational
- ( ) Equipment Operating Without A Permit *
- ( ) Compliance Plan
- ( ) Registration/Certification
- ( ) Streamlined Standard Permit

7b. Facility Permits:

- ( ) Title V Application or Amendment (Refer to Title V Matrix)
- ( ) RECLAIM Facility Permit Amendment

7c. Equipment or Process with an Existing/Previous Application or Permit:

- ( ) Administrative Change
- ( ) Alteration/Modification
- ( ) Alteration/Modification without Prior Approval *
- ( ) Change of Condition
- ( ) Change of Condition without Prior Approval *
- ( ) Change of Location
- ( ) Change of Location without Prior Approval *
- ( ) Equipment Operating with an Expired/Inactive Permit *

Existing or Previous Permit/Application
If you checked any of the items in 7c., you MUST provide an existing Permit or Application Number:

* A Higher Permit Processing Fee and additional Annual Operating Fees (up to 3 full years) may apply (Rule 301(c)(1)(D)(i)).

8a. **Estimated Start Date of Construction** (mm/dd/yyyy): 12/18/2025

8b. **Estimated End Date of Construction** (mm/dd/yyyy): 12/18/2025

8c. **Estimated Start Date of Operation** (mm/dd/yyyy):

9. **Description of Equipment or Reason for Compliance Plan** (list applicable rule):
Wax Burnoff Furnace with Integrated Afterburner (Burnout 1)
(A/N 658073)

10. **For Identical equipment, how many additional applications are being submitted with this application?** (Form 400-A required for each equipment / process): 3

11. **Are you a Small Business as per AQMD's Rule 102 definition?** (10 employees or less and total gross receipts are $500,000 or less OR a not-for-profit training center) (●) No ( ) Yes

12. **Has a Notice of Violation (NOV) or a Notice to Comply (NC) been issued for this equipment?** (●) No ( ) Yes
If Yes, provide NOV/NC#:

Section E - Facility Business Information

13. **What type of business is being conducted at this equipment location?** Aerospace Manufacturing

14. **What is your business primary NAICS Code?** (North American Industrial Classification System): 336414

15. **Are there other facilities in the SCAQMD jurisdiction operated by the same operator?** ( ) No (●) Yes

16. **Are there any schools (K-12) within 1000 feet of the facility property line?** (●) No ( ) Yes

Section F - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application are true and correct.

17. **Signature of Responsible Official:** Nicholas Engebretson

18. **Title of Responsible Official:** Lead EHS Engineer

19. **I wish to review the permit prior to issuance.** (This may cause a delay in the application process.) ( ) No (●) Yes

20. **Print Name:** Nicholas Engebretson

21. **Date:** 12/18/2025

22. **Do you claim confidentiality of data?** (If Yes, see instructions.) ( ) No ( ) Yes

23. **Check List:** ☐ Authorized Signature/Date ☐ Form 400-CEQA ☐ Supplemental Form(s) (ie., Form 400-E-xx) ☐ Fees Enclosed

AQMD USE ONLY	APPLICATION TRACKING #	CHECK #	AMOUNT RECEIVED $	PAYMENT TRACKING #	VALIDATION

DATE	APP REJ	DATE	APP REJ	CLASS I III	BASIC CONTROL	EQUIPMENT CATEGORY CODE	TEAM	ENGINEER	REASON/ACTION TAKEN

South Coast Air Quality Management District

Form 400-A

Application Form for Permit or Plan Approval

List only one piece of equipment or process per form.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

1. Facility Name (Business Name of Operator to Appear on the Permit): Space Exploration Technologies

2. Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 191558

3. Owner's Business Name (If different from Business Name of Operator):

Section B - Equipment Location Address

4. Equipment Location Is: (●) Fixed Location ( ) Various Location
(For equipment operated at various locations, provide address of initial site.)

3901 Jack Northrop Avenue
Street Address

Hawthorne , CA 90250
City Zip

Nicholas Engebretson — Lead EHS Engineer
Contact Name — Title

(310) 844-2952 — Ext. — Fax #
Phone #

E-Mail: Nicholas.Engebretson@spacex.com

Section C - Permit Mailing Address

5. Permit and Correspondence Information:
☐ Check here if same as equipment location address

1 Rocket Road
Address

Hawthorne , CA 90250
City State Zip

Nicholas Engebretson — Lead EHS Engineer
Contact Name — Title

(310) 844-2952 — Ext. — Fax #
Phone #

E-Mail: Nicholas.Engebretson@spacex.com

Section D - Application Type

6. The Facility Is: (●) Not In RECLAIM or Title V ( ) In RECLAIM ( ) In Title V ( ) In RECLAIM & Title V Programs

7. Reason for Submitting Application (Select only ONE):

7a. New Equipment or Process Application:

- (●) New Construction (Permit to Construct)
- ( ) Equipment On-Site But Not Constructed or Operational
- ( ) Equipment Operating Without A Permit *
- ( ) Compliance Plan
- ( ) Registration/Certification
- ( ) Streamlined Standard Permit

7b. Facility Permits:

- ( ) Title V Application or Amendment (Refer to Title V Matrix)
- ( ) RECLAIM Facility Permit Amendment

7c. Equipment or Process with an Existing/Previous Application or Permit:

- ( ) Administrative Change
- ( ) Alteration/Modification
- ( ) Alteration/Modification without Prior Approval *
- ( ) Change of Condition
- ( ) Change of Condition without Prior Approval *
- ( ) Change of Location
- ( ) Change of Location without Prior Approval *
- ( ) Equipment Operating with an Expired/Inactive Permit *

Existing or Previous Permit/Application
If you checked any of the items in 7c., you MUST provide an existing Permit or Application Number:

* A Higher Permit Processing Fee and additional Annual Operating Fees (up to 3 full years) may apply (Rule 301(c)(1)(D)(i)).

8a. Estimated Start Date of Construction (mm/dd/yyyy): 12/18/2025

8b. Estimated End Date of Construction (mm/dd/yyyy): 12/18/2025

8c. Estimated Start Date of Operation (mm/dd/yyyy):

9. Description of Equipment or Reason for Compliance Plan (list applicable rule):
Wax Burnoff Furnace with Integrated Afterburner (Burnout 2)
(A/N 658075)

10. For Identical equipment, how many additional applications are being submitted with this application?
(Form 400-A required for each equipment / process): 3

11. Are you a Small Business as per AQMD's Rule 102 definition?
(10 employees or less and total gross receipts are $500,000 or less OR a not-for-profit training center) (●) No ( ) Yes

12. Has a Notice of Violation (NOV) or a Notice to Comply (NC) been issued for this equipment? (●) No ( ) Yes
If Yes, provide NOV/NC#:

Section E - Facility Business Information

13. What type of business is being conducted at this equipment location?
Aerospace Manufacturing

14. What is your business primary NAICS Code?
(North American Industrial Classification System): 336414

15. Are there other facilities in the SCAQMD jurisdiction operated by the same operator? ( ) No (●) Yes

16. Are there any schools (K-12) within 1000 feet of the facility property line? (●) No ( ) Yes

Section F - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application are true and correct.

17. Signature of Responsible Official: Nicholas Engebretson

18. Title of Responsible Official: Lead EHS Engineer

19. I wish to review the permit prior to issuance. (This may cause a delay in the application process.) ( ) No (●) Yes

20. Print Name: Nicholas Engebretson

21. Date: 12/18/2025

22. Do you claim confidentiality of data? (If Yes, see instructions.) ( ) No ( ) Yes

23. Check List: ☐ Authorized Signature/Date ☐ Form 400-CEQA ☐ Supplemental Form(s) (ie., Form 400-E-xx) ☐ Fees Enclosed

AQMD USE ONLY	APPLICATION TRACKING #	CHECK #	AMOUNT RECEIVED $	PAYMENT TRACKING #	VALIDATION

DATE	APP REJ	DATE	APP REJ	CLASS I III	BASIC CONTROL	EQUIPMENT CATEGORY CODE	TEAM	ENGINEER	REASON/ACTION TAKEN

South Coast Air Quality Management District

Form 400-A

Application Form for Permit or Plan Approval

List only one piece of equipment or process per form.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

1. **Facility Name** (Business Name of Operator to Appear on the Permit): Space Exploration Technologies

2. **Valid AQMD Facility ID** (Available On Permit Or Invoice Issued By AQMD): 191558

3. **Owner's Business Name** (If different from Business Name of Operator):

Section B - Equipment Location Address

4. **Equipment Location Is:** (●) Fixed Location ( ) Various Location
(For equipment operated at various locations, provide address of initial site.)

3901 Jack Northrop Avenue
Street Address

Hawthorne , CA 90250
City Zip

Nicholas Engebretson — Lead EHS Engineer
Contact Name — Title

(310) 844-2952 — Ext. — Fax #
Phone #

E-Mail: Nicholas.Engebretson@spacex.com

Section C - Permit Mailing Address

5. **Permit and Correspondence Information:**
☐ Check here if same as equipment location address

1 Rocket Road
Address

Hawthorne , CA 90250
City State Zip

Nicholas Engebretson — Lead EHS Engineer
Contact Name — Title

(310) 844-2952 — Ext. — Fax #
Phone #

E-Mail: Nicholas.Engebretson@spacex.com

Section D - Application Type

6. **The Facility Is:** (●) Not In RECLAIM or Title V ( ) In RECLAIM ( ) In Title V ( ) In RECLAIM & Title V Programs

7. **Reason for Submitting Application** (Select only ONE):

7a. New Equipment or Process Application:

- (●) New Construction (Permit to Construct)
- ( ) Equipment On-Site But Not Constructed or Operational
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- ( ) Registration/Certification
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7b. Facility Permits:

- ( ) Title V Application or Amendment (Refer to Title V Matrix)
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7c. Equipment or Process with an Existing/Previous Application or Permit:

- ( ) Administrative Change
- ( ) Alteration/Modification
- ( ) Alteration/Modification without Prior Approval *
- ( ) Change of Condition
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Existing or Previous Permit/Application
If you checked any of the items in 7c., you MUST provide an existing Permit or Application Number:

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8a. **Estimated Start Date of Construction** (mm/dd/yyyy): 12/18/2025

8b. **Estimated End Date of Construction** (mm/dd/yyyy): 12/18/2025

8c. **Estimated Start Date of Operation** (mm/dd/yyyy):

9. **Description of Equipment or Reason for Compliance Plan** (list applicable rule):
Wax Burnoff Furnace with Integrated Afterburner (Preheat 1)
(A/N 658071)

10. **For Identical equipment, how many additional applications are being submitted with this application?** (Form 400-A required for each equipment / process): 3

11. **Are you a Small Business as per AQMD's Rule 102 definition?** (10 employees or less and total gross receipts are $500,000 or less OR a not-for-profit training center) (●) No ( ) Yes

12. **Has a Notice of Violation (NOV) or a Notice to Comply (NC) been issued for this equipment?** (●) No ( ) Yes
If Yes, provide NOV/NC#:

Section E - Facility Business Information

13. **What type of business is being conducted at this equipment location?** Aerospace Manufacturing

14. **What is your business primary NAICS Code?** (North American Industrial Classification System): 336414

15. **Are there other facilities in the SCAQMD jurisdiction operated by the same operator?** ( ) No (●) Yes

16. **Are there any schools (K-12) within 1000 feet of the facility property line?** (●) No ( ) Yes

Section F - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application are true and correct.

17. **Signature of Responsible Official:** Nicholas Engebretson

18. **Title of Responsible Official:** Lead EHS Engineer

19. **I wish to review the permit prior to issuance.** (This may cause a delay in the application process.) ( ) No (●) Yes

20. **Print Name:** Nicholas Engebretson

21. **Date:** 12/18/2025

22. **Do you claim confidentiality of data?** (If Yes, see instructions.) ( ) No ( ) Yes

23. **Check List:** ☐ Authorized Signature/Date ☐ Form 400-CEQA ☐ Supplemental Form(s) (ie., Form 400-E-xx) ☐ Fees Enclosed

AQMD USE ONLY	APPLICATION TRACKING #	CHECK #	AMOUNT RECEIVED $	PAYMENT TRACKING #	VALIDATION

DATE	APP REJ	DATE	APP REJ	CLASS I III	BASIC CONTROL	EQUIPMENT CATEGORY CODE	TEAM	ENGINEER	REASON/ACTION TAKEN

South Coast Air Quality Management District

Form 400-A

Application Form for Permit or Plan Approval

List only one piece of equipment or process per form.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

1. **Facility Name** (Business Name of Operator to Appear on the Permit): Space Exploration Technologies

2. **Valid AQMD Facility ID** (Available On Permit Or Invoice Issued By AQMD): 191558

3. **Owner's Business Name** (If different from Business Name of Operator):

Section B - Equipment Location Address

4. **Equipment Location Is:** (●) Fixed Location ( ) Various Location
(For equipment operated at various locations, provide address of initial site.)

3901 Jack Northrop Avenue
Street Address

Hawthorne , CA 90250
City Zip

Nicholas Engebretson — Lead EHS Engineer
Contact Name — Title

(310) 844-2952 — Ext. — Fax #
Phone #

E-Mail: Nicholas.Engebretson@spacex.com

Section C - Permit Mailing Address

5. **Permit and Correspondence Information:**
☐ Check here if same as equipment location address

1 Rocket Road
Address

Hawthorne , CA 90250
City State Zip

Nicholas Engebretson — Lead EHS Engineer
Contact Name — Title

(310) 844-2952 — Ext. — Fax #
Phone #

E-Mail: Nicholas.Engebretson@spacex.com

Section D - Application Type

6. **The Facility Is:** (●) Not In RECLAIM or Title V ( ) In RECLAIM ( ) In Title V ( ) In RECLAIM & Title V Programs

7. **Reason for Submitting Application** (Select only ONE):

7a. New Equipment or Process Application:

- (●) New Construction (Permit to Construct)
- ( ) Equipment On-Site But Not Constructed or Operational
- ( ) Equipment Operating Without A Permit *
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- ( ) Alteration/Modification
- ( ) Alteration/Modification without Prior Approval *
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- ( ) Change of Condition without Prior Approval *
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- ( ) Change of Location without Prior Approval *
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8a. **Estimated Start Date of Construction** (mm/dd/yyyy): 12/18/2025

8b. **Estimated End Date of Construction** (mm/dd/yyyy): 12/18/2025

8c. **Estimated Start Date of Operation** (mm/dd/yyyy):

9. **Description of Equipment or Reason for Compliance Plan** (list applicable rule):
Wax Burnoff Furnace with Integrated Afterburner (Preheat 3)
(A/N 658076)

10. **For Identical equipment, how many additional applications are being submitted with this application?** (Form 400-A required for each equipment / process): 3

11. **Are you a Small Business as per AQMD's Rule 102 definition?** (10 employees or less and total gross receipts are $500,000 or less OR a not-for-profit training center) (●) No ( ) Yes

12. **Has a Notice of Violation (NOV) or a Notice to Comply (NC) been issued for this equipment?** (●) No ( ) Yes
If Yes, provide NOV/NC#:

Section E - Facility Business Information

13. **What type of business is being conducted at this equipment location?** Aerospace Manufacturing

14. **What is your business primary NAICS Code?** (North American Industrial Classification System): 336414

15. **Are there other facilities in the SCAQMD jurisdiction operated by the same operator?** ( ) No (●) Yes

16. **Are there any schools (K-12) within 1000 feet of the facility property line?** (●) No ( ) Yes

Section F - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application are true and correct.

17. **Signature of Responsible Official:** Nicholas Engebretson

18. **Title of Responsible Official:** Lead EHS Engineer

19. **I wish to review the permit prior to issuance.** (This may cause a delay in the application process.) ( ) No (●) Yes

20. **Print Name:** Nicholas Engebretson

21. **Date:** 12/18/2025

22. **Do you claim confidentiality of data?** (If Yes, see instructions.) ( ) No ( ) Yes

23. **Check List:** ☐ Authorized Signature/Date ☐ Form 400-CEQA ☐ Supplemental Form(s) (ie., Form 400-E-xx) ☐ Fees Enclosed

AQMD USE ONLY	APPLICATION TRACKING #	CHECK #	AMOUNT RECEIVED $	PAYMENT TRACKING #	VALIDATION

DATE	APP REJ	DATE	APP REJ	CLASS I III	BASIC CONTROL	EQUIPMENT CATEGORY CODE	TEAM	ENGINEER	REASON/ACTION TAKEN

South Coast Air Quality Management District

Form 400-CEQA
California Environmental Quality Act (CEQA) Applicability

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

The SCAQMD is required by state law, the California Environmental Quality Act (CEQA), to review discretionary permit project applications for potential air quality and other environmental impacts. This form is a screening tool to assist the SCAQMD in clarifying whether or not the project [1] has the potential to generate significant adverse environmental impacts that might require preparation of a CEQA document [CEQA Guidelines § 15060(a)]. Form 400-CEQA and the instructions for guidance on completing this form are available at http://www.aqmd.gov/home/regulations/ceqa/ceqa-permit-forms or http://www.aqmd.gov/home/permits/permit-application-forms. For each Form 400-A application, also complete and submit one Form 400-CEQA. If submitting multiple Form 400-A applications for the same project at the same time, only one Form 400-CEQA is necessary for the entire project. If you need assistance completing this form, contact Permit Services at (909) 396-3385.

Section A – Facility Information

1. Facility Name (Business Name of Operator to Appear on the Permit): Space Exploration Technologies

2. SCAQMD Facility ID: 191558

3. Project Description: Application for Permits to Operate Four Furnaces

Section B – Review For Exemption From Further CEQA Action

Check "Yes" or "No" as applicable. If "Yes" is checked for any question in Section B, skip Section C and proceed to page 2 and complete Section D - Signatures.

	Yes	No	Is this application for:
1.	○	⊙	**A request for a change of operator only (without equipment or process change modifications)?**
2.	○	⊙	**A functionally identical permit unit replacement with no increase in equipment unit rating or emissions?**
3.	○	⊙	**A change of daily VOC permit limit to a monthly VOC permit limit?**
4.	○	⊙	**Equipment damaged as a result of a disaster during state of emergency?**
5.	○	⊙	**A Title V** (e.g., SCAQMD Regulation XXX) **permit renewal without equipment or process change modifications?**
6.	○	⊙	**A Title V administrative permit revision?**
7.	○	⊙	**The conversion of an existing permit into an initial Title V permit?**

Section C – Review of Impacts Which May Trigger Further CEQA Review

Check "Yes" or "No" as applicable. To avoid delays in processing your application(s), explain all "Yes" responses on a separate sheet and attach it to this form.

	Yes	No	
1.	○	⊙	**Is this project specifically evaluated in a previously certified or adopted CEQA document?** If "Yes" is checked, attach a copy of the signed Notice of Determination to this form.
2.	○	⊙	**Is this project specifically exempted from CEQA by another entity (e.g., city or agency)?** If "Yes" is checked, attach a copy of the signed Notice of Exemption or other documentation from the entity to this form.
3.	○	⊙	**Is this project part of a larger project?** If "Yes" is checked, attach a separate sheet to briefly describe the larger project.
4.	○	⊙	**Will the project increase the QUANTITY of hazardous materials stored aboveground onsite or transported by mobile vehicle to or from the site by greater than or equal to the amounts associated with each compound listed on Form 400-CEQA, Table 1 - Regulated Substances List and Threshold Quantities for Accidental Release Prevention** [http://www.aqmd.gov/home/regulations/ceqa/ceqa-permit-forms]**?** If "Yes" is checked, attach a separate sheet to identify each hazardous material and corresponding quantity to be transported, stored, or used.
5.	○	⊙	**Will the project emit any air toxic listed on Form 400-CEQA, Table 2 - Other Air Toxics and Their Screening Levels** [http://www.aqmd.gov/home/regulations/ceqa/ceqa-permit-forms] [2]**?** If "Yes" is checked, attach a separate sheet to identify each air toxic and corresponding quantity to be emitted.
6.	○	⊙	**Will the project require any demolition, excavation, and/or grading construction activities that encompass an area exceeding 20,000 square feet?**

[1] A "project" means the whole of an action which has a potential for resulting in physical change to the environment, including construction activities, clearing or grading of land, improvements to existing structures, and activities or equipment involving the issuance of a permit. For example, a project might include installation of a new, or modification of an existing internal combustion engine, dry cleaning facility, boiler, gas turbine, spray coating booth, solvent cleaning tank, etc

[2] Form 400-CEQA, Table 2 – Other Air Toxics and Their Screening Levels, contains a list of air toxics that either do not have a cancer potency (CP) or reference exposure level (REL) approved by the Office of Environmental Health Hazards Assessment (OEHHA) or have a combination of OEHHA-approved and non-approved CPs or RELs.

Section C – Review of Impacts Which May Trigger Further CEQA (concluded)

	Yes	No	
7.	◉	○	**Will the project utilize a boiler, engine, or other combustion equipment that uses fuel (e.g., gasoline, diesel, natural gas, liquefied petroleum gas (LPG), or landfill gas)?** If "Yes" is checked, then the applicant will need to calculate the amount of GHGs from fuel use via on the Greenhouse Gas (GHG) online estimator [http://www.aqmd.gov/home/regulations/ceqa/ceqa-permit-forms], and attaching the printout or by conducting hand calculations and providing the documentation. Refer to the Instructions for Form 400-CEQA for guidance.
8.	○	◉	**Will the project utilize other types of equipment not addressed in Question 7 that require the use of, or will generate, any chemicals listed on Form 400-CEQA, Table 3 - Greenhouse Gases** [http://www.aqmd.gov/home/regulations/ceqa/ceqa-permit-forms]**?** If "Yes" is checked, attach a separate sheet to identify each equipment unit, the chemical name(s), and the quantity of each chemical identified.
9.	○	◉	**Will the project include the open outdoor storage of dry bulk solid materials that could generate dust?** If "Yes" is checked, include a plot plan with the application package.
10.	○	◉	**Will the project result in or make worse noticeable off-site odors from activities that may not be subject to SCAQMD permit requirements?** For example, landfills, materials recovery/recycling facilities (MRF), and compost materials or other types of greenwaste (e.g., lawn clippings, tree trimmings, etc.) have the potential to generate odor complaints subject to SCAQMD Rule 402 – Nuisance.
11.	○	◉	**Will the project cause an increase of emissions from marine vessels, trains and/or airplanes?**
12.	○	◉	**Will the project increase demand for potable water at the facility by more than 262,820 gallons per day?** The following examples identify some, but not all, types of projects that may result in a "Yes" answer to this question: 1) a project that generates steam; 2) a project that uses water as part of operating air pollution control equipment; 3) a project that requires water as part of the production process; 4) a project that requires a new, or the expansion of an existing, sewage treatment facility, new water lines, sewage lines, sewage hook-ups etc.; 5) a project where the water demand exceeds the capacity of the local water purveyor to supply sufficient water for the project; 6) a project that requires new or the expansion of existing, water supply and conveyance facilities; and, 7) a project that requires water to hydrotest pipelines, storage tanks etc. for structural integrity.
13.	○	◉	**Will the project create an increase in the mass inflow of effluents to a public wastewater treatment facility that would require a new, or revision to an existing, National Pollutant Discharge Elimination System (NPDES) or other related permit at the facility?**
14.	○	◉	**Will the project result in the need for more than 350 new employees?**
15.	○	◉	**Will the project result in an increase in heavy-duty transport truck traffic to and/or from the facility by more than 350 truck round-trips per day?**
16.	○	◉	**Will the project result in an increase in customer traffic by more than 700 visits per day?**
17.	○	◉	**Will the project result in temporary or permanent noise or vibration in excess of what is allowed by the applicable local noise ordinance?**
18.	○	◉	**Will the project create a permanent need for new or additional solid waste disposal?** Check "No" if the projected potential amount of solid waste to be generated by the project is less than five tons per day.
19.	○	◉	**Will the project create a permanent need for new or additional hazardous waste disposal?** Check "No" if the projected potential amount of hazardous wastes to be generated by the project is less than 42 cubic yards per day (or equivalent in pounds).
20.	○	◉	**Will the project include equipment that after installation or modification will change the visual character of the site and its surroundings or block views?**
21.	○	◉	**Will the project have equipment that will create a new source of external lighting that will be visible at the property line?**

Section D – SIGNATURES

I HEREBY CERTIFY THAT ALL INFORMATION CONTAINED HEREIN AND INFORMATION SUBMITTED WITH THIS APPLICATION IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE. I UNDERSTAND THAT THIS FORM IS A SCREENING TOOL AND THAT THE SCAQMD RESERVES THE RIGHT TO CONSIDER OTHER PERTINENT INFORMATION IN DETERMINING CEQA APPLICABILITY.

1. Signature of Responsible Official of Firm: Nicholas Engebretson		2. Title of Responsible Official of Firm: Lead EHS Engineer
3. Print Name of Responsible Official of Firm: Nicholas Engebretson		4. Date Signed: 12/18/2025
5. Phone # of Responsible Official of Firm: (310) 844-2952	6. Fax # of Responsible Official of Firm:	7. Email of Responsible Official of Firm: Nicholas.Engebretson@spacex.com
8. Signature of Preparer (if prepared by person other than responsible official of firm): Peter J. Moore		9. Title of Preparer: Principal Engineer, Yorke Engineering
10. Print Name of Preparer: Peter Moore		11. Date Signed: 12/18/2025
12. Phone # of Preparer: (949) 248-8490	13. Fax # of Preparer:	14. Email of Preparer: PMoore@YorkeEngr.com

THIS CONCLUDES FORM 400-CEQA. INCLUDE THIS FORM AND ANY ATTACHMENTS WITH FORM 400-A.

South Coast Air Quality Management District

Form 400-E-9d
External Combustion
Burn Off Furnaces/Brake Debonders/Wax Burnoff Furnaces

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator That Appears On Permit): Space Exploration Technologies

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 191558

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 3901 Jack Northrop Ave., Hawthorne, CA 90250

(•) Fixed Location ( ) Various Locations

Section B - Equipment Description

Equipment — Manufacturer: Armil CFS; Model: Tru-Heat Box Furnace; Serial No.:

Type — ( ) Burn Off Furnace ( ) Brake Debonder (•) Wax Burnoff Furnace

Primary Chamber

( ) Electric — Total KW Rating:

( ) LPG (•) Natural Gas ( ) Other:

Total BTU Rating: 2,000,000 BTU/hr

Number of Burners: 2 BTU Rating of Each Burner: 1,000,000 BTU/hr

Manufacturer: Eclipse Model: ThermJet TJ0100

Low NOx Type? ( ) No (•) Yes If Yes, 30 ppm* @ 3.00 %O_2

*Provide supporting document.

Blower(s)

[ ] Exhaust	Quantity:	HP:	CFM:	for each unit
[ ] Circulation	Quantity:	HP:	CFM:	for each unit
[x] Combustion Air Blower	Quantity: 1	HP:	CFM:	for each unit

Outside Dimensions

Diameter: ft. in. Width: 12 ft. in.

Height: 14 ft. in. Length: 15 ft. in.

Secondary Chamber/ Afterburner

( ) Electric — Total KW Rating:

( ) LPG (•) Natural Gas ( ) Other:

Total BTU Rating: 2,000,000 BTU/hr

Number of Burners: 1 BTU Rating of Each Burner: 2,000,000 BTU/hr

Manufacturer: Eclipse Model: ThermJet TJ0200

Low NOx Type? ( ) No (•) Yes If Yes, 30 ppm* @ 3.00 %O_2

*Provide supporting document.

Blower(s)

[ ] Exhaust	Quantity:	HP:	CFM:	for each unit
[ ] Circulation	Quantity:	HP:	CFM:	for each unit
[ ] Combustion Air Blower	Quantity:	HP:	CFM:	for each unit

Outside Dimensions

Diameter: 3 ft. in. Width: ft. in.

Height: 16 ft. in. Length: ft. in.

South Coast Air Quality Management District

Form 400-E-9d
External Combustion
Burn Off Furnaces/Brake Debonders/Wax Burnoff Furnaces

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Forms 400-A, Form 400-CEQA, and Form 400-PS.

Section B - Equipment Description (cont.)

Design Features

Distance from Secondary Chamber Burner to Temperature Probe: _____ ft. _____ in.

Operating Temperature of Secondary Chamber: _____ °F

Time to Reach Operating Temperature in Primary Chamber: _____ min.

Time to Reach Operating Temperature in Secondary Chamber: _____ min.

Is the Secondary Chamber Ignited Prior to the Primary Chamber? ○ No ○ Yes

If Yes, What is the Controlling Factor for Igniting the Primary Chamber?

○ Temperature in Secondary Chamber Reaching: _____ °F ○ Time Delay: _____ min.

○ Describe the Ignition Procedure: _____

Section C - Process Description

Brief Description of Process

Materials Processed: Investment casting molds

Please provide a brief description of the process and attach manufacturer's technical specifications and guarantees:

Operation

◉ Batch ○ Continuous

Process Data

Number of Batches Per Day: _____ Weight of Each Batch of Material Processed (Pounds): _____

Hours to Process Each Batch: _____ Weight Percent of Combustible / Volatile in Each Batch: _____

Wax Burnoff

Pounds of Wax Per Pound of Materials Processed: _____

Brake Debonding

Maximum Weight of Brake Shoes Processed Per Batch (Pounds): _____ Maximum Weight of Calipers Processed Per Batch (Pounds): _____

Weight Percent of Oil on Brake Shoes: _____ Weight Percent of Oil on Calipers: _____

Instrumentation

Attach description of instrumentation for measuring temperature and other operating parameters (attach description).

Operating Schedule

Normal: 16 hours/day 6 days/week 50 weeks/yr

Maximum: 24 hours/day 7 days/week 52 weeks/yr

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application is true and correct.

Preparer Info

Signature: Peter J. Moore Date: 12/18/2025

Title: Principal Engineer Company Name: Yorke Engineering

Name: Peter Moore

Phone #: (949) 248-8490 Fax #: (949) 248-8499

Email: PMoore@YorkeEngr.com

Contact Info

Name: Nicholas Engebretson

Title: Lead EHS Engineer Company Name: SpaceX

Phone #: (310) 844-2952 Fax #:

Email: Nicholas.Engebretson@spacex.com

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Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator That Appears On Permit): Space Exploration Technologies

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 191558

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 3901 Jack Northrop Ave., Hawthorne, CA 90250

(●) Fixed Location ( ) Various Locations

Section B - Equipment Description

Equipment — Manufacturer: Armil CFS; Model: Tru-Heat Box Furnace; Serial No.:

Type — ( ) Burn Off Furnace ( ) Brake Debonder (●) Wax Burnoff Furnace

Primary Chamber

( ) Electric — Total KW Rating:

(●) Natural Gas ( ) LPG ( ) Other:
Total BTU Rating: 2,000,000 BTU/hr
Number of Burners: 2 BTU Rating of Each Burner: 1,000,000 BTU/hr
Manufacturer: Eclipse Model: ThermJet TJ0100
Low NOx Type? ( ) No (●) Yes If Yes, 30 ppm* @ 3.00 %O_2
*Provide supporting document.

Blower(s)

[ ] Exhaust	Quantity:	HP:	CFM: for each unit
[ ] Circulation	Quantity:	HP:	CFM: for each unit
[X] Combustion Air Blower	Quantity: 1	HP:	CFM: for each unit

Outside Dimensions
Diameter: ft. in. Width: 12 ft. in.
Height: 14 ft. in. Length: 15 ft. in.

Secondary Chamber/ Afterburner

( ) Electric — Total KW Rating:

(●) Natural Gas ( ) LPG ( ) Other:
Total BTU Rating: 2,000,000 BTU/hr
Number of Burners: 1 BTU Rating of Each Burner: 2,000,000 BTU/hr
Manufacturer: Eclipse Model: ThermJet TJ0200
Low NOx Type? ( ) No (●) Yes If Yes, 30 ppm* @ 3.00 %O_2
*Provide supporting document.

Blower(s)

[ ] Exhaust	Quantity:	HP:	CFM: for each unit
[ ] Circulation	Quantity:	HP:	CFM: for each unit
[ ] Combustion Air Blower	Quantity:	HP:	CFM: for each unit

Outside Dimensions
Diameter: 3 ft. in. Width: ft. in.
Height: 16 ft. in. Length: ft. in.

South Coast Air Quality Management District

Form 400-E-9d
External Combustion
Burn Off Furnaces/Brake Debonders/Wax Burnoff Furnaces

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Section B - Equipment Description (cont.)

Design Features

Distance from Secondary Chamber Burner to Temperature Probe: _____ ft. _____ in.

Operating Temperature of Secondary Chamber: _____ °F

Time to Reach Operating Temperature in Primary Chamber: _____ min.

Time to Reach Operating Temperature in Secondary Chamber: _____ min.

Is the Secondary Chamber Ignited Prior to the Primary Chamber? ○ No ○ Yes

If Yes, What is the Controlling Factor for Igniting the Primary Chamber?

○ Temperature in Secondary Chamber Reaching: _____ °F ○ Time Delay: _____ min.

○ Describe the Ignition Procedure: _____

Section C - Process Description

Brief Description of Process

Materials Processed: Investment casting molds

Please provide a brief description of the process and attach manufacturer's technical specifications and guarantees:

Operation

● Batch ○ Continuous

Process Data

Number of Batches Per Day: _____ Weight of Each Batch of Material Processed (Pounds): _____

Hours to Process Each Batch: _____ Weight Percent of Combustible / Volatile in Each Batch: _____

Wax Burnoff

Pounds of Wax Per Pound of Materials Processed: _____

Brake Debonding

Maximum Weight of Brake Shoes Processed Per Batch (Pounds): _____ Maximum Weight of Calipers Processed Per Batch (Pounds): _____

Weight Percent of Oil on Brake Shoes: _____ Weight Percent of Oil on Calipers: _____

Instrumentation

Attach description of instrumentation for measuring temperature and other operating parameters (attach description).

Operating Schedule

Normal: 16 hours/day 6 days/week 50 weeks/yr

Maximum: 24 hours/day 7 days/week 52 weeks/yr

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application is true and correct.

Preparer Info

Signature: Peter J. Moore Date: 12/18/2025

Title: Principal Engineer Company Name: Yorke Engineering

Name: Peter Moore

Phone #: (949) 248-8490 Fax #: (949) 248-8499

Email: PMoore@YorkeEngr.com

Contact Info

Name: Nicholas Engebretson

Title: Lead EHS Engineer Company Name: SpaceX

Phone #: (310) 844-2952 Fax #:

Email: Nicholas.Engebretson@spacex.com

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Tel: (909) 396-3385
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Section A - Operator Information

Facility Name (Business Name of Operator That Appears On Permit): Space Exploration Technologies

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 191558

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(●) Fixed Location ( ) Various Locations

Section B - Equipment Description

Equipment

Manufacturer: Armil CFS | Model: Tru-Heat Box Furnace | Serial No.:

Type

( ) Burn Off Furnace ( ) Brake Debonder (●) Wax Burnoff Furnace

Primary Chamber

( ) Electric

Total KW Rating:

( ) LPG (●) Natural Gas ( ) Other:

Total BTU Rating: 2,000,000 BTU/hr

Number of Burners: 2 BTU Rating of Each Burner: 1,000,000 BTU/hr

Manufacturer: Eclipse Model: ThermJet TJ0100

Low NOx Type? ( ) No (●) Yes If Yes, 30 ppm* @ 3.00 %O_2

*Provide supporting document.

Blower(s)

☐ Exhaust	Quantity:	HP:	CFM:	for each unit
☐ Circulation	Quantity:	HP:	CFM:	for each unit
☒ Combustion Air Blower	Quantity: 1	HP:	CFM:	for each unit

Outside Dimensions

Diameter: ft. in. Width: 12 ft. in.

Height: 14 ft. in. Length: 15 ft. in.

Secondary Chamber/ Afterburner

( ) Electric

Total KW Rating:

( ) LPG (●) Natural Gas ( ) Other:

Total BTU Rating: 2,000,000 BTU/hr

Number of Burners: 1 BTU Rating of Each Burner: 2,000,000 BTU/hr

Manufacturer: Eclipse Model: ThermJet TJ0200

Low NOx Type? ( ) No (●) Yes If Yes, 30 ppm* @ 3.00 %O_2

*Provide supporting document.

Blower(s)

☐ Exhaust	Quantity:	HP:	CFM:	for each unit
☐ Circulation	Quantity:	HP:	CFM:	for each unit
☐ Combustion Air Blower	Quantity:	HP:	CFM:	for each unit

Outside Dimensions

Diameter: 3 ft. in. Width: ft. in.

Height: 16 ft. in. Length: ft. in.

South Coast Air Quality Management District

Form 400-E-9d
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Section B - Equipment Description (cont.)

Design Features

Distance from Secondary Chamber Burner to Temperature Probe: _____ ft. _____ in.

Operating Temperature of Secondary Chamber: _____ °F

Time to Reach Operating Temperature in Primary Chamber: _____ min.

Time to Reach Operating Temperature in Secondary Chamber: _____ min.

Is the Secondary Chamber Ignited Prior to the Primary Chamber? ○ No ○ Yes

If Yes, What is the Controlling Factor for Igniting the Primary Chamber?

○ Temperature in Secondary Chamber Reaching: _____ °F ○ Time Delay: _____ min.

○ Describe the Ignition Procedure: _____

Section C - Process Description

Brief Description of Process

Materials Processed: Investment casting molds

Please provide a brief description of the process and attach manufacturer's technical specifications and guarantees:

Operation

◉ Batch ○ Continuous

Process Data

Number of Batches Per Day: _____ Weight of Each Batch of Material Processed (Pounds): _____

Hours to Process Each Batch: _____ Weight Percent of Combustible / Volatile in Each Batch: _____

Wax Burnoff

Pounds of Wax Per Pound of Materials Processed: _____

Brake Debonding

Maximum Weight of Brake Shoes Processed Per Batch (Pounds): _____ Maximum Weight of Calipers Processed Per Batch (Pounds): _____

Weight Percent of Oil on Brake Shoes: _____ Weight Percent of Oil on Calipers: _____

Instrumentation

Attach description of instrumentation for measuring temperature and other operating parameters (attach description).

Operating Schedule

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Maximum: 24 hours/day 7 days/week 52 weeks/yr

Section D - Authorization/Signature

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Preparer Info

Signature: Peter J. Moore Date: 12/18/2025

Title: Principal Engineer Company Name: Yorke Engineering

Name: Peter Moore

Phone #: (949) 248-8490 Fax #: (949) 248-8499

Email: PMoore@YorkeEngr.com

Contact Info

Name: Nicholas Engebretson

Title: Lead EHS Engineer Company Name: SpaceX

Phone #: (310) 844-2952 Fax #:

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Section A - Operator Information

Facility Name (Business Name of Operator That Appears On Permit): Space Exploration Technologies

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 191558

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 3901 Jack Northrop Ave., Hawthorne, CA 90250

(●) Fixed Location ( ) Various Locations

Section B - Equipment Description

Equipment

Manufacturer: Armil CFS | Model: Tru-Heat Box Furnace | Serial No.:

Type

( ) Burn Off Furnace ( ) Brake Debonder (●) Wax Burnoff Furnace

Primary Chamber

( ) Electric

Total KW Rating:

( ) LPG (●) Natural Gas ( ) Other:

Total BTU Rating: 2,000,000 BTU/hr

Number of Burners: 2 BTU Rating of Each Burner: 1,000,000 BTU/hr

Manufacturer: Eclipse Model: ThermJet TJ0100

Low NOx Type? ( ) No (●) Yes If Yes, 30 ppm* @ 3.00 %O_2

*Provide supporting document.

Blower(s)

☐ Exhaust	Quantity:	HP:	CFM:	for each unit
☐ Circulation	Quantity:	HP:	CFM:	for each unit
☒ Combustion Air Blower	Quantity: 1	HP:	CFM:	for each unit

Outside Dimensions

Diameter: ft. in. Width: 12 ft. in.

Height: 14 ft. in. Length: 15 ft. in.

Secondary Chamber/ Afterburner

( ) Electric

Total KW Rating:

( ) LPG (●) Natural Gas ( ) Other:

Total BTU Rating: 2,000,000 BTU/hr

Number of Burners: 1 BTU Rating of Each Burner: 2,000,000 BTU/hr

Manufacturer: Eclipse Model: ThermJet TJ0200

Low NOx Type? ( ) No (●) Yes If Yes, 30 ppm* @ 3.00 %O_2

*Provide supporting document.

Blower(s)

☐ Exhaust	Quantity:	HP:	CFM:	for each unit
☐ Circulation	Quantity:	HP:	CFM:	for each unit
☐ Combustion Air Blower	Quantity:	HP:	CFM:	for each unit

Outside Dimensions

Diameter: 3 ft. in. Width: ft. in.

Height: 16 ft. in. Length: ft. in.

South Coast Air Quality Management District

Form 400-E-9d
External Combustion
Burn Off Furnaces/Brake Debonders/Wax Burnoff Furnaces

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Section B - Equipment Description (cont.)

Design Features

Distance from Secondary Chamber Burner to Temperature Probe: _____ ft. _____ in.

Operating Temperature of Secondary Chamber: _____ °F

Time to Reach Operating Temperature in Primary Chamber: _____ min.

Time to Reach Operating Temperature in Secondary Chamber: _____ min.

Is the Secondary Chamber Ignited Prior to the Primary Chamber? ○ No ○ Yes

If Yes, What is the Controlling Factor for Igniting the Primary Chamber?

○ Temperature in Secondary Chamber Reaching: _____ °F ○ Time Delay: _____ min.

○ Describe the Ignition Procedure: _____

Section C - Process Description

Brief Description of Process

Materials Processed: Investment casting molds

Please provide a brief description of the process and attach manufacturer's technical specifications and guarantees:

Operation

● Batch ○ Continuous

Process Data

Number of Batches Per Day: _____ Weight of Each Batch of Material Processed (Pounds): _____

Hours to Process Each Batch: _____ Weight Percent of Combustible / Volatile in Each Batch: _____

Wax Burnoff

Pounds of Wax Per Pound of Materials Processed: _____

Brake Debonding

Maximum Weight of Brake Shoes Processed Per Batch (Pounds): _____ Maximum Weight of Calipers Processed Per Batch (Pounds): _____

Weight Percent of Oil on Brake Shoes: _____ Weight Percent of Oil on Calipers: _____

Instrumentation

Attach description of instrumentation for measuring temperature and other operating parameters (attach description).

Operating Schedule

Normal: 16 hours/day 6 days/week 50 weeks/yr

Maximum: 24 hours/day 7 days/week 52 weeks/yr

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application is true and correct.

Preparer Info

Signature: Peter J. Moore Date: 12/18/2025

Title: Principal Engineer Company Name: Yorke Engineering

Name: Peter Moore

Phone #: (949) 248-8490 Fax #: (949) 248-8499

Email: PMoore@YorkeEngr.com

Contact Info

Name: Nicholas Engebretson

Title: Lead EHS Engineer Company Name: SpaceX

Phone #: (310) 844-2952 Fax #:

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South Coast Air Quality Management District

Form 400-PS

Plot Plan And Stack Information Form

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Form 400A and Form 400-CEQA.

Mail To:
SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator To Appears On The Permit): Space Exploration Technologies

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 191558

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 3901 Jack Northrop Ave., Hawthorne, CA 90250

(●) Fixed Location ( ) Various Locations

Section B - Location Data

Plot Plan

Please attach a site map for the project with distances and scales. Identify and locate the proposed equipment on the map. A copy of the appropriate Thomas Brothers page, a web-based map, or a sketch that shows the major streets and location of the equipment is acceptable.

Location of Schools Nearby

Is the facility located within a 1/4 mile radius (1,320 feet) of the outer boundary of a school? ( ) Yes (●) No

If yes, please provide name(s) of school(s) below:

School Name: _____ **School Name:** _____

School Address: _____ **School Address:** _____

Distance from stack or equipment vent to the outer boundary of the school: _____ feet

Distance from stack or equipment vent to the outer boundary of the school: _____ feet

CA Health & Safety Code 42301.9: "School" means any public or private school used for purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes.

Population Density

(●) Urban ( ) Rural (<50% of land within 3 km radius accounted for by urban land use categories, i.e., multi-family dwelling or industrial.)

Zoning Classification

( ) Mixed Use Residential Commercial Zone (M-U) ( ) Service and Professional Zone (C-S) ( ) Medium Commercial (C-3)

( ) Heavy Commercial (C-4) (●) Commercial Manufacturing (C-M)

Section C - Emission Release Parameters - Stacks, Vents

Stack Data

Stack Height: 44.00 feet (above ground level) **What is the height of the closest building nearest the stack?** 15 feet

Stack Inside Diameter: 38.00 inches **Stack Flow:** _____ acfm **Stack Temperature:** _____ °F

Rain Cap Present: ( ) Yes (●) No **Stack Orientation:** ( ) Vertical ( ) Horizontal

If the stack height is less than 2.5 times the closest building height (H), please provide information on any building within 5xH distance from the stack (attach additional sheet if necessary):

Building #/Name: _____ **Building #/Name:** _____

Building Height: _____ feet (above ground level) **Building Height:** _____ feet (above ground level)

Building Width: _____ feet **Building Width:** _____ feet

Building Length: _____ feet **Building Length:** _____ feet

Receptor Distance From Equipment Stack or Roof Vents/Openings

Distance to nearest residence or sensitive receptor*: 540 feet

Distance to nearest business: 100 feet

Building Information

Are the emissions released from vents and/or openings from a building? ( ) Yes (●) No

If yes, please provide:

Building #/Name: _____ **Building Width:** _____ feet

Building Height: _____ feet (above ground level) **Building Length:** _____ feet

*AQMD Rule 1470 defines SENSITIVE RECEPTOR as meaning any residence including private homes, condominiums, apartments, and living quarters, schools as defined under paragraph (b)(57), preschools, daycare centers and health facilities such as hospitals or retirement and nursing homes. A sensitive receptor includes long term care hospitals, hospices, prisons, and dormitories or similar live-in housing.

South Coast Air Quality Management District

Form 400-PS

Plot Plan And Stack Information Form

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Form 400A and Form 400-CEQA.

Section D - Authorization/Signature

I hereby certify that all information contained herein and information submitted with this application is true and correct.

Signature of Preparer:	Title of Preparer:	Preparer's Phone #: (949) 248-8490 Preparer's Email: PMoore@YorkeEngr.com
Pete J. Moore	Principal Engineer	

Contact Person:	Contact's Phone#: (310) 844-2952	Date Signed:
Nicholas Engebretson		12/18/2025
Contact's Email: Nicholas.Engebretson@spacex.com	Contact's Fax#:	

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Section B - Location Data

Plot Plan

Please attach a site map for the project with distances and scales. Identify and locate the proposed equipment on the map. A copy of the appropriate Thomas Brothers page, a web-based map, or a sketch that shows the major streets and location of the equipment is acceptable.

Location of Schools Nearby

Is the facility located within a 1/4 mile radius (1,320 feet) of the outer boundary of a school? ○ Yes ◉ No

If yes, please provide name(s) of school(s) below:

School Name: _____ **School Name:** _____

School Address: _____ **School Address:** _____

_____ _____

Distance from stack or equipment vent to the outer boundary of the school: _____ feet **Distance from stack or equipment vent to the outer boundary of the school:** _____ feet

CA Health & Safety Code 42301.9: "School" means any public or private school used for purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes.

Population Density

◉ Urban ○ Rural (<50% of land within 3 km radius accounted for by urban land use categories, i.e., multi-family dwelling or industrial.)

Zoning Classification

○ Mixed Use Residential Commercial Zone (M-U) ○ Service and Professional Zone (C-S) ○ Medium Commercial (C-3)

○ Heavy Commercial (C-4) ◉ Commercial Manufacturing (C-M)

Section C - Emission Release Parameters - Stacks, Vents

Stack Data

Stack Height: 44.00 feet (above ground level) **What is the height of the closest building nearest the stack?** 15 feet

Stack Inside Diameter: 38.00 inches **Stack Flow:** _____ acfm **Stack Temperature:** _____ °F

Rain Cap Present: ○ Yes ◉ No **Stack Orientation:** ○ Vertical ○ Horizontal

If the stack height is less than 2.5 times the closest building height (H), please provide information on any building within 5xH distance from the stack (attach additional sheet if necessary):

Building #/Name: _____ **Building #/Name:** _____

Building Height: _____ feet (above ground level) **Building Height:** _____ feet (above ground level)

Building Width: _____ feet **Building Width:** _____ feet

Building Length: _____ feet **Building Length:** _____ feet

Receptor Distance From Equipment Stack or Roof Vents/Openings

Distance to nearest residence or sensitive receptor*: 710 feet

Distance to nearest business: 100 feet

Building Information

Are the emissions released from vents and/or openings from a building? ○ Yes ◉ No

If yes, please provide:

Building #/Name: _____ **Building Width:** _____ feet

Building Height: _____ feet (above ground level) **Building Length:** _____ feet

*AQMD Rule 1470 defines SENSITIVE RECEPTOR as meaning any residence including private homes, condominiums, apartments, and living quarters, schools as defined under paragraph (b)(57), preschools, daycare centers and health facilities such as hospitals or retirement and nursing homes. A sensitive receptor includes long term care hospitals, hospices, prisons, and dormitories or similar live-in housing.

Form 400-PS

Plot Plan And Stack Information Form

This form must be accompanied by a completed Application for a Permit to Construct/Operate - Form 400A and Form 400-CEQA.

Section D - Authorization/Signature			
I hereby certify that all information contained herein and information submitted with this application is true and correct.			
Signature of Preparer:	**Title of Preparer:** Principal Engineer	**Preparer's Phone #:** (949) 248-8490 **Preparer's Email:** PMoore@YorkeEngr.com	
Contact Person: Nicholas Engebretson **Contact's Email:** Nicholas.Engebretson@spacex.com	**Contact's Phone#:** (310) 844-2952 **Contact's Fax#:**	**Date Signed:** 12/18/2025	

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South Coast Air Quality Management District

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SCAQMD
P.O. Box 4944
Diamond Bar, CA 91765-0944

Tel: (909) 396-3385
www.aqmd.gov

Section A - Operator Information

Facility Name (Business Name of Operator To Appears On The Permit): Space Exploration Technologies

Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 191558

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 3901 Jack Northrop Ave., Hawthorne, CA 90250

(•) Fixed Location ( ) Various Locations

Section B - Location Data

Plot Plan

Please attach a site map for the project with distances and scales. Identify and locate the proposed equipment on the map. A copy of the appropriate Thomas Brothers page, a web-based map, or a sketch that shows the major streets and location of the equipment is acceptable.

Location of Schools Nearby

Is the facility located within a 1/4 mile radius (1,320 feet) of the outer boundary of a school? ( ) Yes (•) No

If yes, please provide name(s) of school(s) below:

School Name: _____ **School Name:** _____

School Address: _____ **School Address:** _____

_____ _____

Distance from stack or equipment vent to the outer boundary of the school: _____ feet **Distance from stack or equipment vent to the outer boundary of the school:** _____ feet

CA Health & Safety Code 42301.9: "School" means any public or private school used for purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes.

Population Density

(•) Urban ( ) Rural (<50% of land within 3 km radius accounted for by urban land use categories, i.e., multi-family dwelling or industrial.)

Zoning Classification

( ) Mixed Use Residential Commercial Zone (M-U) ( ) Service and Professional Zone (C-S) ( ) Medium Commercial (C-3)

( ) Heavy Commercial (C-4) (•) Commercial Manufacturing (C-M)

Section C - Emission Release Parameters - Stacks, Vents

Stack Data

Stack Height: 44.00 feet (above ground level) **What is the height of the closest building nearest the stack?** 15 feet

Stack Inside Diameter: 38.00 inches **Stack Flow:** _____ acfm **Stack Temperature:** _____ °F

Rain Cap Present: ( ) Yes (•) No **Stack Orientation:** ( ) Vertical ( ) Horizontal

If the stack height is less than 2.5 times the closest building height (H), please provide information on any building within 5xH distance from the stack (attach additional sheet if necessary):

Building #/Name: _____ **Building #/Name:** _____

Building Height: _____ feet (above ground level) **Building Height:** _____ feet (above ground level)

Building Width: _____ feet **Building Width:** _____ feet

Building Length: _____ feet **Building Length:** _____ feet

Receptor Distance From Equipment Stack or Roof Vents/Openings

Distance to nearest residence or sensitive receptor*: 540 feet

Distance to nearest business: 100 feet

Building Information

Are the emissions released from vents and/or openings from a building? ( ) Yes (•) No

If yes, please provide:

Building #/Name: _____ **Building Width:** _____ feet

Building Height: _____ feet (above ground level) **Building Length:** _____ feet

*AQMD Rule 1470 defines SENSITIVE RECEPTOR as meaning any residence including private homes, condominiums, apartments, and living quarters, schools as defined under paragraph (b)(57), preschools, daycare centers and health facilities such as hospitals or retirement and nursing homes. A sensitive receptor includes long term care hospitals, hospices, prisons, and dormitories or similar live-in housing.

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Signature of Preparer:	Title of Preparer:	Preparer's Phone #: (949) 248-8490 Preparer's Email: PMoore@YorkeEngr.com
Peter J. Moore	Principal Engineer	

Contact Person:	Contact's Phone#: (310) 844-2952	Date Signed:
Nicholas Engebretson		12/18/2025
Contact's Email: Nicholas.Engebretson@spacex.com	Contact's Fax#:	

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www.aqmd.gov

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Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 191558

Address where the equipment will be operated (for equipment which will be moved to various location in AQMD's jurisdiction, please list the initial location site): 3901 Jack Northrop Ave., Hawthorne, CA 90250

(●) Fixed Location ( ) Various Locations

Section B - Location Data

Plot Plan

Please attach a site map for the project with distances and scales. Identify and locate the proposed equipment on the map. A copy of the appropriate Thomas Brothers page, a web-based map, or a sketch that shows the major streets and location of the equipment is acceptable.

Location of Schools Nearby

Is the facility located within a 1/4 mile radius (1,320 feet) of the outer boundary of a school? ( ) Yes (●) No

If yes, please provide name(s) of school(s) below:

School Name: _____ **School Name:** _____

School Address: _____ **School Address:** _____

Distance from stack or equipment vent to the outer boundary of the school: _____ feet

Distance from stack or equipment vent to the outer boundary of the school: _____ feet

CA Health & Safety Code 42301.9: "School" means any public or private school used for purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes.

Population Density

(●) Urban ( ) Rural (<50% of land within 3 km radius accounted for by urban land use categories, i.e., multi-family dwelling or industrial.)

Zoning Classification

( ) Mixed Use Residential Commercial Zone (M-U) ( ) Service and Professional Zone (C-S) ( ) Medium Commercial (C-3)

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Rain Cap Present: ( ) Yes (●) No **Stack Orientation:** ( ) Vertical ( ) Horizontal

If the stack height is less than 2.5 times the closest building height (H), please provide information on any building within 5xH distance from the stack (attach additional sheet if necessary):

Building #/Name: _____ **Building #/Name:** _____

Building Height: _____ feet (above ground level) **Building Height:** _____ feet (above ground level)

Building Width: _____ feet **Building Width:** _____ feet

Building Length: _____ feet **Building Length:** _____ feet

Receptor Distance From Equipment Stack or Roof Vents/Openings

Distance to nearest residence or sensitive receptor*: 710 feet

Distance to nearest business: 100 feet

Building Information

Are the emissions released from vents and/or openings from a building? ( ) Yes (●) No

If yes, please provide:

Building #/Name: _____ **Building Width:** _____ feet

Building Height: _____ feet (above ground level) **Building Length:** _____ feet

*AQMD Rule 1470 defines SENSITIVE RECEPTOR as meaning any residence including private homes, condominiums, apartments, and living quarters, schools as defined under paragraph (b)(57), preschools, daycare centers and health facilities such as hospitals or retirement and nursing homes. A sensitive receptor includes long term care hospitals, hospices, prisons, and dormitories or similar live-in housing.

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Peter J. Moore	Principal Engineer	

Contact Person:	Contact's Phone#: (310) 844-2952	Date Signed:
Nicholas Engebretson		12/18/2025
Contact's Email: Nicholas.Engebretson@spacex.com	Contact's Fax#:	

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South Coast Air Quality Management District

Form 400 - XPP

Express Permit Processing Request

Form 400-A, Form 400-CEQA and one or more 400-E-xx form(s) must accompany all submittals.

Mail To:
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Tel: (909) 396-3385
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2. **Valid AQMD Facility ID** (Available On Permit Or Invoice Issued By AQMD): 191558

Section B - Equipment Location Address

3. (●) **Fixed Location** ( ) **Various Location**
(For equipment operated at various locations, provide address of initial site.)

3901 Jack Northrop Avenue
Street Address

Hawthorne, CA 90250
City State Zip

Nicholas Engebretson — Lead EHS Engineer
Contact Name Title

(310) 844-2952 — — —
Phone # Ext. Fax #

Nicholas.Engebretson@spacex.com
E-Mail

Section C - Permit Mailing Address

4. **Permit and Correspondence Information:**
☐ Check here if same as equipment location address

1 Rocket Road
Address

Hawthorne, CA 90250
City State Zip

Nicholas Engebretson — Lead EHS Engineer
Contact Name Title

(310) 844-2952 — — —
Phone # Ext. Fax #

Nicholas.Engebretson@spacex.com
E-Mail

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I understand that the Expedited Permit Processing fees must be submitted at the time of application submittal, and that the application may be subject to additional fees per Rule 301. I understand that requests for Express Permit Processing neither guarantees action by any specific date nor does it guarantee permit approval; that Express Permit Processing is subject to availability of qualified staff; and that once Express Permit Processing has commenced, the expedited fees will not be refunded. I hereby certify that all information contained herein and information submitted with the application are true and correct.

5. **Signature of Responsible Official:**	6. **Title of Responsible Official:**
Nicholas Engebretson	Lead EHS Engineer
7. Print Name of Responsible Official:	**8. Date:**
Nicholas Engebretson	12/18/2025
9. Phone #:	**10. Fax #:**
(310) 844-2952	

AQMD USE ONLY	APPLICATION TRACKING #		TYPE B C	EQUIPMENT CATEGORY CODE:	FEE SCHEDULE: $		VALIDATION
ENG. DATE A R	ENG. DATE A R		CLASS I III	ASSIGNMENT Unit Engineer	CHECK/MONEY ORDER #	AMOUNT $	TRACKING #

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SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

PAYMENT VOUCHER

VOUCHER NO. 27302

FACILITY ID: 191558

PRINT DATE : 12/18/2025

COMPANY NAME: SPACE EXPLORATION TECHNOLOGIES

CONTACT NAME: RUTHANNE BRUCH

ADDRESS: 3901 Jack Northrop Rd.
Hawthorne CA 90251

Transaction Date	Description	Transaction Balance
12/18/2025	Furnace, Burn-Off, Wax	6259.78
12/18/2025	Furnace, Burn-Off, Wax (3 Identical)	9389.67
12/18/2025	Higher Fees	7824.74

VOUCHER TOTAL : 23474.19

Valid through: 06/30/2026

For questions or information, call Billing Services at 909-396-2900; within California, you may call toll free 866-888-8838.
Send email inquiries to billingservice@aqmd.gov
Mail remittance to: P.O.Box 4943 Diamond Bar CA, 91765-0943

Thank you for your payment.

Please print this receipt and keep it for your records.

Facility ID : 191558

Facility Name : Space Exploration Technologies

Invoice Number	Invoice Type	Amount Due
27308	Permit Processing Payment	$23,474.19

$23,474.19
Payment Amount:

$521.13
Convenience Fee:

$23,995.32
Total Payment Amount:

Receipt Number: 3912398770

Transaction Date: 12/18/2025 11:20 AM

Payment Type: VISA

Account Number: *3038

Your Privacy Choices

Your session will expire in _ seconds. To continue working with the site, click "Extend".

Submitted to SCAQMD Source Testing 12/15/2025

NOx & CO Source Test Protocol: Four Wax Burnoff/Preheat Furnaces

Space Exploration Technologies
1 Rocket Rd.
Hawthorne, CA 90250

Equipment Location:
(HT27)
3901 Jack Northrop Ave.
Hawthorne, CA 90250

SCAQMD Facility ID: 191558

December 2025

Prepared by:

Yorke ENGINEERING, LLC
www.YorkeEngr.com

Office Locations:
Los Angeles, Orange County, Riverside, Ventura, Fresno, Oakland, Bakersfield

Tel: (949) 248-8490
Fax: (949) 248-8499

NOx & CO Source Test Protocol: Four Wax Burnoff/Preheat Furnaces

Prepared for:

Space Exploration Technologies
1 Rocket Rd.
Hawthorne, CA 90250

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(HT27)
3901 Jack Northrop Ave
Hawthorne, CA 90250

SCAQMD Facility ID: 191558

December 2025

Table of Contents

Table of Appendices

List of Tables

List of Figures

List of Acronyms and Abbreviations

Δ	Symbol for Delta
ρ	Symbol for Density
γ	Symbol for Dry Gas Meter Correction Factor
Btu	British Thermal Unit
CARB	California Air Resources Board
CEMS	Continuous Emissions Monitoring System
cfm	Cubic Feet per Minute
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO_2	Carbon Dioxide
dscf	Dry Standard Cubic Feet
dscfm	Dry Standard Cubic Feet per Minute
EPA	Environmental Protection Agency
°F	Degrees Fahrenheit
fps	Feet per Second
ft^2	Square Foot
ft^3	Cubic Foot
Hg	Mercury
H_2O	Water
LAP	Laboratory Approval Program
lb	Pound
lb/hr	Pounds per Hour
mg	Milligram
ml	Milliliter
mmBtu	1 Million British Thermal Units
N_2	Nitrogen
NH_3	Ammonia
NIST	National Institute of Standards and Technology
NO	Nitrogen Oxide
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
O_2	Oxygen
PM	Particulate Matter
PM_{10}	Particulate Matter Less Than 10 Microns in Size
ppm	Parts per Million
ppmv	Parts per Million by Volume
QAQC	Quality Assurance/Quality Control
°R	Degrees Rankine
SCAQMD	South Coast Air Quality Management District
scfm	Standard Cubic Feet per Minute

NOx & CO Source Test Protocol: Four Furnaces

1.0 INTRODUCTION

Space Exploration Technologies (SpaceX) is submitting this source test protocol for four identical Furnaces to demonstrate that NOx and CO emissions meet the South Coast Air Quality Management District (SCAQMD) permit limits and the requirements of SCAQMD Rule 1147 - NOx Reductions from Miscellaneous Sources. The Furnaces are used for wax burnoff and preheating of ceramic investment casting molds. The molds are used to manufacture metal components with aerospace alloys. The source test is required by Rule 1147.

Table 1-1 lists the equipment.

Table 1-1: Equipment List

Equipment Description	Location	A/N
Wax Burnoff/Preheat Furnace (PREHEAT1)	South Foundry (Pump Line)	658071
Wax Burnoff /Preheat Furnace (BURNOUT 1)	South Foundry (Pump Line)	658073
Wax Burnoff /Preheat Furnace (BURNOUT 2)	North Foundry (TCA Line)	658075
Wax Burnoff/Preheat Furnace (PREHEAT3)	North Foundry (TCA Line)	658076

The equipment is located at HT27, 3901 Jack Northrop Avenue in Hawthorne, California (SCAQMD Facility ID 191558).

1.1 Purpose

The purpose of the test program is to verify that the NOx and CO emissions from the natural-gas-fueled furnaces comply with the emission standards of SCAQMD Rule 1147. This test protocol is consistent with the requirements of Rule 1147(d) – Requirements.

During the source test, the furnace exhaust will be evaluated to determine the following parameters:

- Oxides of nitrogen (NO_x);
- Carbon monoxide (CO);
- Carbon dioxide (CO_2);
- Oxygen (O_2);
- Moisture content;
- Temperature;
- Flow rate.

In addition, during the source test the following data will be recorded using a calibrated fuel meter:

- Natural Gas Fuel Consumption (scf) corrected to standard temperature and pressure.

1.2 Facility Contact Information

Facility contact information is provided in Table 1-3.

Table 1-22: Facility Contact Information

Applicant Name:	Space Exploration Technologies (SpaceX)
Facility ID:	191558
Mailing Address:	1 Rocket Rd. Hawthorne, CA 90250
Equipment Location:	HT27 3901 Jack Northrop Avenue. Hawthorne, CA 90250
Contact:	Ruthanne Bruch
Phone:	(414) 429-1511
E-mail:	Ruthanne.Bruch@spacex.com

1.3 Protocol Preparer

This protocol was prepared by Yorke Engineering, LLC. Technical questions regarding this protocol can be directed to Mr. Moore as listed in Table 1-4.

Table 1-33: Protocol Preparers

Name:	Peter Moore	Justin Thompson
Title:	Principal Engineer	Scientist
Phone:	(949) 248-8490	(949) 248-8490
Fax:	(949) 248-8499	(949) 248-8499
Cell:	(949) 466-8465	(562) 477-9345
E-mail Address:	PMoore@YorkeEngr.com	JThompson@YorkeEngr.com

1.4 Source Testing Organization

SpaceX intends to use one of the source testers listed in Table 1-4.

Table 1-4: Source Test Organizations

Company Name	Contact	Phone
Montrose Air Quality Services	Rudy Nunez	(714) 279-6777
Alliance Technical Group	Greg Rubin	(714) 889-4000

However, SpaceX may choose to use any other source test company certified by SCAQMD under their Laboratory Approval Program (LAP). The complete list of LAP approved sources testers can be accessed from the following website:http://www.aqmd.gov/docs/default-source/laboratory-procedures/lap-contact-info.pdf?sfvrsn=4

In addition, the designated testing organization will be screened to ensure it is an "independent testing laboratory" with no conflict of interest under SCAQMD Rule 304(k)(4).

2.0 FACILITY AND SOURCE INFORMATION

SpaceX designs, manufactures, and launches advanced rockets and spacecraft. At the Hawthorne facilities, SpaceX manufactures the Falcon 9 rocket, Dragon spacecraft, components of the Starship launch vehicle, and elements of the Starlink satellite internet system.

2.1 Equipment Location

Space X's HT27 facility is south of Hawthorne airport, and north of Jack Northrop Ave; see Figure 2-1.

Figure 2-1: Facility Boundary and Equipment Location

2.2 Source Description

The furnaces are used for wax burnoff and preheating of ceramic investment casting molds. Investment casting is used to make metal components from aerospace alloys. The furnaces are used to remove any residual moisture from molds, volatilize the residual pattern material through the integrated afterburner, and preheat the mold prior to filling it with molten metal. The furnaces are natural gas fired. Each furnace is rated at 2.0 mmBtu/hour, and each integrated afterburner is rated at 2.0 mmBtu/hour, for a total heat input of 4.0 mmBtu/hour per furnace. The furnace dimensions are 12'W x 15' L x 14' H. The afterburner stacks are 50' tall and 38" internal diameter, and vent vertically through the roof. Ventilation is provided by one combustion air blower.

Each furnace is equipped with a dedicated natural gas fuel meter. Current fuel meter calibrations will be included with the test report.

Table 2-1 summarizes the equipment and application numbers. Permit numbers have not been issued yet.

Table 2-1: Equipment Summary

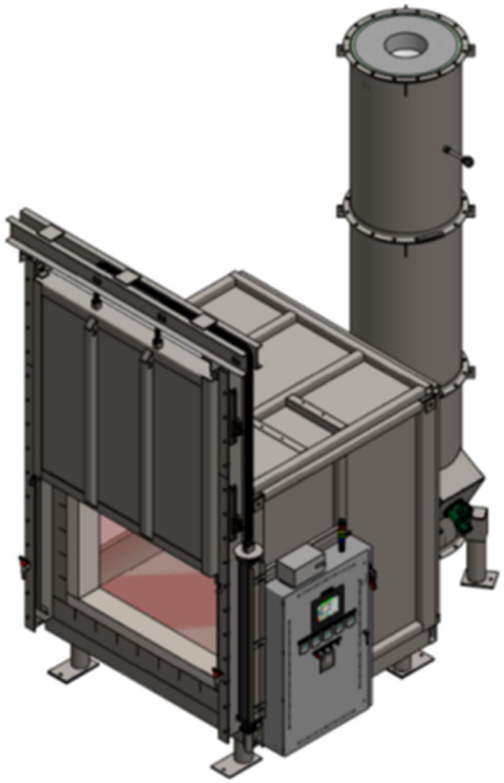
Equipment Description	Location	Permit No.	App. No.
Wax Burnoff/Preheat Furnace (PREHEAT1) – Pump PH1	South Foundry (Pump Line)	-	658071
Wax Burnoff /Preheat Furnace (BURNOUT 1) – Pump BO1	South Foundry (Pump Line)	-	658073
Wax Burnoff /Preheat Furnace (BURNOUT 2) – TCA BO2	North Foundry (TCA Line)	-	658075
Wax Burnoff/Preheat Furnace (PREHEAT3) – TCA PH1	North Foundry (TCA Line)	-	658076

Table 2-2 provides the equipment details. Figure 2-2 shows a schematic of one of the burnoff/preheat furnaces.

Table 2-2: Equipment Description

Make	Armil CFS
Model	Tru-Heat Box Furnace
Dimensions	12'W x 15' L x 14' H (Wax Burnoff Furnace) 3' D x 16' H (Afterburner)
Burner Make/Model	Eclipse ThermJet TJ0100 (2 of them)
Burner Heat Input Rating	2,000,000 Btu/hour (total)
Afterburner Make/Model	Eclipse Thermjet TJ0200
Afterburner Heat Input Rating	2,000,000 Btu/hour
Fuel	Natural Gas (both)
Operating Temperature	Minimum 1200 ºF (Afterburner) Maximum 2200 ºF (Wax Burnoff Furnace)
Blowers	One Combustion Air Blower
Fuel Meter	Will be provided with final report

Figure 2-2: Equipment Schematic: Burnoff/Preheat Furnace



3.0 OVERVIEW OF TEST PROGRAM

3.1 Test Objectives

The purpose of this test program is to demonstrate compliance with NOx and CO emission limits specified in Rule 1147. The emission limits are NOx 30 ppm @ 3% O_2 dry (or 0.036 lb/mmBtu), and CO 1000 ppm @3% O_2 averaged over a period of 15 to 60 consecutive minutes. Source test requirements are specified in Rule 1147(h).

3.2 Proposed Test Methods

Testing will be performed according to SCAQMD Methods 1.1 - 4.1, and Method 100.1. Each of these methods is described in detail in Section 4 and Appendix C.

Rule 1147(d) requires measurement of NO_x, CO_2 and O_2 concentrations. In addition, the test will measure CO, volumetric stack flow to determine the NO_x mass emission rate, and fuel flow to determine the heat input rate. This information can be used to determine if the unit complies with the alternate Rule 1147 NOx limit in terms of lb/mmBtu.

3.3 Source Test Operating Conditions

Source testing will be performed consistent with the requirements of Rule 1147(h) which requires compliance to be determined:

A. Using a District approved test protocol averaged over a period of at least 15 and no more than 60 consecutive minutes;

B. After unit start up;

C. In the unit's as-found operating condition.

D. Compliance determination shall be made in the maximum heat input range at which the unit normally operates;

E. An additional compliance determination shall be made using a heat input of less than 35% of the Rated Heat Input Capacity; **or** for at least 30 consecutive minutes after unit startup using the minimum operating temperature that may be used during normal operation of the unit.

Because of the stringent quality, reliability, and performance requirements for materials produced in the furnace for space flight applications, the furnace will be tested while empty or containing materials that have no wax or other organic materials and operating under typical conditions. The nominal furnace temperature is 2000 ºF, and the afterburner minimum temperature is 1200 ºF. Testing will be conducted at two conditions:

1. During furnace ramp up to its set-point temperature, which is the maximum heat input range at which the furnace normally operates.
2. While the furnace is maintaining its minimum operating temperature.

Fuel meter readings will be recorded regularly throughout the testing interval, or at a minimum of start, mid, and finish of test for each operating load tested. Each meter reading interval shall not be less than 5 minutes or one meter revolution, whichever is more.

3.4 Sampling Location

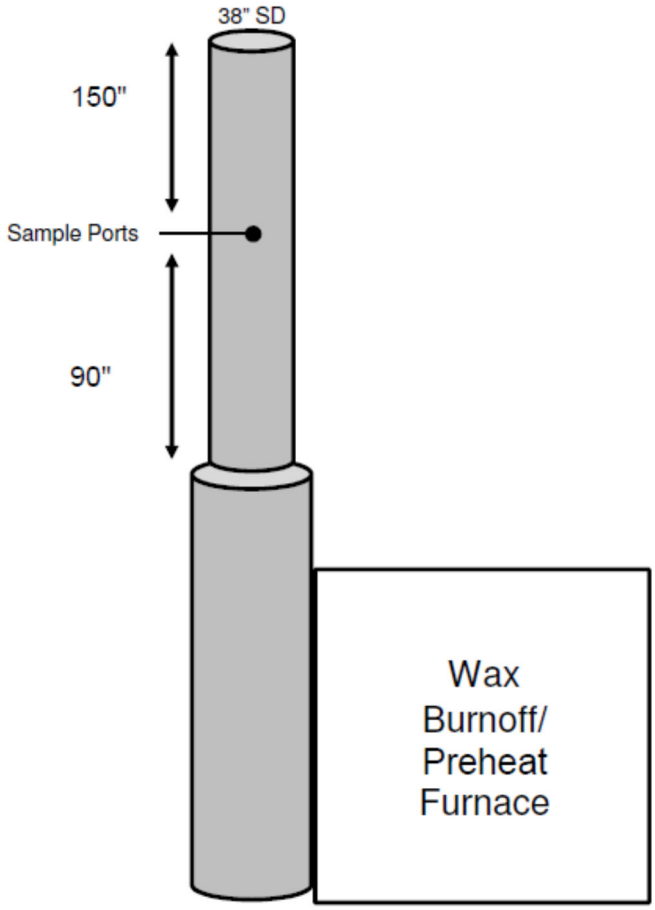
Each furnace vents to a single exhaust duct, which runs vertically up to the roof. The sample ports are located on the exhaust duct and will be accessed from the roof or using a boom lift. The ducting is 38 inches internal diameter. Two 3-inch sample ports are installed 90° from each other around the perimeter of the duct. The sampling port is at least 0.5 stack diameters downstream of the nearest disturbance and at least 2.0 stack diameters upstream of the nearest disturbance. All stack dimensions will be verified prior to testing.

The sampling parameters are summarized in Table 3-1. Figure 3-1 shows a figure of the exhaust duct and sample ports.

Table 3-1: Stack Configuration

Equipment ID	Upstream	Downstream	Stack Diameter	No. of Sampling Ports
South PH 1	90" (2.4 SD)	>150" (3.9 SD)	38”	2
South BO 1	90" (2.4 SD)	>150" (3.9 SD)	38”	2
North PH 3	90" (3.0 SD)	>150" (5.0 SD)	38”	2
North PH 2	90" (3.0 SD)	>150" (5.0 SD)	38”	2

Figure 3-1: Exhaust Duct – Sample Port Locations



3.5 Source Test Date

The source test will be conducted within 30 days after the SCAQMD approves the protocol, unless an extension is granted by SCAQMD.

4.0 SAMPLING ANALYTICAL METHODS

The sampling and analytical methods that will be used are listed in Table 4-1. Gaseous sampling for NO_x, CO, CO_2 and O_2 will be performed by SCAQMD Method 100.1. Volumetric flow rate will be determined by SCAQMD Methods 1.1 - 4.1. The CEM probe will be traversed during measurement of gaseous emissions. The stack will be checked for the absence of cyclonic flow. The NO_2 Converter Efficiency test will be performed at the beginning of the day. If a gas divider is used during the test, EPA Method 205 Blender verification will be performed at the start of the test program. The QAQC procedures for Method 100.1 are described in greater detail in Appendix C.

If stack Oxygen concentrations are greater than 19%, stack CO_2 emissions will be used to correct NO_X and CO emissions to 3% O2 as described in the SCAQMD "Source Test Protocol for Determining Oxygen Corrected Pollutant Concentrations from Combustion Sources with High Stack Oxygen Content Based on Carbon Dioxide Emissions". Stack CO_2 emissions will be

measured using SCAQMD 100.1 and the default value of 500 ppm for ambient CO_2 because the Furnaces have combustion air inlet composition that is free of CO_2 or CO sources.

Table 4-1: Sampling and Analytical Methods (NOx & CO Compliance Test)

Load	Test Method	Pollutants	Number of Samples	No. of Stacks	Sampling Duration (min)
Normal Operation	M100.1	NO_x	1	1	≥ 15 and <60 (~36 min)
		CO			
		CO_2			
		O_2			
	M2.1	Stack Gas Flow Rate			
	M4.1	Stack Gas Moisture			
<35% Load, or for 30 min. after startup at lowest operating temp.	M100.1	NO_x	1	1	≥ 15 and <60 (~36 min)
		CO			
		CO_2			
		O_2			
	M2.1	Stack Gas Flow Rate			
	M4.1	Stack Gas Moisture			
1 Stack x 2 Loads = Total of 2 Samples per Furnace					

4.1 SCAQMD Method 100.1

Sampling for gaseous pollutants will follow SCAQMD Method 100.1. A leak check of the entire sampling system will be performed prior to the test. The leak test will be accomplished by plugging the tip of the Continuous Emissions Monitoring (CEM) sampling probe and observing the gauge on the vacuum side. The Continuous Emissions Monitoring System (CEMS) will be connected, and the sampling pump will be started. The probe tip will be blocked and the flow on the rotameter mounted on the manifold will be checked. When the flow indicating bulb located on the rotameter drops to the bottom, the sample pump will be turned off. At this time, the vacuum gauge will be observed for 5 minutes. No resultant vacuum loss with the pump turned off ensures that the sampling system is leak-free. The tester will mark the pre- and post-test leak checks on the strip chart.

All quality assurance/quality control (QAQC) procedures described in Method 100.1 will be followed. All analyzers, including NO_x, CO, CO_2, and O_2, will be calibrated using Environmental Protection Agency (EPA) Protocol 1 gas traceable to 1% National Institute of Standards and Technology (NIST) standards. Each of the analyzers will be calibrated directly and indirectly. The direct calibration will include the introduction of calibration gases directly to the analyzers at three levels: zero [Ultra-High Purity (UHP)-grade nitrogen (N_2)], mid-grade calibration blend balanced N_2 at 40-60% of the range, and high-grade calibration blend balanced N_2 at 80-100% of the range.

The acceptable analyzer response is within 2% of the range. Direct calibration needs to be performed before and after the test. Pre- and post-test analyzer linearity shall be below 1%.

Indirect calibration (system bias) is accomplished by introducing the calibration gas at the probe tip and recording the response. The acceptable response is below 5% of the range. System bias needs to be performed before and after each test. System bias calibration drift between pre- and post-test shall be below 3%.

During the test, if the measured concentration drops below 20% of the selected analyzer range, the tester will inject a low-level calibration gas close to the actual concentration observed during the test to verify the analyzer accuracy at the lower level.

4.1.1 Calculations

4.1.1.1 Emission Drift Corrections

The following equation will be used for O_2, CO_2, CO and NO_x emission drift corrections.

$$C_{gas} = (C - C_o) \times \left(\frac{C_{ma}}{C_m - C_o} \right) \quad \text{(Eq. 1)}$$

Where,

C_{gas} = Effluent gas concentration, ppmv dry;

C = Emissions concentration recorded during the test, dry, ppmv or %;

C_{ma} = Concentration of the span gas used in the drift correction, ppmv or %;

C_m = Average response of initial and final system bias response, upscale; and

C_o = Average response of initial and final system bias response, zero.

4.1.1.2 NOx Correction to 3% O_2

The actual CO and NO_x concentration will be converted to 3% O_2, as shown below.

$$C_{corr}, ppm @ 3\% = \left(\frac{(20.9 - 3)}{(20.9 - O_2 Meas} \right) \times C_{Meas} \quad \text{(Eq. 2)}$$

Where,

C_{corr} = Concentration corrected to 3% O_2

O_2Meas = % O_2 measured during the test (drift corrected)

C_{Meas} = ppmv measured during the test (drift corrected)

4.1.1.3 Mass Emission Rate

The NO_x mass emission rate can be calculated using the equation shown below (*Ref: Rule 1146 Standard Protocol, Section 7.3.3*):

$$E = (K) \times \frac{(20.9)}{(20.9 - \%O2)} \times (Fd) \times (P)$$

Where:

E	=	NOx Emissions Rate (lb/mmBtu);
K	=	Constant for NOx = 1.195 x $10^{-7;}$
%O2	=	O2 concentration in stack, %;
Fd	=	Oxygen based F-Factor, dry basis; and
P	=	Average NOx concentration in stack, dry ppmv.

4.2 SCAQMD Methods 1.1 and 4.1

Volumetric flow measurement will be performed by measuring the stack differential pressure, temperature and moisture. After determining the number of sampling points (M1.1), the tester will measure the volumetric flow rate following M2.1. The tester will deploy a calibrated S-type Pitot tube and a K-type thermocouple to measure the differential/static pressures and stack temperatures. The Pitot tube and thermocouple are strapped together and connected to a manometer and thermocouple reader. For low flow velocity, the test may use a low-level manometer (0 - 1 inch H_2O column) or digital manometer traceable to NIST standards and capable of reading to 0.00001 inch of H_2O.

A leak check of the Pitot tube is completed prior to taking the measurements. One end of the S-type Pitot tube is blown to obtain 2-3 inches of water. One end of the s-type Pitot tube is plugged and the manometer is observed. Immediately, the other end of the tip is plugged and the pressure drop in the liquid level inside the manometer is examined for 1-2 minutes. No drop in the liquid pressure level inside the manometer ensures that the pitot sampling assembly is free of all leaks. The leak checks are performed before and after each test. Cyclonic flow is measured by rotating the Pitot tube such that the face of the S-type Pitot tube is perpendicular to the stack flow. The positive end of the pitot is disconnected and the change in the liquid level is recorded. This constitutes successful static pressure measurement. When a protractor is strapped to the pitot, the angle displayed by rotating the pitot indicates the yaw angle. Combined cyclonic flow shall not exceed 10°. For flow measurements, the Pitot tube and the thermocouple are positioned sequentially at each of the traverse points. Temperature and differential pressure are recorded at each point and recorded on the data sheets.

There is one circular stack venting the emissions from the Furnace. Two sample ports, 90° apart, will be installed on the circular duct. The sample ports will comply with SCAQMD Method 1.1 sample location criteria.

Stack gas moisture content is determined gravimetrically using the wet impingement method. The moisture sampling train consists of four glass impingers. The first 2 impingers contain 100 ml of H_2O, followed by an empty impinger. The fourth impinger contains a known amount of silica gel crystals. Each of the impingers is weighed and recorded. A minimum of 21 dscf of stack gas is pulled through the impingers using a sealed vacuum pump. The total moisture gain is determined gravimetrically by comparing the weights using a top load electronic balance with 0.05 gm accuracy.

4.2.1 Calculations

4.2.1.1 Sample Gas Volume Determination

$$V_{m_{std}} = 0.03342\ x\ V_m\ x\ \left(P_{bar} + \frac{\Delta H}{13.6}\right)\ x\ \left(\frac{T_{ref}}{T_m}\right)\ x\ \gamma \qquad \text{(Eq. 4)}$$

Where:

$V_{m_{std}}$ = Gas volume metered at standard conditions, ft^3;

V_m = Volume of exhaust gas sampled through dry gas meter, ft^3;

T_m = Average dry gas meter temperature, °F (T_m + 460 = °R);

P_{bar} = Barometric pressure at the orifice meter, inches of Hg;

ΔH = Average pressure drop across the orifice meter, inches of H_2O;

13.6 = Specific gravity of mercury;

P_{std} = Absolute pressure at standard conditions, 29.92 inches of Hg; and

γ = Dry gas meter correction factor.

4.2.1.2 Water Vapor Volume Determination

$$V_{w_{std}} = V_l\ x\ \left(\frac{\rho H_2O}{MH_2O}\right) x \left(\frac{R\ x\ T_{std}}{P_{std}}\right) = 0.0464 \frac{ft^3}{ml} x V_l \qquad \text{(Eq. 5)}$$

Where:

$V_{w_{std}}$ = Volume of water vapor present in the exhaust gas at standard conditions;

V_l = Volume of water collected during the test;

ρH_2O = Density of water, lb-mole;

MH_2O = Molecular weight of water (18 lb/lb-mole);

R = Ideal gas constant (379.48 ft^3/lb-mole);

T_{std} = Absolute temperature at standard conditions, 528°R; and

P_{std} = Absolute pressure at standard conditions, 29.92 inches of Hg.

4.2.1.3 Moisture Content Determination

$$B_w = \left(\frac{V_{w_{std}}}{V_{m_{std}} + V_{w_{std}}}\right) \qquad \text{(Eq. 6)}$$

Where:

B_w = Proportion by volume of water vapor in the gas stream

4.2.1.4 Stack Gas Molecular Weight Determination

$$MW_{dry} = 0.44\ x\ (\%CO_2) + 0.32\ x\ (\%O_2) + 0.28\ x\ (\%N_2) \quad \text{(Eq. 7)}$$

$$W_{wet} = (1 - B_w) + 18\ x\ (B_w) \quad \text{(Eq. 8)}$$

Where:

Mw_{dry} = Dry molecular weight of stack gas, lb/lb-mole; and

Mw_{wet} = Wet molecular weight of stack gas, lb/lb-mole.

4.2.1.5 Absolute Stack Pressure Determination

$$P_s = \left(P_{bar} + \frac{P_{static}}{13.6}\right) \quad \text{(Eq. 9)}$$

Where:

P_s = Absolute stack pressure, inches of Hg;

P_{bar} = Barometric pressure measured during the test, inches of Hg; and

P_{static} = Stack static pressure, inches of Hg.

4.2.1.6 Stack Gas Velocity Determination

$$V_{s_{avg}} = 2.90\ x\ C_p\ x\ \sqrt{\Delta P\ x\ \mathrm{T_s}}\ x\ \sqrt{\left(\frac{29.92}{P_s}\right) x \left(\frac{28.95}{MW_{wet}}\right)} \quad \text{(Eq. 10)}$$

Where:

$V_{s_{avg}}$ = Average stack velocity, feet per second (fps);

Cp = Pitot coefficient, 0.84 (assigned by U.S. EPA, 0.99 standard);

Ts_{avg} = Average stack temperature °F (absolute, °R);

ΔP_{avg} = Average velocity head of stack gas, inches of H_2O;

P_S = Absolute stack pressure, inches of Hg; and

MW_{wet} = Wet molecular weight of stack gas, lb/lb-mole.

4.2.1.7 Exhaust Gas Volumetric Flow Rate Determination

$$Q = V_s \, x \, A_s \, x \, 60 \qquad \text{(Eq. 11)}$$

Where:

Q = Stack gas volumetric flow rate, scfm; and

A_s = Cross-sectional area of stack, ft^2.

4.2.1.8 Standard Stack Gas Flow Rate Determination

$$Q_{std} = Q \, x \, (1 - B_w) \, x \left(\frac{T_{ref}}{T_s}\right) x \left(\frac{P_s}{29.92}\right) \qquad \text{(Eq. 12)}$$

Where:

Q_{std} = Stack flow rate at standard conditions, dry (dscfm)

Note: In the event of any discrepancies between the calculations here and those in the reference methods, the reference method calculations will be used.

4.3 Calculations

All calculations will be included in the final report including calculations for emissions, flows, and laboratory emission calculations.

4.4 Equipment Servicing

The source test will be performed at as-found conditions. The furnace will not be serviced on the day of the source test.

4.5 Sampling Port Access

The facility will provide safe sampling platform(s), scaffolding, or mechanical lifts on the day of the test so that testing personnel can have safe and easy access to the sampling ports.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

5.1 Sampling Protocol

Sampling will be organized in a manner that facilitates sample management, analytical performance management, and data management. Personnel will be assigned specific tasks to ensure implementation of the QAQC program.

The sample analyst will perform the analyses and initial data review. Each analyst must check and initial their work, making certain that it is complete, determining that instrumentation has been properly calibrated and ensuring that the analysis has been performed within the QAQC limits.

The data submitted by the analyst will be evaluated by first assessing the validity of the analytical method chosen for the analysis. After data verification, the report will be prepared following the guidelines specified in each method, the calculations checked, the data assembled and signed, and the report completed.

5.2 Equipment Maintenance

All major pieces of equipment have maintenance logs to document maintenance activities. Table 5-1 lists routine maintenance activities that are performed on source testing equipment.

Table 5-1: Test Equipment Maintenance Schedule

Equipment	Acceptance Limits	Frequency of Service	Methods of Service
Pump	1. Absence of leaks 2. Ability to draw within reported specifications	Every 500 hours of operation or 6 months, whichever is less	1. Visual inspection
Flow Meter	1. Free mechanical movement 2. Absence of malfunction	Every 500 hours of operation or 5 months, whichever is less	1. Visual inspection 2. Clean 3. Calibrate
Sampling Instrument	1. Absence of malfunction 2. Proper response to zero, span gas	As recommended by manufacturer	As recommended by manufacturer
Mobile Van Sampling System	1. Absence of leaks	Depends on nature of use	1. Change filters 2. Change gas dryer 3. Leak check 4. Check for system contamination
Sampling Line	Sampling degradation after each test less than 1% of test series		Flush with solvent and blow air through line until dry

5.3 Equipment Calibration

The S-type pitot tubes are calibrated initially upon purchase and semiannually thereafter. Visual inspections/measurements are taken prior to each use to ensure accidental damage has not occurred. This check is documented on the calibration forms. Measurement is performed using a micrometer and compass.

Each temperature sensor is marked and identified. This is done by marking each thermocouple end-connector with a number. This sensor is calibrated as a unit with the control box potentiometer

and associated lead wire as an identified unit. Calibrations are performed initially and annually at multiple three points over the range of expected temperatures for that particular thermocouple. A non-multiple three-point check is performed bimonthly thereafter. As an alternative to the three baths, an oyster calibrator thermometer is used as a temperature reference source.

The field barometer is adjusted initially and semiannually to within 0.1 inches of Hg of the atmospheric pressure as reported by Los Angeles International Airport. There is no correction between Los Angeles International Airport and the test location. The field dry gas test meter is calibrated against a reference dry gas test meter before its initial use and semiannually thereafter.

The dry gas meter orifice is calibrated before its initial use and then annually. This calibration is performed during the calibration of the dry gas test meter. The unit is checked in the field after every series of tests using a field gas meter check procedure.

Analytical balances are internally calibrated prior to use following the manufacturer's instructions. The balances are further checked using Class S-1 analytical weights prior to daily usage. Field top-loading balances are also internally calibrated prior to use and checked with a field analytical weight prior to usage.

5.4 Data Validation

The data presented in final reports are reviewed three times. First, the analyst reviews and certifies that the raw data comply with technical controls, documentation requirements, and standard group procedures. Second, the Principal Chemist reviews and certifies that data packages comply with specifications for sample holding conditions, chain of custody, and data documentation and that the final report is free of transcription errors. Third, a quality assurance review is performed by other senior personnel. This review thoroughly examines the entire completed data report. The report is signed off and sent out. All raw laboratory data and final reports are stored for 5 years.

6.0 REFERENCES

1. SCAQMD Rule 1147, amended May 6, 2022.

2. SCAQMD Method 100.1, dated March 1989.

3. SCAQMD Method 1.1-4.1, dated March 1989.

4. Source Test Protocol for Determining Oxygen Corrected Pollutant Concentrations from Combustion Sources with High Stack Oxygen Content Based on Carbon Dioxide Emissions, dated March 3, 2011.

APPENDIX A – PERMITS TO OPERATE

Equipment Description	Location	Permit No.	App. No.
Wax Burnoff/Preheat Furnace (PREHEAT1)	South Foundry (Pump Line)	-	658071
Wax Burnoff /Preheat Furnace (BURNOUT 1)	South Foundry (Pump Line)	-	658073
Wax Burnoff /Preheat Furnace (BURNOUT 2)	North Foundry (TCA Line)	-	658075
Wax Burnoff/Preheat Furnace (PREHEAT3)	North Foundry (TCA Line)	-	658076

APPENDIX B – CONTINUOUS GAS MONITORING REQUIREMENTS

- **Appendix B-1**: General Continuous Gas Monitoring Requirements
- **Appendix B-2**: Sample Conditioning Requirements
- **Appendix B-3**: NO_2 to NO Conversion Test Procedure

APPENDIX B-1 – GENERAL CONTINUOUS GAS MONITORING REQUIREMENTS

The SCAQMD requires continuous gas monitoring equipment employing sample extraction and conditioning and electronic detection to be conducted strictly according to the EPA gaseous monitoring method, with the emphasis upon representativeness, documentation, and quality assurance. This includes, in part:

1. Gas analyzers must meet minimum acceptable standards for method of detection, sensitivity, noise, precision, linearity, and interference. Also, the gas sample extraction and conditioning equipment (probe, filter, pump, conditioner, connective plumbing, etc.) and data acquisition and logging equipment shall meet minimum acceptable specifications, as described in the QAQC portion of the gaseous sampling method.
2. It is recommended that the entire sampling system for continuous gas monitoring instruments should be leak checked before and after each test run by evacuating the system to a minimum of 20 inches of Hg vacuum and plugging for a period of 5 minutes. The resultant loss of vacuum cannot exceed 1 inch of Hg during this period.
3. Calibration of all analyzers must be accomplished at zero, mid-span (40-60% of full-scale range), and high-span (80-95% of full-scale range). The lowest practicable range should be selected for monitoring, so that the measured emission values are within 20-95% of the range. If a significant amount of the data are outside of this range, the data may be rejected, depending upon the application.
4. The calibration gases must be certified according to EPA Protocol Number 1 or certified to an analytical accuracy of $\pm$1% and be NIST traceable (except cal gases used for system bias check), following EPA-600/R93/224, "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards," TABLE 2-2. Superblend or multi-component blend gas recertifications are based upon the individual component(s) with the shortest recertification date.
5. Field calibrations employing gas dilution systems (mass flow or critical orifice) must be performed in accordance with EPA Method 205, "Gas Dilution Verification Protocol." A five-point check is required.
6. A calibration error check and zero/span drift check must be performed before and after each test run. Calibration error must be less than $\pm$2% of the range of measurement for zero, mid, and high-range calibration gases. Zero/span drift must be less than $\pm$3% of the range of measurement.
7. A system bias check must be performed before and after each test run by alternately introducing cal gases to the entire sampling system, then to the gas analyzer(s), for comparison. The difference cannot exceed $\pm$5% of the analyzer range.
8. Semi-annual analyzer certifications consisting of linearity plot, calibration curve, response time, and interference response must be furnished with the other calibrations to satisfy quality assurance documentation requirements.
9. NO_x measurement must be performed in the NO_x mode of the analyzer. An NO_2 to NO converter is required if NO_2 constitutes 5% or more of the total NO_x in the sample stream or the rule or permit condition requires "NO_x" monitoring. The NO_2 to NO converter must be at least 90% efficient (use the NO_2 to NO converter efficiency procedure). The converter should be high-temperature (650°C) stainless steel, if no NH_3 is present. If NH_3 is present in the sample stream, then a low-temperature (350°C) molybdenum catalyst must be used in the converter. This check must be done at the beginning of the test.

10. The connective tubing from the probe to the sample conditioner must be heated above the dew point and the dew point reported. The sample conditioner must be able to maintain a dew point temperature of 37°F or less.
11. Data recorder resolution must be at least 0.5% of the range of measurement. A data point for each contaminant/diluent monitored must be recorded at least once/minute. Analog chart recorders must have a minimum 10-inch chart width, with 100 minor divisions.
12. All facets of testing must be continuously recorded. This includes the three-point calibration, system bias, calibration error, and zero/span drift checks, which must precede and conclude each test run.
13. All chart traces, or digital printouts, must be included in the final report and must be clearly identified as to:

    - location/source
    - operator initials
    - date/running times
    - actual test interval
    - contaminant/diluent
    - range changes
    - range of measurement
    - calibrations
    - cal gas concentration/cyl. no.
    - range of calibration

14. When more than one gas trace is shown on a chart, the individual traces must be distinguishable by color coding or some other means (original charts may be submitted and returned following evaluation). If a gas measurement range has been "offset" from zero or zero has been "transposed" to the right side of the recorder chart, it must be clearly identified. This offset should not be more than five small divisions of the chart. This data must be corrected using the ratio of the offset.
15. Gaseous measurements must be conducted a minimum of 60 continuous minutes at each load or specified condition, after the readings have stabilized.
16. Sampling locations not meeting the minimum site selection standards for EPA Method 1 must be tested for absence of stratification. (A gaseous constituent concentration profile differing more than 10% between any two monitoring points within the same cross-sectional plane of a stack or duct indicates stratification.) If stratification is present and alternate approved site selection or modification is not possible, then special monitoring will be required.

ATTACHMENT B-2 – SAMPLE CONDITIONING REQUIREMENTS

For gaseous sampling method tests, proper sample conditioning is essential for representative sampling. Sample conditioning includes removal of particulate matter and moisture present in the sample gas stream. The design of the sample conditioning system must be such that during the process of particulate and moisture removal, the pollutants of interest are not also removed from the gas stream. Method 100 requires that the tester select a system that will have a minimum "scrubbing" effect. In particular, NO_2 and SO_2 are more susceptible to scrubbing than, for example, NO or CO, because of their high solubility in water. Since 3A, 7E, and 10B are reference methods, it is required that a sample conditioning system cause only minimum loss of these pollutants.

The EPA recommends a gas sampling system that can be used universally[1] (i.e., under all testing conditions). The setup includes a heated ¼-inch stainless steel probe with a 50-80 micron size, sintered 316 stainless steel or ceramic filter at the tip, and a short (not more than 6 feet) heated Teflon line to the sample conditioning system. The temperature of the probe and the Teflon line should be maintained at about 250°F. The conditioning system consists of a pair of standard Greenburg-Smith impingers with the stems cut to about 1-inch length from the top, immersed in a bath containing water and dry ice pellets, and immediately followed by a thermo-electric cooler or permeation drier. The gas temperature at the outlet of the impinger shall be less than 60°F and the gas at the drier outlet shall be maintained at a dew point less than 37°F. If the drier cannot be directly connected to the impinger outlet, then a Teflon line heated to 10°F above the impinger outlet gas temperature can be used for connection. Another particulate filter (~5 microns) should be in the line right after the cooler/drier. All the temperatures should be measured and recorded, preferably on a strip chart recorder. If the moisture content of the exhaust gas is below 5% and the sample gas flow rate is less than 10 liters/minute, the impinger setup need not be used, as long as no moisture condensation occurs in the system and the conditioned sample is maintained at the required dew point.

PRECAUTIONS: Never allow the water in the impingers to accumulate more than ¼ of the impinger height. Don't allow the water bath to become frozen around the impingers, or cracking of the glassware may result. Assure that the thermo-electric cooler/permeation drier has adequate design capacity. Follow a good maintenance schedule for the cooler/drier gas conditioning system.

Other systems may be used, upon Agency approval, emphasizing the requirements that water is removed immediately after separation from the gas stream and minimal water contact with the gas stream is assured.

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[1] An example of a non-universally applicable water removal system is based on the refrigerated cooling coil principle. A refrigerated cooling coil system can scrub out a high percentage of water-soluble pollutants due to a comparatively long residence time and intimate contact between the sample gases and the water droplets collected on the inside of the coil. Consequently, it will show a high bias for the CEMS being tested if the sample gas contains a significant amount of NO_2 compared to NO_x or SO_2, and therefore it may not be suitable in all cases.

ATTACHMENT B-3 – NO_2 TO NO CONVERSION TEST PROCEDURE

NO_2 TO NO CONVERSION TEST PROCEDURE

(Alternative to O_3 Titration Method – 40 CFR 50.1, Appendix F)

1. **NO_x Analyzer Requirements**
   a. Full span range (FSR) set so that raw readings are within 10 – 95% of FSR (e.g. 0-50 ppm)
   b. Equipped with NO and NO_x modes
2. **Auditing Gas Requirements**
   a. NO_2 in air (or N_2): Use NO_2 in air for a stainless steel converter.
   b. Concentration of NO_2: 15 to 18 ppm ± 0.5 ppm *(C_o, ppm)*
   c. Recertification: An audit gas should be recertified after 6 months.
3. **Calibration Gas Requirements**
   a. Concentration: NO (80 – 95% of FSR; e.g. 40 to 50 ppm) with less than 0.1 ppm NO_2 – high-span
   NO (40 – 60% of FSR; e.g. 20 to 30 ppm) with less than 0.1 ppm NO_2 – mid-span
   b. Zero Gas: High purity N_2
4. **Calibration of Analyzer**
   a. Calibrate NO mode with the NO calibration gases.
   b. Calibrate NO_x mode with the same gases without any gain adjustment.
   b1. If the analyzer is equipped with two independent gain adjusting circuits, skip 4.b., then repeat 4.a. for the NO_x mode.
5. **Conversion Efficiency (CE) Test**
   a. Analyze the audit gas with NO mode. Read and standardize concentration. *(C_1, ppm)*
   b. Analyze the audit gas with NO_x mode. Read and standardize concentration. *(C_2, ppm)*
6. **Calculation for Conversion Efficiency**

$$\%CE = \frac{|C_2 - C_1|}{C_0} x100$$

7. **Criteria for Acceptability of CE**
   a. % CE must be larger than 90%.
   b. C_1 must be less than 5% of total NO_x (NO + NO_2) in the NO_2 audit gas (Section 2b).

NOTE: NO_2 audit gas concentration of higher value than what is specified in *Section 2* may be required where NO_2 present in the exhaust gas being measured is greater than 60 ppm. Select the NO_2 gas within 10% of the expected NO_2 concentration in the exhaust.

APPENDIX C – SCAQMD SOURCE TEST FORMS

- **ST-1: CHECKLIST FOR REQUEST TO REVIEW: SOURCE TEST PROTOCOL, REPORT, OR SPECIAL PROJECT**
- **ST-2: INFORMATION REQUEST FOR PROTOCOL, REPORT, OR SPECIAL PROJECT REVIEW**

FORM ST-1

MONITORING & ANALYSIS DIVISION | MONITORING & SOURCE TEST ENGINEERING BRANCH

CHECKLIST FOR REQUEST TO REVIEW: SOURCE TEST PROTOCOL, REPORT, OR SPECIAL PROJECT

This *Checklist* (***FORM ST-1***) must accompany any request to evaluate a source test protocol, report, or special project. It may be completed by the requesting AQMD Engineer or Inspector, or a representative of the Source Testing Firm/Laboratory/Contractor. Verify, by checking each item below, that all the requested information has been provided with the attached source test protocol, report, or special project. (An incomplete submittal will be returned, and will ultimately delay the evaluation process):

All Source Test Protocols and Reports Must Include:

- ☐ Completed Review Request Memorandum. (A request for a *"Priority Review"* involves Hearing Board, Abatement Order, or similar critical action, and must be authorized by a manager).
- ☐ Statement of Confidentiality of Test Information, or similar statement, provided by company (if included).
- ☑ Information Request ***FORM ST-2*** with those applicable parts filled out completely.
- ☑ Reason for test, including proposed operating test loads, reference to applicable rules/permit conditions, and key facility, test firm and AQMD personnel.
- ☑ Complete Permit to Construct or Permit to Operate, including all conditions.
- ☑ Brief process description, including maximum and normal operating temperatures, pressures, through-put, etc.
- ☑ Brief description of sampling and analytical methods for each constituent to be measured. If a standard District, EPA, or ARB method "without any deviation" will be used, reference it by method number.
- ☑ Process schematic diagram showing the ports and sampling locations, including the dimensions of the ducts/stacks at the sampling locations, along with upstream and downstream distances to flow disturbances, (e.g. elbows, tees, fans) from the sampling locations.
- ☑ Calibration and quality assurance (QA) procedures identified.
- ☐ Statement that source test firm/laboratory qualifies as an *"independent testing laboratory"* under Rule 304 (no conflict of interest), and is approved by AQMD or ARB, if required.
- ☐ Attached test firm AQMD-LAP or CARB approval, if required.

All Source Test Reports Must Also Include:

- ☐ Field raw data sheets and laboratory data forms, where applicable.
- ☐ Gas monitoring stripcharts and/or DAS printouts, legible and properly annotated, where applicable.
- ☐ Complete calculations for volumetric flowrates and emissions rates, where applicable.
- ☐ Complete QA supporting documentation (sampling equipment, cal gases, lab analyses, custodies).
- ☐ (*CEMS & Fuel Meters*): Full identification/documentation for CEMS components and fuel meters (analyzer/fuel meter make, model, s/n, range, calibrations, etc.).
- ☐ (*RECLAIM/Large Source*): "Certificate of No Exceptions for testing RECLAIM Large Sources" completed and signed.

Applicable Source Specific Protocols / Reports Must Also Include:

- ☐ (*VOC Efficiency*): VOC overall efficiency (capture/collection plus control efficiencies), or transfer efficiency describes all sample collection points, verifies total collection, and shows all calculations and documentation, according to specified requirements.
- ☐ (*Organics Loading*): Organic (VOC) liquid loading testing describes all sample collection/monitoring points (both liquid and vapor), verifies representative start/stop time, and shows all calculations and documentation, according to specified requirements.
- ☐ (*Particulates/sulfur*): Particulate testing of effluent gas streams with high amounts of sulfur compounds addresses additional test preparation, equipment, calculations, and documentation.

FORM ST-2 *(TO BE COMPLETED BY E&C REQUESTER)*

MONITORING & ANALYSIS DIVISION | MONITORING & SOURCE TEST ENGINEERING BRANCH

INFORMATION REQUEST FOR PROTOCOL, REPORT, OR SPECIAL PROJECT REVIEW

This *Information Request* (***FORM ST-2)*** must accompany any request to evaluate a source test protocol, report, or special project, and it can *only* be completed by the requesting AQMD Engineer or Inspector. Please mark the appropriate items and provide the requested information. The sampling and analytical methods will be reviewed *only* for those constituents identified on this form, so be sure to provide as much information as possible.

Constituent(s) to be measured	Allowable Limit(s)[1].			Rule or Permit Condition(s)	Sampling Location(s) (SCR inlet, outlet, exhaust, etc.)	Other Requirements (test parameters, BACT, Rule Development, etc.)
	Concentration (specify ppm as CH_4, @ 3% O_2, etc.)		Mass Emission (specify lb/hr, etc.)			
☒ CO	@ 3% O_2	☒ Compliance Only ☐ Mass Emissions or Factors	1000 ppm	Rule 1147(d)(6)	exhaust	BACT
☒ CO_2		☒ Compliance Only ☐ Mass Emissions or Factors	-	-	exhaust	If needed for correction to CO_2
☒ O_2		☒ Compliance Only ☐ Mass Emissions or Factors	-	-	exhaust	For correction to 3% O_2
☒ NOx, as NO_2	@ 3% O_2	☒ Compliance Only ☐ Mass Emissions or Factors	30 ppm	Rule 1147(d)(6)	exhaust	BACT
☐ SOx, as SO_2		☐ Compliance Only ☐ Mass Emissions or Factors				
☐ SO_2		☐ Compliance Only ☐ Mass Emissions or Factors				
☐ SO_3		☐ Compliance Only ☐ Mass Emissions or Factors				
☐ H_2S		☐ Compliance Only ☐ Mass Emissions or Factors				
☐ Total Reduced Sulfur, as SO_2		☐ Compliance Only ☐ Mass Emissions or Factors				
☐ NH_3 Slip		☐ Compliance Only ☐ Mass Emissions or Factors				
☐ Aldehydes		☐ Compliance Only ☐ Mass Emissions or Factors				

1. Concentration must include correction to standard point-of-reference (NOx @ *3%O_2*, ROG *as CH_4*, etc.). If there is no "Mass Emission" compliance limit specified, please specify if concentration will be used only for compliance determination or whether it will also be calculated to a mass emission or factor (this will affect how we interpret the reported concentrations).

FORM ST-2 *(TO BE COMPLETED BY E&C REQUESTER)*

MONITORING & ANALYSIS DIVISION | MONITORING & SOURCE TEST ENGINEERING BRANCH

INFORMATION REQUEST FOR SOURCE TEST PROTOCOL, REPORT, OR SPECIAL PROJECT REVIEW

Constituent(s) to be measured	Allowable Limit(s)[1].		Rule or Permit Condition(s)	Sampling Location(s) (SCR inlet, outlet, exhaust, etc.)	Other Requirements (test parameters, BACT, Rule Development, etc.)
	Concentration (specify ppm as CH_4, @ 3% O_2, etc.)	Mass Emission (specify lb/hr, etc.)			
☐ TGNMO, Conc & Mass ☐ TGNMO, Efficiency (*check all that apply*): ☐ Transfer ☐ Capture/Collect ☐ Control/Destruct ☐ Overall	☐ Compliance Only ☐ Mass Emissions or Factors				
☐ Speciated Organics (*specify*):	☐ Compliance Only ☐ Mass Emissions or Factors				
☐ PM (total)	☐ Compliance Only ☐ Mass Emissions or Factors				
☐ PM (solid)	☐ Compliance Only ☐ Mass Emissions or Factors				
☐ PM_{10}	☐ Compliance Only ☐ Mass Emissions or Factors				
☐ Toxics (*specify*):	☐ Compliance Only ☐ Mass Emissions or Factors				

1. Concentration must include correction to standard point-of-reference (NOx @ *3%O_2*, ROG *as CH_4*, etc.). If there is no "Mass Emission" compliance limit specified, please specify if concentration will be used only for compliance determination or whether it will also be calculated to a mass emission or factor (this will affect how we interpret the reported concentrations).

4.0 RESULTS

Results indicate that Wax Burnoff/Preheat Furnace #3 complied with all applicable District Rule 1147 emissions limits. Table 4-1 presents the analytical results for NO_x and CO sampling, along with the field measurements taken during each test. Additional information, such as gas calibrations and permits, is available in Appendices A and D.

TABLE 4-1
TEST RESULTS
SPACE EXPLORATION TECHNOLOGIES
WAX BURNOFF/PREHEAT FURNACE #3
OCTOBER 15, 2025

Parameter/Units	High Fire (Startup)	Low Fire	Compliance Limit
Exhaust Gas Flow, dscfm	3,702	3,570	--
O_2, %	18.3	19.4	--
CO_2, %	1.52	0.85	--
NO_x			
ppm, v/v	3.48	1.79	--
ppm, v/v @ 3% O_2	24.1	23.0(1)	**30**
lb/hr	0.0939	0.0465	--
lb/MMBtu	0.018	0.017	**0.036**
CO			
ppm, v/v	5.20	2.95	**--**
ppm, v/v @ 3% O_2	36.0	38.0(1)	**1,000**
lb/hr	0.085	0.047	--
lb/MMBtu	0.017	0.017	**0.73**

(1) ppm @ 3% O_2 Corrected to % CO_2.

North TCA Furnace (PH1)
Wax Burnoff Furnace (Cerberus) (PREHEAT3)
Previous AN 658076

Facility: SpaceX
Source: TCA Preheat Furnace #3
Date: 10/15/25
Standard Temperature (°F): 60

EMISSIONS SUMMARY

Unit Tested:	High Fire	Low Fire	
Field Data Inputs:			
Barometric Pressure ("Hg)	30.05	30.05	
Stack Diameter (Inches)	38.0	38.0	
Pitot Correction	0.84	0.84	
Sqrt Delta P ("H_20)	0.156	0.153	
Stack Temperature (°F)	157	174	
Static Pressure ("H_20)	0.250	0.210	
Volume Sampled (cf)	23.812	23.812	
Meter Temperature (°F)	78	78	
Meter Gamma	0.991	0.991	
Delta H ("H_20)	1.8	1.8	
Liquid Collected (mils)	13.0	13.0	
Oxygen (%)	18.3	19.44 [1]	
Carbon Dioxide (%)	1.52	0.85 [1]	
Sampling Time (min)	16	32	
Mass Emission Factor	1.583E-07	1.583E-07	
Fuel Usage:			
Fuel Rate (cfh)	4,908	2,609	
Heat Input (MMBtu/hr)	5.15	2.74	
Firing rate (%)	128.8	68.5	
Flow Results:			
Volume Sampled, DSCF	23.008	23.008	
Volume Sampled, DSCM	0.652	0.652	
Moisture in Sample (CF)	0.60	0.60	
Moisture(%)	2.56	2.56	
Molecular Weight (Dry)	28.98	28.91	
Molecular Weight (Wet)	28.69	28.63	
Stack Velocity (Ft/Sec)	9.5	9.4	
Actual CFM	4,485	4,447	
Standard CFM	3,800	3,663	
Dry Standard CFM	3,702	3,570	
NOx:			**Permit Limit**
ppm	3.48	1.79	
ppm @ 3% O2	24.1	-----	**30.0**
ppm @ 3% O2 Corrected to %CO2	-----	23.0	**30**
lbs/hr	0.0939	0.0465	
lbs/MMBtu	0.018	0.017	**0.036**
CO:			
ppm	5.20	2.95	
ppm @ 3% O2	36.0	-----	**1,000**
ppm @ 3% O2 Corrected to %CO2	-----	38.0	**1,000**
lbs/hr	0.085	0.047	
lbs/MMBtu	0.017	0.017	**0.73**

[1] Value from EPA 3C analysis

South Pump Furnace (BO1)
Wax Burnoff /Shell Preheat Furnace No. 3 (BURNOUT 1)
Previous AN 658073

REFERENCE METHOD DATA SUMMARY

Client Name: Space Exploration Technologies
Plant Name: Space X
City, State: Hawthorne, CA
Test Location: Wax Burnoff - Burnout 1
Job Number: PROJ-059397

									Limit: 30ppm NOx @ 3% O2			Limit: 1000ppm CO @ 3% O2		
			Flue Gas Composition						Pollutant 2: NOx (MW: 46 lb/lb-mole)			Pollutant 3: CO (MW: 28 lb/lb-mole)		
Run Information			Moisture	Flow Rate:		O_2	Amb. CO_2	CO_2-L	dry	dry ppm**		dry	dry ppm**	
No.	Date	Time	%	dry scfm	dry scfh	dry %	dry %	dry %	ppm	@3%O2	lbs/hr	ppm	@3%O2	lbs/hr
High	12/17/2025	1131-1215	3.93	18499	1109946	19.01	0.0500	1.22	2.90	25.4	0.3908	24.80	217.13	2.030803
Low	12/17/2025	1233-1311	3.20	4919	295116	19.97	0.0500	0.67	1.42	23.6	0.051	24.80	411	0.54

** When stack O_2 concentrations were greater than 19%, the NOx and CO concentrations corrected to 3% O_2 were determined using the example equation: NOx (ppm) @ 3% O_2 = NOxstk*10.23/(CO_2stk – CO_2amb)

* Based on Standard Conditions of 60 deg. F and 29.92 in Hg

References 5-NOx Subrange

References 125-CO Subrange defaulted to 25ppm

South Pump Furnace (BO1)
Wax Burnoff /Shell Preheat Furnace No. 3 (BURNOUT 1)
Previous AN 658073

CLIENT NAME: **Space Exploration Technologies**
PLANT NAME: **Space X**
TEST LOCATION: **Wax Burnoff - Burnout 1**
CITY/STATE: **Hawthorne, CA**

JOB NUMBER: **PROJ-059397**
RUN NO.: **Low Fire**
TEST DATE: 12/17/25
RUN TIME: 1233-1311

TEST DATA

VARIABLE	DESCRIPTION	Pollutant 1 CO-L	Pollutant 2 NOx	Pollutant 3 CO	Pollutant 4 CO2-L	Diluent 1 O2	Diluent 2 CO2	
A	ANALYTICAL RANGE	125	5	250	10000	25	5	
	Unit of Measurement	ppmd	ppmd	ppmd	ppmw	% dry	% dry	
	CALIBRATION GAS INFORMATION							
B	Zero Gas	0.00	0.00	0.00	0.00	0.00	0.00	
C	Mid Gas Concentration	67.11	2.53	111.85	4232.50	11.06	2.27	
	Mid Gas Cylinder S/N:	'44472 - DILUT	178850 - DILUT	44472 - DILUT	0107797 - DILU	2997 - DILUT	221858 - DILUTED	
D	High Gas Concentration	111.85	4.22	223.70	8465.00	22.11	4.54	
	High Gas Cylinder S/N:	'44472 - DILUT	178850 - DILUT	CC44472	EB0107797	SA2997	CC221858	
	Primary Gas Cylinder S/N:							
E	UPSCALE CALIBRATION GAS USED	67.11	2.53	111.85	4232.50	11.06	2.27	
	L=Low, M=Mid, H=High	M	M	M	M	M	M	
	INITIAL CALIBRATION ERROR TEST							
F	Zero Gas Response	-0.07	-0.01	-0.07	1.14	0.00	0.00	
G	Mid Gas Response	67.60	2.47	112.92	4281.74	10.97	2.26	
H	High Gas Reponse	112.92	4.17	223.83	8462.31	22.14	4.54	
	INITIAL SYSTEM CALIBRATION CHECK							
I	Zero Gas Response	0.00	0.00	0.00	24.92	0.02	0.04	
J	Upscale Gas Response	67.70	2.47	113.34	4329.69	10.95	2.30	
	FINAL SYSTEM CALIBRATION CHECK							
K	Zero Gas Response	-0.02	-0.01	-0.02	23.44	0.03	0.04	
L	Upscale Gas Response	67.66	2.47	113.22	4306.44	10.95	2.29	
	FINAL CALIBRATION ERROR CHECK							
M	Zero Gas Response	-0.05	-0.01	-0.05	16.41	-0.01	-0.02	
N	Mid Gas Response	67.25	2.47	112.84	4289.13	10.94	2.23	
O	High Gas Reponse	112.84	4.16	223.25	8436.82	22.12	4.48	
		x		x			x	<-- Out of Range! Additional Cal. Gas Required at x
P	AS MEASURED FLUE GAS CONCENTRATION	25.000	1.389	0.946	6540.917	19.759	0.704	

CALCULATIONS

								FORMULA
	AVERAGE SYSTEM CALIBRATION							
Q	Zero Response	-0.01	-0.01	-0.01	24.18	0.03	0.04	(I+K)/2
R	Upscale Response	67.68	2.47	113.28	4318.07	10.95	2.30	(J+L)/2
		x		x			x	<-- Out of Range! Additional Cal. Gas Required at x
S	CORRECTED CONC.	24.80	1.42	0.94	6423.57	19.97	0.67	E*(P-Q)/(R-Q)

QA/QC CALCULATIONS

CALIBRATION GAS SELECTION, % of Range							
Mid Gas	53.7	50.6	44.7	42.3	44.2	45.4	C*100/A
High Gas	89.5	84.3	89.5	84.7	88.4	90.7	D*100/A
CALIBRATION ERROR, % of Range							
Initial Zero Gas Error	-0.06	-0.20	-0.03	0.01	0.00	0.00	(F-B)*100/A
Initial Mid Gas Error	0.39	-1.19	0.43	0.49	-0.34	-0.15	(G-C)*100/A
Initial High Gas Error	0.86	-0.91	0.05	-0.03	0.12	0.16	(H-D)*100/A
Final Zero Gas Error	-0.04	-0.20	-0.02	0.16	-0.04	-0.40	(M-B)*100/A
Final Mid Gas Error	0.11	-1.19	0.40	0.57	-0.46	-0.75	(N-C)*100/A
Final High Gas Error	0.79	-1.11	-0.18	-0.28	0.04	-1.10	(O-D)*100/A
LINEARITY, % of Range							
Initial	-0.10	-0.56	0.42	0.50	-0.40	-0.23	|(G-F)-[(H-F)*C]/D|*100/A
Final	-0.35	-0.44	0.50	0.63	-0.46	0.00	|(N-M)-[(O-M)*C]/D|*100/A
SAMPLING SYSTEM BIAS, % of Range							
Initial Zero Gas Bias	0.06	0.20	0.03	0.24	0.08	0.80	(I-F)*100/A
Initial Upscale Gas Bias	0.08	0.00	0.17	0.48	-0.08	0.80	(J-G|or G', or H|*100/A
Final Zero Gas Bias	0.02	0.00	0.01	0.07	0.16	1.20	(K-M)*100/A
Final Upscale Gas Bias	0.33	0.00	0.15	0.17	0.04	1.20	(L-N|or N', or O|*100/A
CALIBRATION DRIFT, % of Range							
Zero	-0.02	-0.20	-0.01	-0.01	0.04	0.00	(K-I)*100/A
Upscale	-0.03	0.00	-0.05	-0.23	0.00	-0.20	(L-J)*100/A

South Pump Furnace (BO1)
Wax Burnoff /Shell Preheat Furnace No. 3 (BURNOUT 1)
Previous AN 658073

CLIENT NAME: Space Exploration Technologies
PLANT NAME: Space X
TEST LOCATION: Wax Burnoff - Burnout 1
CITY/STATE: Hawthorne, CA

JOB NUMBER: PROJ-059397
RUN NO.: High Fire
TEST DATE: 12/17/25
RUN TIME: 1131-1215

TEST DATA

VARIABLE	DESCRIPTION	Pollutant 1 CO-L	Pollutant 2 NOx	Pollutant 3 CO	Pollutant 4 CO2-L	Diluent 1 O2	Diluent 2 CO2	
A	ANALYTICAL RANGE	125	10	250	10000	25	5.0	
	Unit of Measurement	ppmd	ppmd	ppmd	ppmw	% dry	% dry	
	CALIBRATION GAS INFORMATION							
B	Zero Gas	0.00	0.00	0.00	0.00	0.00	0.00	
C'	Low Gas Concentration						0.42	
	Low Gas Cylinder S/N:						EB0107797 - DILUTED	
C	Mid Gas Concentration	67.11	4.216	111.85	4232.50	11.06	2.268	
	Mid Gas Cylinder S/N:	CC44472 - DILUTED	CC178850 - DILUTED	CC44472 - DILUTED	EB0107797 - DILUTED	SA2997 - DILUTED	CC221858 - DILUTED	
D	High Gas Concentration	111.85	8.431	223.70	8465.00	22.11	4.535	
	High Gas Cylinder S/N:	CC44472 - DILUTED	CC178850	CC44472	EB0107797	SA2997	CC221858	
	Primary Gas Cylinder S/N:							
E	UPSCALE CALIBRATION GAS USED	67.11	4.22	111.85	4232.50	11.06	2.27	
	L=Low, M=Mid, H=High	M	M	M	M	M	M	
	INITIAL CALIBRATION ERROR TEST							
F	Zero Gas Response	-0.07	-0.01	-0.07	1.14	0.00	0.00	
G'	Low Gas Response						0.44	
G	Mid Gas Response	67.60	4.17	112.92	4281.74	10.97	2.26	
H	High Gas Reponse	112.92	8.43	223.83	8462.31	22.14	4.54	
	INITIAL SYSTEM CALIBRATION CHECK							
I	Zero Gas Response	0.00	0.00	0.00	24.92	0.02	0.04	
J	Upscale Gas Response	67.70	4.14	113.34	4329.69	10.95	2.30	
	FINAL SYSTEM CALIBRATION CHECK							
K	Zero Gas Response	-0.02	-0.01	-0.02	23.44	0.03	0.04	
L	Upscale Gas Response	67.66	4.13	113.22	4306.44	10.95	2.29	
	FINAL CALIBRATION ERROR CHECK							
M	Zero Gas Response	-0.05	-0.01	-0.05	16.41	-0.01	-0.02	
N'	Low Gas Response						0.42	
N	Mid Gas Response	67.25	4.16	112.84	4289.13	10.94	2.23	
O	High Gas Reponse	112.84	8.42	223.25	8436.82	22.12	4.48	
		x		x	x			--- Out of Range! Additional Cal. Gas Required at x
P	AS MEASURED FLUE GAS CONCENTRATION	25.000	2.848	0.605	10452.194	18.807	1.252	

CALCULATIONS

								FORMULA
	AVERAGE SYSTEM CALIBRATION							
Q	Zero Response	-0.01	-0.01	-0.01	24.18	0.03	0.04	(I+K)/2
R	Upscale Response	67.68	4.14	113.28	4318.07	10.95	2.30	(J+L)/2
		x	x	x	x			--- Out of Range! Additional Cal. Gas Required at x
S	CORRECTED CONC	24.80	2.90	0.61	10278.94	19.01	1.22	E*(P-Q)/(R-Q)

QA/QC CALCULATIONS

CALIBRATION GAS SELECTION, "n of Range							
Low Gas						8.5	C'*100/A
Mid Gas	53.7	42.2	44.7	42.3	44.2	45.4	C*100/A
High Gas	89.5	84.3	89.5	84.7	88.4	90.7	D*100/A
CALIBRATION ERROR, % of Range							
Initial Zero Gas Error	-0.06	-0.10	-0.03	0.01	0.00	0.00	(F-B)*100/A
Initial Low Gas Error						0.34	(G'-C')*100/A
Initial Mid Gas Error	0.39	-0.45	0.43	0.49	-0.34	-0.15	(G-C)*100/A
Initial High Gas Error	0.86	-0.01	0.05	-0.03	0.12	0.16	(H-D)*100/A
Final Zero Gas Error	-0.04	-0.10	-0.02	0.16	-0.04	-0.40	(M-B)*100/A
Final Low Gas Error						-0.07	(N'-C')*100/A
Final Mid Gas Error	0.11	-0.55	0.40	0.57	-0.46	-0.75	(N-C)*100/A
Final High Gas Error	0.79	-0.11	-0.18	-0.28	0.04	-1.10	(O-D)*100/A
LINEARITY, % of Range							
Initial	-0.10	-0.40	0.42	0.50	-0.40	-0.23	{(G-F)-[(H-F)*C]/D}*100/A
Final	-0.35	-0.45	0.50	0.63	-0.46	0.00	{(N-M)-[(O-M)*C]/D}*100/A
SAMPLING SYSTEM BIAS, % of Range							
Initial Zero Gas Bias	0.06	0.10	0.03	0.24	0.08	0.80	(I-F)*100/A
Initial Upscale Gas Bias	0.08	-0.30	0.17	0.48	-0.08	0.80	(J-G]or G', or H]*100/A
Final Zero Gas Bias	0.02	0.00	0.01	0.07	0.16	1.20	(K-M)*100/A
Final Upscale Gas Bias	0.33	-0.30	0.15	0.17	0.04	1.20	(L-N]or N', or O]*100/A
CALIBRATION DRIFT, "n of Range							
Zero	-0.02	-0.10	-0.01	-0.01	0.04	0.00	(K-I)*100/A
Upscale	-0.03	-0.10	-0.05	-0.23	0.00	-0.20	(L-J)*100/A

South Pump Furnace (PH1)
Wax Burnoff Furnace (Cerberus) (PREHEAT1)
Previous AN 658071

REFERENCE METHOD DATA SUMMARY

Client Name: Space X
Plant Name: Space X
City, State: Hawthorne, CA
Test Location: Cerebus Furnace
Job Number: PROJ-059397

									Limit 3ppm NOx @ 3% O_2			Limit 100ppm CO @ 3% O2		
			Flue Gas Composition						Pollutant 2: NOx (MW: 46 lb/lb-mole)			Pollutant 3: CO (MW: 28 lb/lb-mole)		
Run Information			Moisture	Flow Rate:		O_2	Amb. CO_2	CO_2-L	dry	dry ppm**		dry	dry ppm**	
No.	Date	Time	%	dry scfm	dry scfh	dry %	dry %	dry %	ppm	@3%O2	lbs/hr	ppm	@3%O2	lbs/hr
High	12/16/2025	1509-1546	4.67	21232	1273937	19.25	0.0500	1.12	1.80	17.1	0.2773	48.25	460.85	4.535950
Low	12/16/2025	1756-1835	3.36	5582	334920	19.47	0.0500	0.98	1.61	17.7	0.07	24.78	272.1	0.61

** When stack O_2 concentrations were greater than 19%, the NOx and CO concentrations corrected to 3% O_2 were determined using the example equation: NOx (ppm) @ 3% O_2 = NOxstk*10.23/(CO_2stk - CO_2amb)

* Based on Standard
Conditions of:
60 deg. F and
29.92 in. Hg

References 125-CO Subrange defaulted to 25ppm

South Pump Furnace (PH1)
Wax Burnoff Furnace (Cerberus) (PREHEAT1)
Previous AN 658071

CLIENT NAME:	**Space X**	JOB NUMBER:	**PROJ-059397**
PLANT NAME:	**Space X**	RUN NO.:	**Low Fire**
TEST LOCATION:	**Cerebus Furnace**	TEST DATE:	12/16/25
CITY/STATE:	**Hawthorne, CA**	RUN TIME:	**1756-1835**

TEST DATA		Pollutant 1	Pollutant 2	Pollutant 3	Pollutant 4	Diluent 1	Diluent 2	
VARIABLE	DESCRIPTION	CO-L	NOx	CO	CO2-L	O2	CO2	
A	ANALYTICAL RANGE	125	5	250	10000	25	5	
	Unit of Measurement	ppmd	ppmd	ppmd	ppmw	% dry	% dry	
	CALIBRATION GAS INFORMATION							
B	Zero Gas	0.00	0.00	0.00	0.00	0.00	0.00	
C	Mid Gas Concentration	67.11	2.53	111.85	4232.50	11.06	2.70	
	Mid Gas Cylinder S/N: [illegible]							
D	High Gas Concentration	111.85	4.22	223.70	8465.00	22.11	4.50	
	High Gas Cylinder S/N: [illegible]							
	Primary Gas Cylinder S/N:							
E	UPSCALE CALIBRATION GAS USED	67.11	2.53	111.85	4232.50	11.06	2.70	
	L=Low, M=Mid, H=High	M	M	M	M	M	M	
	INITIAL CALIBRATION ERROR TEST							
F	Zero Gas Response	0.03	0.00	0.03	1.11	0.01	0.02	
G	Mid Gas Response	67.19	2.52	112.04	4315.17	10.98	2.70	
H	High Gas Reponse	112.04	4.22	223.60	8474.26	22.15	4.51	
	INITIAL SYSTEM CALIBRATION CHECK							
I	Zero Gas Response	0.08	0.00	0.08	18.16	0.05	-0.04	
J	Upscale Gas Response	67.75	2.51	113.25	4246.59	11.31	2.69	
	FINAL SYSTEM CALIBRATION CHECK							
K	Zero Gas Response	0.00	-0.01	0.00	-6.02	0.06	-0.02	
L	Upscale Gas Response	67.55	2.49	112.80	4226.89	11.32	2.71	
	FINAL CALIBRATION ERROR CHECK							
M	Zero Gas Response	-0.01	-0.02	-0.01	-2.74	0.01	-0.03	
N	Mid Gas Response	67.28	2.51	112.63	4265.75	10.97	2.69	
O	High Gas Reponse	112.63	4.22	222.86	8335.00	22.16	4.51	
		x		x			x	<-- Out of Range! Additional Cal. Gas Required at x
P	AS MEASURED FLUE GAS CONCENTRATION	25.000	1.593	2.069	8939.056	19.888	0.962	

CALCULATIONS								FORMULA
	AVERAGE SYSTEM CALIBRATION							
Q	Zero Response	0.04	-0.01	0.04	6.07	0.06	-0.03	(I+K)/2
R	Upscale Response	67.65	2.50	113.03	4236.74	11.32	2.70	(J+L)/2
		x		x			x	<-- Out of Range! Additional Cal. Gas Required at x
S	CORRECTED CONC	24.78	1.61	2.01	8936.85	19.47	0.98	E*(P-Q)/(R-Q)

QA/QC CALCULATIONS

CALIBRATION GAS SELECTION, "a of Range							
Mid Gas	53.7	50.6	44.7	42.3	44.2	54.0	C*100/A
High Gas	89.5	84.3	89.5	84.7	88.4	90.0	D*100/A
CALIBRATION ERROR, "a of Range							
Initial Zero Gas Error	0.02	0.00	0.01	0.01	0.04	-0.40	(F-B)*100/A
Initial Mid Gas Error	0.06	-0.19	0.08	0.83	-0.30	0.01	(G-C)*100/A
Initial High Gas Error	0.15	0.09	-0.04	0.09	0.16	0.21	(H-D)*100/A
Final Zero Gas Error	-0.01	-0.40	0.00	-0.03	0.04	-0.60	(M-B)*100/A
Final Mid Gas Error	0.14	-0.39	0.31	0.33	-0.34	-0.19	(N-C)*100/A
Final High Gas Error	0.62	0.09	-0.34	-1.30	0.20	0.21	(O-D)*100/A
LINEARITY, "a of Range							
Initial	-0.04	-0.24	0.09	0.77	-0.40	0.04	{(G-F)-[(H-F)*C]/D}*100/A
Final	-0.24	-0.28	0.48	1.00	-0.46	-0.08	{(N-M)-[(O-M)*C]/D}*100/A
SAMPLING SYSTEM BIAS, % of Range							
Initial Zero Gas Bias	0.04	0.00	0.02	0.17	0.16	-0.40	(I-F)*100/A
Initial Upscale Gas Bias	0.45	-0.20	0.48	-0.69	1.32	-0.20	(J-G[or G', or H]*100/A
Final Zero Gas Bias	0.01	0.20	0.00	-0.03	0.20	0.20	(K-M)*100/A
Final Upscale Gas Bias	0.22	-0.40	0.07	-0.39	1.40	0.40	(L-N[or N', or O]*100/A
CALIBRATION DRIFT, % of Range							
Zero	-0.06	-0.20	-0.03	-0.24	0.04	0.40	(K-I)*100/A
Upscale	-0.16	-0.40	-0.18	-0.20	0.04	0.40	(L-J)*100/A

South Pump Furnace (PH1)
Wax Burnoff Furnace (Cerberus) (PREHEAT1)
Previous AN 658071

CLIENT NAME: Space X
PLANT NAME: Space X
TEST LOCATION: Cerebus Furnace
CITY/STATE: Hawthorne, CA

JOB NUMBER: PROJ-059397
RUN NO.: High Fire
TEST DATE: 12/16/25
RUN TIME: 1509-1546

TEST DATA

VARIABLE	DESCRIPTION	Pollutant 1 CO-L	Pollutant 2 NOx	Pollutant 3 CO	Pollutant 4 CO2-L	Diluent 1 O2	Diluent 2 CO2
A	ANALYTICAL RANGE	125	5	250	10000	25	5.0
	Unit of Measurement	ppmd	ppmd	ppmd	ppmw	% dry	% dry
	CALIBRATION GAS INFORMATION						
B	Zero Gas	0.00	0.00	0.00	0.00	0.00	0.00
C'	Low Gas Concentration		0.467				
	Low Gas Cylinder S/N:		CC426958 - DILUTED				
C	Mid Gas Concentration	67.11	2.529	111.85	4232.50	11.06	2.700
	Mid Gas Cylinder S/N:	CC44472 - DILUTED	CC178850 - DILUTED	CC44472 - DILUTED	EB0107797 - DILUTED	SA2997 - DILUTED	CC326130 - DILUTED
D	High Gas Concentration	111.85	4.216	223.70	8465.00	22.11	4.500
	High Gas Cylinder S/N:	CC44472 - DILUTED	CC178850 - DILUTED	CC44472	EB0107797	SA2997	CC326130 - DILUTED
	Primary Gas Cylinder S/N:						
E	UPSCALE CALIBRATION GAS USED	67.11	2.53	111.85	4232.50	11.06	2.70
	L=Low, M=Mid, H=High	M	M	M	M	M	M
	INITIAL CALIBRATION ERROR TEST						
F	Zero Gas Response	0.03	0.00	0.03	1.11	0.01	-0.02
G'	Low Gas Response		0.47				
G	Mid Gas Response	67.19	2.52	112.04	4315.17	10.98	2.70
H	High Gas Reponse	112.04	4.22	223.60	8474.26	22.15	4.51
	INITIAL SYSTEM CALIBRATION CHECK						
I	Zero Gas Response	0.35	0.05	0.35	70.41	0.06	0.07
J	Upscale Gas Response	67.82	2.58	113.35	4244.62	11.16	2.77
	FINAL SYSTEM CALIBRATION CHECK						
K	Zero Gas Response	0.08	0.00	0.08	18.16	0.05	-0.04
L	Upscale Gas Response	67.75	2.51	113.25	4246.59	11.31	2.69
	FINAL CALIBRATION ERROR CHECK						
M	Zero Gas Response	-0.01	-0.02	-0.01	-2.74	0.01	-0.03
N'	Low Gas Response		0.45				
N	Mid Gas Response	67.28	2.51	112.63	4265.75	10.97	2.69
O	High Gas Reponse	112.63	4.22	222.86	8335.00	22.16	4.51
				x	x		<-- Out of Range! Additional Cal. Gas Required at x
P	AS MEASURED FLUE GAS CONCENTRATION	48.799	1.814	48.799	10213.306	19.522	1.143

CALCULATIONS

								FORMULA
	AVERAGE SYSTEM CALIBRATION							
Q	Zero Response	0.22	0.03	0.22	44.29	0.06	0.02	(I+K)/2
R	Upscale Response	67.79	2.55	113.30	4245.61	11.24	2.73	(J+L)/2
				x	x			<-- Out of Range! Additional Cal. Gas Required at x
S	CORRECTED CONC	48.25	1.80	48.05	10244.49	19.25	1.12	E*(P-Q)/(R-Q)

QA/QC CALCULATIONS

CALIBRATION GAS SELECTION, % of Range							
Low Gas		9.3					C'*100/A
Mid Gas	53.7	50.6	44.7	42.3	44.2	54.0	C*100/A
High Gas	89.5	84.3	89.5	84.7	88.4	90.0	D*100/A
CALIBRATION ERROR, % of Range							
Initial Zero Gas Error	0.02	0.00	0.01	0.01	0.04	-0.40	(F-B)*100/A
Initial Low Gas Error		0.07					(G'-C')*100/A
Initial Mid Gas Error	0.06	-0.19	0.08	0.83	-0.30	0.01	(G-C)*100/A
Initial High Gas Error	0.15	0.09	-0.04	0.09	0.16	0.21	(H-D)*100/A
Final Zero Gas Error	-0.01	-0.40	0.00	-0.03	0.04	-0.60	(M-B)*100/A
Final Low Gas Error		-0.33					(N'-C')*100/A
Final Mid Gas Error	0.14	-0.39	0.31	0.33	-0.34	-0.19	(N-C)*100/A
Final High Gas Error	0.62	0.09	-0.34	-1.30	0.20	0.21	(O-D)*100/A
LINEARITY, % of Range							
Initial	-0.04	-0.24	0.09	0.77	-0.40	0.04	{(G-F)-[(H-F)*C]/D}*100/A
Final	-0.24	-0.28	0.48	1.00	-0.46	-0.08	{(N-M)-[(O-M)*C]/D}*100/A
SAMPLING SYSTEM BIAS, % of Range							
Initial Zero Gas Bias	0.26	1.00	0.13	0.69	0.20	1.80	(I-F)*100/A
Initial Upscale Gas Bias	0.50	1.20	0.52	-0.71	0.72	1.40	(J-G[or G', or H]*100/A
Final Zero Gas Bias	0.07	0.40	0.04	0.21	0.16	-0.20	(K-M)*100/A
Final Upscale Gas Bias	0.38	0.00	0.25	-0.19	1.36	0.00	(L-N[or N', or O]*100/A
CALIBRATION DRIFT, % of Range							
Zero	-0.22	-1.00	-0.11	-0.52	-0.04	-2.20	(K-I)*100/A
Upscale	-0.06	-1.40	-0.04	0.02	0.60	-1.60	(L-J)*100/A

PRELIMINARY RESULTS

North TCA Furnace (BO2)
Wax Burnoff /Shell Preheat Furnace No. 3 (BURNOUT 2)
Previous AN 658075

REFERENCE METHOD DATA SUMMARY

Client Name: Space Exploration Technologies
Plant Name: Space X
City, State: Hawthorne, CA
Test Location: Wax Burnoff Furnace (BURNOUT 2) (Previous AN658075)
Job Number: PROJ-061968

									Limit: 30ppm NOx @ 3% O_2			Limit: 1000ppm CO @ 3% O2		
Run Information			Flue Gas Composition					Pollutant 2: NOx (MW: 46 lb/lb-mole)			Pollutant 3: CO (MW: 28 lb/lb-mole)		
			Moisture	Flow Rate:		O_2	Amb. CO_2	CO_2-L	dry	dry ppm**		dry	dry ppm**	
No.	Date	Time	%	dry scfm	dry scfh	dry %	dry %	dry %	ppm	@3%O2	lbs/hr	ppm	@3%O2	lbs/hr
High	12/18/2025	1351-1428	3.70	5424	325463	19.40	0.0500	1.01	2.93	31.4	0.1156	24.70	264.19	0.593121
Low	12/18/2025	1616-1655	2.34	5720	343182	19.92	0.0500	0.70	1.76	27.6	0.073	24.72	387	0.63
High-2	12/18/2025	1811-1848	3.56	5661	339646	19.24	0.0500	1.11	3.05	29.3	0.13	24.69	237.2	0.62

** When stack O_2 concentrations were greater than 19%, the NOx and CO concentrations corrected to 3% O_2 were determined using the example equation: NOx (ppm) @ 3% O_2 = NOxstk*10.23/(CO_2stk – CO_2amb)

* Based on Standard
Conditions of:
60 deg. F and
29.92 in. Hg

References 5-Nox Subrange

References 125-CO Subrange defaulted to 25ppm

North TCA Furnace (BO2)
Wax Burnoff /Shell Preheat Furnace
No. 3 (BURNOUT 2)
Previous AN 658075

PRELIMINARY RESULTS

CLIENT NAME: **Space Exploration Technologies** JOB NUMBER: **PROJ-061968**
PLANT NAME: **Space X** RUN NO.: **High Fire**
TEST LOCATION: **Wax Burnoff Furnace (BURNOUT 2) (Previous AN658075)** TEST DATE: **12/18/25**
CITY/STATE: **Hawthorne, CA** RUN TIME: **1351-1428**

TEST DATA

VARIABLE	DESCRIPTION	Pollutant 1 CO-L	Pollutant 2 NOx	Pollutant 3 CO	Pollutant 4 CO2-L	Diluent 1 O2	Diluent 2 CO2	
A	ANALYTICAL RANGE	125	10	250	10000	25	5.0	
	Unit of Measurement	ppmd	ppmd	ppmd	ppmw	% dry	% dry	
	CALIBRATION GAS INFORMATION							
B	Zero Gas	0.00	0.00	0.00	0.00	0.00	0.00	
C'	Low Gas Concentration						0.42	
	Low Gas Cylinder S/N:						EB0107797	
C	Mid Gas Concentration	67.11	4.216	111.85	4232.50	11.06	2.268	
	Mid Gas Cylinder S/N:	CC44472 - DILUTED	CC178850 - DILUTED	CC44472 - DILUTED	EB0107797 - DILUTED	SA2997 - DILUTED	CC221858 - DILUTED	
D	High Gas Concentration	111.85	8.431	223.70	8465.00	22.11	4.535	
	High Gas Cylinder S/N:	CC44472 - DILUTED	CC178850	CC44472	EB0107797	SA2997	CC221858	
	Primary Gas Cylinder S/N:							
E	UPSCALE CALIBRATION GAS USED	67.11	4.22	111.85	4232.50	11.06	2.27	
	L=Low, M=Mid, H=High	M	M	M	M	M	M	
	INITIAL CALIBRATION ERROR TEST							
F	Zero Gas Response	-0.06	0.00	-0.06	1.33	0.00	0.00	
G'	Low Gas Response						0.43	
G	Mid Gas Response	67.58	4.16	113.09	4267.61	10.96	2.26	
H	High Gas Reponse	113.09	8.43	224.30	8472.52	22.14	4.54	
	INITIAL SYSTEM CALIBRATION CHECK							
I	Zero Gas Response	0.01	-0.02	0.01	-13.93	0.03	0.04	
J	Upscale Gas Response	67.89	4.12	113.72	4302.68	10.95	2.29	
	FINAL SYSTEM CALIBRATION CHECK							
K	Zero Gas Response	0.01	-0.03	0.01	1.69	0.03	0.02	
L	Upscale Gas Response	67.94	4.11	113.72	4299.28	10.94	2.27	
	FINAL CALIBRATION ERROR CHECK							
M	Zero Gas Response	-0.04	-0.04	-0.04	-19.04	0.00	0.00	
N'	Low Gas Response						0.44	
N	Mid Gas Response	67.55	4.14	113.24	4268.42	10.92	2.24	
O	High Gas Reponse	113.24	8.42	224.79	8463.17	22.11	4.49	
		x		x	x			*<-- Out of Range! Additional Cal. Gas Required at x*
P	AS MEASURED FLUE GAS CONCENTRATION	25.000	2.853	3.929	9671.306	19.184	1.029	

CALCULATIONS

								FORMULA	
	AVERAGE SYSTEM CALIBRATION								
Q	Zero Response	0.01	-0.03	0.01	-6.12	0.03	0.03	(I+K)/2	
R	Upscale Response	67.92	4.12	113.72	4300.98	10.95	2.28	(J+L)/2	
		x		x	x				*<-- Out of Range! Additional Cal. Gas Required at x*
S	CORRECTED CONC.	24.70	2.93	3.85	9509.81	19.40	1.01	E*(P-Q)/(R-Q)	

QA/QC CALCULATIONS

CALIBRATION GAS SELECTION, % of Range							
Low Gas						8.5	C'*100/A
Mid Gas	53.7	42.2	44.7	42.3	44.2	45.4	C*100/A
High Gas	89.5	84.3	89.5	84.7	88.4	90.7	D*100/A
CALIBRATION ERROR, % of Range							
Initial Zero Gas Error	-0.05	0.00	-0.02	0.01	0.00	0.00	(F-B)*100/A
Initial Low Gas Error						0.14	(G'-C')*100/A
Initial Mid Gas Error	0.38	-0.55	0.50	0.35	-0.38	-0.15	(G-C)*100/A
Initial High Gas Error	0.99	-0.01	0.24	0.08	0.12	0.10	(H-D)*100/A
Final Zero Gas Error	-0.03	-0.40	-0.02	-0.19	0.00	0.00	(M-B)*100/A
Final Low Gas Error						0.34	(N'-C')*100/A
Final Mid Gas Error	0.35	-0.75	0.56	0.36	-0.54	-0.55	(N-C)*100/A
Final High Gas Error	1.11	-0.11	0.44	-0.02	0.00	-0.90	(O-D)*100/A
LINEARITY, % of Range							
Initial	-0.20	-0.55	0.39	0.31	-0.44	-0.20	{(G-F)-[(H-F)*C]/D}*100/A
Final	-0.30	-0.50	0.35	0.46	-0.54	-0.10	{(N-M)-[(O-M)*C]/D}*100/A
SAMPLING SYSTEM BIAS, % of Range							
Initial Zero Gas Bias	0.06	-0.20	0.03	-0.15	0.12	0.80	(I-F)*100/A
Initial Upscale Gas Bias	0.25	-0.40	0.25	0.35	-0.04	0.60	(J-G[or G', or H]*100/A
Final Zero Gas Bias	0.04	0.10	0.02	0.21	0.12	0.40	(K-M)*100/A
Final Upscale Gas Bias	0.31	-0.30	0.19	0.31	0.08	0.60	(L-N[or N', or O]*100/A
CALIBRATION DRIFT, % of Range							
Zero	0.00	-0.10	0.00	0.16	0.00	-0.40	(K-I)*100/A
Upscale	0.04	-0.10	0.00	-0.03	-0.04	-0.40	(L-J)*100/A

North TCA Furnace (BO2)
Wax Burnoff /Shell Preheat Furnace
No. 3 (BURNOUT 2)
Previous AN 658075

PRELIMINARY RESULTS

CLIENT NAME: **Space Exploration Technologies** JOB NUMBER: **PROJ-061968**
PLANT NAME: **Space X** RUN NO.: **Low Fire**
TEST LOCATION: **Wax Burnoff Furnace (BURNOUT 2) (Previous AN658075)** TEST DATE: **12/18/25**
CITY/STATE: **Hawthorne, CA** RUN TIME: **1616-1655**

TEST DATA

VARIABLE	DESCRIPTION	Pollutant 1 CO-L	Pollutant 2 NOx	Pollutant 3 CO	Pollutant 4 CO2-L	Diluent 1 O2	Diluent 2 CO2	
A	ANALYTICAL RANGE	125	5	250	10000	25	5	
	Unit of Measurement	ppmd	ppmd	ppmd	ppmw	% dry	% dry	
	CALIBRATION GAS INFORMATION							
B	Zero Gas	0.00		0.00	0.00	0.00	0.00	
C'	Low Gas Concentration						0.42	
	Low Gas Cylinder S/N:						EB0107797	
C	Mid Gas Concentration	67.11	2.53	111.85	4232.50	11.06	2.27	
	Mid Gas Cylinder S/N:	CC44472 - DILUTED	CC178850 - DILUTED	CC44472 - DILUTED	EB0107797 - DILUTED	SA2997 - DILUTED	CC221858 - DILUTED	
D	High Gas Concentration	111.85	4.22	223.70	8465.00	22.11	4.54	
	High Gas Cylinder S/N:	CC44472 - DILUTED	CC178850 - DILUTED	CC44472	EB0107797	SA2997	CC221858	
	Primary Gas Cylinder S/N:							
E	UPSCALE CALIBRATION GAS USED	67.11	2.53	111.85	4232.50	11.06	2.27	
	L=Low, M=Mid, H=High	M	M	M	M	M	M	
	INITIAL CALIBRATION ERROR TEST							
F	Zero Gas Response	-0.06	0.00	-0.06	1.33	0.00	0.00	
G	Mid Gas Response	67.58	2.48	113.09	4267.61	10.96	2.26	
H	High Gas Reponse	113.09	4.16	224.30	8472.52	22.14	4.54	
	INITIAL SYSTEM CALIBRATION CHECK							
I	Zero Gas Response	0.01	-0.03	0.01	-6.00	0.03	0.02	
J	Upscale Gas Response	67.94	2.44	113.72	4299.28	10.94	2.27	
	FINAL SYSTEM CALIBRATION CHECK							
K	Zero Gas Response	-0.03	-0.03	-0.03	-15.92	0.03	0.03	
L	Upscale Gas Response	67.85	2.44	113.86	4253.89	10.92	2.26	
	FINAL CALIBRATION ERROR CHECK							
M	Zero Gas Response	-0.04	-0.04	-0.04	-19.04	0.00	0.00	
N	Mid Gas Response	67.55	2.45	113.24	4268.42	10.92	2.24	
O	High Gas Reponse	113.24	4.14	224.79	8463.17	22.11	4.49	
		x		x			x	<-- Out of Range! Additional Cal. Gas Required at x
P	AS MEASURED FLUE GAS CONCENTRATION	25.000	1.691	1.441	7114.083	19.666	0.752	

CALCULATIONS

								FORMULA
	AVERAGE SYSTEM CALIBRATION							
Q	Zero Response	-0.01	-0.03	-0.01	-10.96	0.03	0.03	(I+K)/2
R	Upscale Response	67.90	2.44	113.79	4276.59	10.93	2.27	(J+L)/2
		x		x			x	<-- Out of Range! Additional Cal. Gas Required at x
S	CORRECTED CONC.	24.72	1.76	1.43	7033.57	19.92	0.74	E*(P-Q)/(R-Q)

QA/QC CALCULATIONS

CALIBRATION GAS SELECTION, % of Range							
Mid Gas	53.7	50.6	44.7	42.3	44.2	45.4	C*100/A
High Gas	89.5	84.3	89.5	84.7	88.4	90.7	D*100/A
CALIBRATION ERROR, % of Range							
Initial Zero Gas Error	-0.05	0.00	-0.02	0.01	0.00	0.00	(F-B)*100/A
Initial Mid Gas Error	0.38	-0.99	0.50	0.35	-0.38	-0.15	(G-C)*100/A
Initial High Gas Error	0.99	-1.11	0.24	0.08	0.12	0.10	(H-D)*100/A
Final Zero Gas Error	-0.03	-0.80	-0.02	-0.19	0.00	0.00	(M-B)*100/A
Final Mid Gas Error	0.35	-1.59	0.56	0.36	-0.54	-0.55	(N-C)*100/A
Final High Gas Error	1.11	-1.51	0.44	-0.02	0.00	-0.90	(O-D)*100/A
LINEARITY, % of Range							
Initial	-0.20	-0.32	0.39	0.31	-0.44	-0.20	{(G-F)-[(H-F)*C]/D}*100/A
Final	-0.30	-0.36	0.35	0.46	-0.54	-0.10	{(N-M)-[(O-M)*C]/D}*100/A
SAMPLING SYSTEM BIAS, % of Range							
Initial Zero Gas Bias	0.06	-0.60	0.03	-0.07	0.12	0.40	(I-F)*100/A
Initial Upscale Gas Bias	0.29	-0.80	0.25	0.32	-0.08	0.20	(J-G[or G', or H]*100/A
Final Zero Gas Bias	0.01	0.20	0.00	0.03	0.12	0.60	(K-M)*100/A
Final Upscale Gas Bias	0.24	-0.20	0.25	-0.15	0.00	0.40	(L-N[or N', or O]*100/A
CALIBRATION DRIFT, % of Range							
Zero	-0.03	0.00	-0.02	-0.10	0.00	0.20	(K-I)*100/A
Upscale	-0.07	0.00	0.06	-0.45	-0.08	-0.20	(L-J)*100/A

North TCA Furnace (BO2)
Wax Burnoff /Shell Preheat Furnace
No. 3 (BURNOUT 2)
Previous AN 658075

PRELIMINARY RESULTS

CLIENT NAME: **Space Exploration Technologies** JOB NUMBER: **PROJ-061968**
PLANT NAME: **Space X** RUN NO.: **High Fire - 2**
TEST LOCATION: **Wax Burnoff Furnace (BURNOUT 2) (Previous AN658075)** TEST DATE: **12/18/25**
CITY/STATE: **Hawthorne, CA** RUN TIME: **1811-1848**

TEST DATA		Pollutant 1	Pollutant 2	Pollutant 3	Pollutant 4	Diluent 1	Diluent 2	
VARIABLE	DESCRIPTION	CO-L	NOx	CO	CO2-L	O2	CO2	
A	ANALYTICAL RANGE	125	10	250	10000	25	5	
	Unit of Measurement	ppmd	ppmd	ppmd	ppmw	% dry	% dry	
	CALIBRATION GAS INFORMATION							
B	Zero Gas	0.00	0.00	0.00	0.00	0.00	0.00	
C	Mid Gas Concentration	67.11	4.22	111.85	4232.50	11.06	2.27	
	Mid Gas Cylinder S/N:	'44472 - DILUT	178850 - DILUT	44472 - DILUT	107797 - DILU	2997 - DILUT	221858 - DILUTED	
D	High Gas Concentration	111.85	8.43	223.70	8465.00	22.11	4.54	
	High Gas Cylinder S/N:	'44472 - DILUT	CC178850	CC44472	EB0107797	SA2997	CC221858	
	Primary Gas Cylinder S/N:							
E	UPSCALE CALIBRATION GAS USED	67.11	4.22	111.85	4232.50	11.06	2.27	
	L=Low, M=Mid, H=High	M	M	M	M	M	M	
	INITIAL CALIBRATION ERROR TEST							
F	Zero Gas Response	-0.06	0.00	-0.06	1.33	0.00	0.00	
G	Mid Gas Response	67.58	4.16	113.09	4267.61	10.96	2.26	
H	High Gas Reponse	113.09	8.43	224.30	8472.52	22.14	4.54	
	INITIAL SYSTEM CALIBRATION CHECK							
I	Zero Gas Response	-0.03	-0.03	-0.03	-15.92	0.03	0.03	
J	Upscale Gas Response	67.85	4.10	113.86	4253.89	10.92	2.26	
	FINAL SYSTEM CALIBRATION CHECK							
K	Zero Gas Response	-0.01	-0.02	-0.01	-5.26	0.03	0.04	
L	Upscale Gas Response	68.10	4.13	113.72	4249.49	10.93	2.28	
	FINAL CALIBRATION ERROR CHECK							
M	Zero Gas Response	-0.04	-0.04	-0.04	-19.04	0.00	0.00	
N	Mid Gas Response	67.55	4.14	113.24	4268.42	10.92	2.24	
O	High Gas Reponse	113.24	8.42	224.79	8463.17	22.11	4.49	
		x		x	x			<-- Out of Range! Additional Cal. Gas Required at x
P	AS MEASURED FLUE GAS CONCENTRATION	25.000	2.969	1.111	10408.861	18.995	1.134	

CALCULATIONS								FORMULA
	AVERAGE SYSTEM CALIBRATION							
Q	Zero Response	-0.02	-0.03	-0.02	-10.59	0.03	0.04	(I+K)/2
R	Upscale Response	67.98	4.12	113.79	4251.69	10.93	2.27	(J+L)/2
		x		x	x			<-- Out of Range! Additional Cal. Gas Required at x
S	CORRECTED CONC.	24.69	3.05	1.11	10346.65	19.24	1.11	E*(P-Q)/(R-Q)

QA/QC CALCULATIONS

CALIBRATION GAS SELECTION, % of Range							
Mid Gas	53.7	42.2	44.7	42.3	44.2	45.4	C*100/A
High Gas	89.5	84.3	89.5	84.7	88.4	90.7	D*100/A
CALIBRATION ERROR, % of Range							
Initial Zero Gas Error	-0.05	0.00	-0.02	0.01	0.00	0.00	(F-B)*100/A
Initial Mid Gas Error	0.38	-0.55	0.50	0.35	-0.38	-0.15	(G-C)*100/A
Initial High Gas Error	0.99	-0.01	0.24	0.08	0.12	0.10	(H-D)*100/A
Final Zero Gas Error	-0.03	-0.40	-0.02	-0.19	0.00	0.00	(M-B)*100/A
Final Mid Gas Error	0.35	-0.75	0.56	0.36	-0.54	-0.55	(N-C)*100/A
Final High Gas Error	1.11	-0.11	0.44	-0.02	0.00	-0.90	(O-D)*100/A
LINEARITY, % of Range							
Initial	-0.20	-0.55	0.39	0.31	-0.44	-0.20	{(G-F)-[(H-F)*C]/D}*100/A
Final	-0.30	-0.50	0.35	0.46	-0.54	-0.10	{(N-M)-[(O-M)*C]/D}*100/A
SAMPLING SYSTEM BIAS, % of Range							
Initial Zero Gas Bias	0.02	-0.30	0.01	-0.17	0.12	0.60	(I-F)*100/A
Initial Upscale Gas Bias	0.22	-0.60	0.31	-0.14	-0.16	0.00	(J-G[or G', or H]*100/A
Final Zero Gas Bias	0.02	0.20	0.01	0.14	0.12	0.80	(K-M)*100/A
Final Upscale Gas Bias	0.44	-0.10	0.19	-0.19	0.04	0.80	(L-N[or N', or O]*100/A
CALIBRATION DRIFT, % of Range							
Zero	0.02	0.10	0.01	0.11	0.00	0.20	(K-I)*100/A
Upscale	0.20	0.30	-0.06	-0.04	0.04	0.40	(L-J)*100/A

Equipment	Location	Previous PTO When at Facility ID 184509	Previous AN Submitted Feb 2025
Wax Burnoff Furnace (PREHEAT1)	South Foundry/Pump Line	G65123	658071
Wax Burnoff Furnace (BURNOUT 1)	South Foundry/Pump Line	G65120	658073
Wax Burnoff Furnace (BURNOUT 2)	North Foundry/TCA Line	G65121	658075
Wax Burnoff Furnace (PREHEAT3)	North Foundry/TCA Line	G65119	658076

South Coast Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178

PERMIT TO OPERATE

Permit No.
G65121
A/N 626262

~~This initial permit must be renewed ANNUALLY unless the equipment is moved, or changes ownership.~~
If the billing for the annual renewal fee (Rule 301(d)) is not received by the expiration date, contact the District.

ID 184509

Legal Owner or Operator:

SPACE EXPLORATION TECHNOLOGIES
1 ROCKET RD
HAWTHORNE, CA 90250

Equipment Location: 3301 JACK NORTHROP AVE, HAWTHORNE, CA 90250

Equipment Description :

BURNOUT2, Wax Burnoff Furnace, Armil CFS, Model No. Tru-Heat Box Furnace, 12'W. X 15'L. X 14'H., with Two Low NOx Burners, Eclipse, Model No. ThermJet TJ0100, 1,000,000 Btu/hr each, Natural Gas Fired, One Combustion Air Blowers, and an Integrated Afterburner with Low NOx Burner, Eclipse, Model No. ThermJet TJ0200, 2,000,000 Btu/hr, Natural Gas Fired

Conditions :

1. Operation of this equipment shall be conducted in accordance with all data and specifications submitted with the application under which this permit is issued unless otherwise noted below.

2. This equipment shall be properly maintained and kept in good operating condition at all times.

3. This equipment shall be fired on natural gas only.

4. The operator shall not use natural gas containing sulfur compounds in excess of 16 ppmv, calculated as hydrogen sulfide.

5. This equipment shall not be operated unless it is vented to air pollution control equipment which is in full use and which has been issued a permit to operate by the Executive Officer.

6. This equipment shall emit no more than 60 ppm of oxides of nitrogen (NOx), calculated as NO2, and 800 ppm of carbon monoxide (CO), all measured by volume on a dry basis at 3% O2 and average over a period of 15 consecutive minutes.

7. The operator shall install and maintain a non-resettable totalizing fuel flow meter to accurately indicate the fuel usage in the fuel supply line.

8. The total throughput for wax burn-off furnace BURNOUT1 and BURNOUT2 shall not exceed the annual production rate of 62,739 pounds in one calendar year.

9. The total fuel consumption for wax burn-off furnace BURNOUT1 and BURNOUT2 and pre-heat furnace PREHEAT2 shall not exceed the annual fuel limit of 6,370,574 scf in one calendar month.

10. The operator shall keep records, in a manner approved by the district, for the following parameter(s) or item(s):
    a. Natural gas usage in scf/month.
    b. Operating log showing the date of operation, the type and amount (in pounds) of material being processed in this device.

11. The oven shall be inspected and maintained per manufacturer's specifications. Records of the inspections and maintenance of the burner shall be kept for at least two years and be made available to the South Coast Air Quality Management District (South Coast AQMD) personnel upon request.

12. An afterburner combustion chamber temperature shall be maintained at a minimum of 1200 degrees Fahrenheit whenever the equipment it serves is in operation.

13. The afterburner shall emit no more than 60 ppm of oxides of nitrogen (NOx), calculated as NO2 measured by volume on a dry basis at 3% O2 and average over a period of 15 consecutive minutes.

14. The total quantity of volatile organic compound (VOC) emissions from all permitted equipment and associated operations at this facility shall be equal to or less than 667 pounds in any one calendar month. Associated operations include, but are not limited to, surface preparation, equipment clean-up, hand lay-up, and the application of any other materials to parts that are also processed in the permitted equipment.

15. Safety Data Sheets for all materials used at this facility shall be kept current and be made available to the Executive Officer or representative upon request.

16. The operator shall comply with Rule 109 (Recordkeeping for Volatile Organic Compound Emissions).

17. In addition to the recordkeeping requirements of Rule 109, the operator shall keep adequate records for this equipment to verify the calendar monthly VOC emissions in pounds and the VOC content of each material as applied (including water and exempt compounds). These records shall be prepared in a format which is acceptable to the district.

18. Materials used in this equipment shall not contain any toxic air contaminants identified in Rule 1401, Table 1, with an effective date of September 1, 2017 or earlier.

19. Records shall be maintained to demonstrate compliance with the Conditions on this permit. Records shall be kept in a format acceptable to the South Coast AQMD, shall be retained at the facility for a minimum of two years and shall be made available to South Coast AQMD personnel upon request.

20. This equipment shall comply with the applicable requirements of Rule 431.1 and 1147.

21. The owner or operator of this equipment shall conduct a source test to verify compliance with Condition No. 6 and Rule 1147 under the following conditions:
    a. The tests shall be conducted within 45 days after South Coast AQMD approval of the source test protocol.

b. The tests shall measure NOx, CO, oxygen content, moisture content, temperature, and the exhaust flow rate at the outlet of this equipment, at the normal operating load, using the appropriate test methods specified in Rule 1147. The report shall present the emission data in pounds per hour, and parts per million on a dry basis corrected to 3% oxygen.

c. In case this equipment operates with variable heat input that may fall below 50% of the rated heat input capacity during normal operation, a test shall also be conducted as specified in Section B of this condition above, but using a heat input of less than 35% of the rated heat input of this equipment, pursuant to Rule 1147(d)(1).

d. A written notice of the source test date shall be submitted to the South Coast AQMD (addressed to the South Coast Air Quality Management South Coast AQMD, [for P/O: Attn: Gloria Anebere, Engineering & Permitting, 21865 Copley Drive, Diamond Bar, CA 91765] at least 14 days prior to the source test date so that an observer from the South Coast AQMD may be present.

e. A testing laboratory certified by the California Air Resources Board in the required test methods for criteria pollutants to be measured, and in compliance with South Coast AQMD Rule 304 (no conflict of interest) shall conduct the test.

22. Sampling facilities shall comply with the South Coast AQMD guidelines for construction of sampling and testing facilities pursuant to Rule 217.

23. A source test protocol shall be submitted to the South Coast AQMD (addressed to the South Coast Air Quality Management District, [for P/O: Attn: Gloria Anebere, Engineering & Permitting, 21865 Copley Drive, Diamond Bar, CA 91765] within 30 days from the initial start-up, unless otherwise approved in writing by the South Coast AQMD. The test protocol shall be approved in writing by the South Coast AQMD before the test commences. The test protocol shall include the completed South Coast AQMD Forms ST-1 and ST-2 specifying the proposed operating conditions of the equipment during the test, identity of the testing laboratory, a statement from the testing laboratory certifying it meets the criteria in South Coast AQMD Rule 304(k), and a description of the sampling and analytical procedures to be used.

24. Two complete copies of the source test reports shall be submitted to the South Coast AQMD (addressed to the South Coast Air Quality Management District, [for P/O: Attn: Gloria Anebere, Engineering & Permitting, 21865 Copley Drive, Diamond Bar, CA 91765] within 30 days after the source testing date. The source test report shall include, but not be limited to, all testing data required by this permit.

25. The owner or operator of this equipment shall submit the results of all preliminary tests that are conducted on this equipment for informational purposes to the South Coast AQMD (addressed to the South Coast Air Quality Management District, [for P/O: Attn: Gloria Anebere, Engineering & Permitting, 21865 Copley Drive, Diamond Bar, CA 91765] within 45 days after the testing date unless otherwise approved in writing by the South Coast AQMD.

South Coast Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
PERMIT TO OPERATE

Permit No.
G65121
A/N 626262

NOTICE

In accordance with Rule 206, this Permit to Operate or copy shall be posted on or within 8 meters of the equipment.

This permit does not authorize the emission of air contaminants in excess of those allowed by Division 26 of the Health and Safety Code of the State of California or the applicable Rules and Regulations of the South Coast Air Quality Management District (SCAQMD). This permit cannot be considered as permission to violate existing laws, ordinances, regulations or statutes of other government agencies.

Executive Officer

BY JASON ASPELL/GA04
4/30/2021

South Coast Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178

PERMIT TO OPERATE

Permit No.
G65119
A/N 626260

~~This initial permit must be renewed ANNUALLY unless the equipment is moved, or changes ownership.~~
If the billing for the annual renewal fee (Rule 301(d)) is not received by the expiration date, contact the District.

ID 184509

Legal Owner or Operator:

SPACE EXPLORATION TECHNOLOGIES
1 ROCKET RD
HAWTHORNE, CA 90250

Equipment Location: 3301 JACK NORTHROP AVE, HAWTHORNE, CA 90250

Equipment Description :

Wax Burnoff Furnace, Armil CFS, Model No. Tru-Heat Box Furnace, 12'W. X 15'L. X 14'H., with Two Low NOx Burners, Eclipse, Model No. ThermJet TJ0100, 1,000,000 Btu/hr each, Natural Gas Fired, One Combustion Air Blowers, and an Integrated Afterburner with Low NOx Burner, Eclipse, Model No. ThermJet TJ0200, 2,000,000 Btu/hr, Natural Gas Fired

Conditions :

1. Operation of this equipment shall be conducted in accordance with all data and specifications submitted with the application under which this permit is issued unless otherwise noted below.

2. This equipment shall be properly maintained and kept in good operating condition at all times.

3. This equipment shall be fired on natural gas only.

4. This equipment shall not be operated unless it is vented to air pollution control equipment which is in full use and which has been issued a permit to operate by the Executive Officer.

5. This equipment shall emit no more than 60 ppm of oxides of nitrogen (NOx), calculated as NO2, and 800 ppm of carbon monoxide (CO), all measured by volume on a dry basis at 3% O2 and average over a period of 15 consecutive minutes.

6. This equipment shall operate at a firing load at a minimum of 40 percent or 1.60 MMBTU/hr.

7. The oven shall be inspected and maintained per manufacturer's specifications. Records of the inspections and maintenance of the burner shall be kept for at least two years and be made available to the South Coast Air Quality Management District (South Coast AQMD) personnel upon request.

8. An afterburner combustion chamber temperature shall be maintained at a minimum of 1200 degrees Fahrenheit whenever the equipment it serves is in operation.

9. The afterburner shall emit no more than 60 ppm of oxides of nitrogen (NOx), calculated as NO2 measured by volume on a dry basis at 3% O2 and average over a period of 15 consecutive minutes.

10. The total quantity of volatile organic compound (VOC) emissions from all permitted equipment and associated operations at this facility shall be equal to or less than 667 pounds in any one calendar month. Associated operations include, but are not limited to, surface preparation, equipment clean-up, hand lay-up, and the application of any other materials to parts that are also processed in the permitted equipment.

11. Safety Data Sheets for all materials used at this facility shall be kept current and be made available to the Executive Officer or representative upon request.

12. The operator shall comply with Rule 109 (Recordkeeping for Volatile Organic Compound Emissions).

13. In addition to the recordkeeping requirements of Rule 109, the operator shall keep adequate records for this equipment to verify the calendar monthly VOC emissions in pounds and the VOC content of each material as applied (including water and exempt compounds). These records shall be prepared in a format which is acceptable to the district.

14. Materials used in this equipment shall not contain any toxic air contaminants identified in Rule 1401, Table 1, with an effective date of September 1, 2017 or earlier.

15. This equipment shall comply with the applicable requirements of Rule 431.1 and 1147.

South Coast Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
PERMIT TO OPERATE

Permit No.
G65119
A/N 626260

NOTICE

In accordance with Rule 206, this Permit to Operate or copy shall be posted on or within 8 meters of the equipment.

This permit does not authorize the emission of air contaminants in excess of those allowed by Division 26 of the Health and Safety Code of the State of California or the applicable Rules and Regulations of the South Coast Air Quality Management District (SCAQMD). This permit cannot be considered as permission to violate existing laws, ordinances, regulations or statutes of other government agencies.

Executive Officer

BY JASON ASPELL/GA04
4/30/2021

South Coast Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178

South Coast Air Quality Management District
Certified Copy

South Coast Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178

PERMIT TO OPERATE

Permit No.
G65120
A/N 626261

~~This initial permit must be renewed ANNUALLY unless the equipment is moved, or changes ownership.~~
If the billing for the annual renewal fee (Rule 301(d)) is not received by the expiration date, contact the District.

ID 184509

Legal Owner or Operator:

SPACE EXPLORATION TECHNOLOGIES
1 ROCKET RD
HAWTHORNE, CA 90250

Equipment Location: 3301 JACK NORTHROP AVE, HAWTHORNE, CA 90250

Equipment Description :

BURNOUT1, Wax Burnoff Furnace, Armil CFS, Model No. Tru-Heat Box Furnace, 12'W. X 15'L. X 14'H., with Two Low NOx Burners, Eclipse, Model No. ThermJet TJ0100, 1,000,000 Btu/hr each, Natural Gas Fired, One Combustion Air Blowers, and an Integrated Afterburner with Low NOx Burner, Eclipse, Model No. ThermJet TJ0200, 2,000,000 Btu/hr, Natural Gas Fired

Conditions :

1. Operation of this equipment shall be conducted in accordance with all data and specifications submitted with the application under which this permit is issued unless otherwise noted below.

2. This equipment shall be properly maintained and kept in good operating condition at all times.

3. This equipment shall be fired on natural gas only.

4. The operator shall not use natural gas containing sulfur compounds in excess of 16 ppmv, calculated as hydrogen sulfide.

5. This equipment shall not be operated unless it is vented to air pollution control equipment which is in full use and which has been issued a permit to operate by the Executive Officer.

6. This equipment shall emit no more than 60 ppm of oxides of nitrogen (NOx), calculated as NO2, and 800 ppm of carbon monoxide (CO), all measured by volume on a dry basis at 3% O2 and average over a period of 15 consecutive minutes.

7. The operator shall install and maintain a non-resettable totalizing fuel flow meter to accurately indicate the fuel usage in the fuel supply line.

8. The total throughput for wax burn-off furnace BURNOUT1 and BURNOUT2 shall not exceed the annual production rate of 62,739 pounds in one calendar year.

9. The total fuel consumption for wax burn-off furnace BURNOUT1 and BURNOUT2 and pre-heat furnace PREHEAT2 shall not exceed the annual fuel limit of 6,370,574 scf in one calendar month.

10. The operator shall keep records, in a manner approved by the district, for the following parameter(s) or item(s):

    a. Natural gas usage in scf/month.
    b. Operating log showing the date of operation, the type and amount (in pounds) of material being processed in this device.

11. The oven shall be inspected and maintained per manufacturer's specifications. Records of the inspections and maintenance of the burner shall be kept for at least two years and be made available to the South Coast Air Quality Management District (South Coast AQMD) personnel upon request.

12. An afterburner combustion chamber temperature shall be maintained at a minimum of 1200 degrees Fahrenheit whenever the equipment it serves is in operation.

13. The afterburner shall emit no more than 60 ppm of oxides of nitrogen (NOx), calculated as NO2 measured by volume on a dry basis at 3% O2 and average over a period of 15 consecutive minutes.

14. The total quantity of volatile organic compound (VOC) emissions from all permitted equipment and associated operations at this facility shall be equal to or less than 667 pounds in any one calendar month. Associated operations include, but are not limited to, surface preparation, equipment clean-up, hand lay-up, and the application of any other materials to parts that are also processed in the permitted equipment.

15. Safety Data Sheets for all materials used at this facility shall be kept current and be made available to the Executive Officer or representative upon request.

16. The operator shall comply with Rule 109 (Recordkeeping for Volatile Organic Compound Emissions).

17. In addition to the recordkeeping requirements of Rule 109, the operator shall keep adequate records for this equipment to verify the calendar monthly VOC emissions in pounds and the VOC content of each material as applied (including water and exempt compounds). These records shall be prepared in a format which is acceptable to the district.

18. Materials used in this equipment shall not contain any toxic air contaminants identified in Rule 1401, Table 1, with an effective date of September 1, 2017 or earlier.

19. Records shall be maintained to demonstrate compliance with the Conditions on this permit. Records shall be kept in a format acceptable to the South Coast AQMD, shall be retained at the facility for a minimum of two years and shall be made available to South Coast AQMD personnel upon request.

20. This equipment shall comply with the applicable requirements of Rule 431.1 and 1147.

21. The owner or operator of this equipment shall conduct a source test to verify compliance with Condition No. 6 and Rule 1147 under the following conditions:

    a. The tests shall be conducted within 45 days after South Coast AQMD approval of the source test protocol.

b. The tests shall measure NOx, CO, oxygen content, moisture content, temperature, and the exhaust flow rate at the outlet of this equipment, at the normal operating load, using the appropriate test methods specified in Rule 1147. The report shall present the emission data in pounds per hour, and parts per million on a dry basis corrected to 3% oxygen.

c. In case this equipment operates with variable heat input that may fall below 50% of the rated heat input capacity during normal operation, a test shall also be conducted as specified in Section B of this condition above, but using a heat input of less than 35% of the rated heat input of this equipment, pursuant to Rule 1147(d)(1).

d. A written notice of the source test date shall be submitted to the South Coast AQMD (addressed to the South Coast Air Quality Management South Coast AQMD, [for P/O: Attn: Gloria Anebere, Engineering & Permitting, 21865 Copley Drive, Diamond Bar, CA 91765] at least 14 days prior to the source test date so that an observer from the South Coast AQMD may be present.

e. A testing laboratory certified by the California Air Resources Board in the required test methods for criteria pollutants to be measured, and in compliance with South Coast AQMD Rule 304 (no conflict of interest) shall conduct the test.

22. Sampling facilities shall comply with the South Coast AQMD guidelines for construction of sampling and testing facilities pursuant to Rule 217.

23. A source test protocol shall be submitted to the South Coast AQMD (addressed to the South Coast Air Quality Management District, [for P/O: Attn: Gloria Anebere, Engineering & Permitting, 21865 Copley Drive, Diamond Bar, CA 91765] within 30 days from the initial start-up, unless otherwise approved in writing by the South Coast AQMD. The test protocol shall be approved in writing by the South Coast AQMD before the test commences. The test protocol shall include the completed South Coast AQMD Forms ST-1 and ST-2 specifying the proposed operating conditions of the equipment during the test, identity of the testing laboratory, a statement from the testing laboratory certifying it meets the criteria in South Coast AQMD Rule 304(k), and a description of the sampling and analytical procedures to be used.

24. Two complete copies of the source test reports shall be submitted to the South Coast AQMD (addressed to the South Coast Air Quality Management District, [for P/O: Attn: Gloria Anebere, Engineering & Permitting, 21865 Copley Drive, Diamond Bar, CA 91765] within 30 days after the source testing date. The source test report shall include, but not be limited to, all testing data required by this permit.

25. The owner or operator of this equipment shall submit the results of all preliminary tests that are conducted on this equipment for informational purposes to the South Coast AQMD (addressed to the South Coast Air Quality Management District, [for P/O: Attn: Gloria Anebere, Engineering & Permitting, 21865 Copley Drive, Diamond Bar, CA 91765] within 45 days after the testing date unless otherwise approved in writing by the South Coast AQMD.

South Coast Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
PERMIT TO OPERATE

Permit No.
G65120
A/N 626261

NOTICE

In accordance with Rule 206, this Permit to Operate or copy shall be posted on or within 8 meters of the equipment.

This permit does not authorize the emission of air contaminants in excess of those allowed by Division 26 of the Health and Safety Code of the State of California or the applicable Rules and Regulations of the South Coast Air Quality Management District (SCAQMD). This permit cannot be considered as permission to violate existing laws, ordinances, regulations or statutes of other government agencies.

Executive Officer

BY JASON ASPELL/GA04
4/30/2021

South Coast Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178

PERMIT TO OPERATE

Permit No.
G65123
A/N 626264

~~This initial permit must be renewed ANNUALLY unless the equipment is moved, or changes ownership.~~
If the billing for the annual renewal fee (Rule 301(d)) is not received by the expiration date, contact the District.

ID 184509

Legal Owner or Operator:

SPACE EXPLORATION TECHNOLOGIES
1 ROCKET RD
HAWTHORNE, CA 90250

Equipment Location: 3301 JACK NORTHROP AVE, HAWTHORNE, CA 90250

Equipment Description :

Wax Burnoff Furnace, Armil CFS, Model No. Tru-Heat Box Furnace, 12'W. X 15'L. X 14'H., with Two Low NOx Burners, Eclipse, Model No. ThermJet TJ0100, 1,000,000 Btu/hr each, Natural Gas Fired, One Combustion Air Blowers, and an Integrated Afterburner with Low NOx Burner, Eclipse, Model No. ThermJet TJ0200, 2,000,000 Btu/hr, Natural Gas Fired

Conditions :

1. Operation of this equipment shall be conducted in accordance with all data and specifications submitted with the application under which this permit is issued unless otherwise noted below.

2. This equipment shall be properly maintained and kept in good operating condition at all times.

3. This equipment shall be fired on natural gas only.

4. This equipment shall not be operated unless it is vented to air pollution control equipment which is in full use and which has been issued a permit to operate by the Executive Officer.

5. This equipment shall emit no more than 60 ppm of oxides of nitrogen (NOx), calculated as NO2, and 800 ppm of carbon monoxide (CO), all measured by volume on a dry basis at 3% O2 and average over a period of 15 consecutive minutes.

6. This equipment shall operate at a firing load at a minimum of 40 percent or 1.60 MMBTU/hr.

7. The oven shall be inspected and maintained per manufacturer's specifications. Records of the inspections and maintenance of the burner shall be kept for at least two years and be made available to the South Coast Air Quality Management District (South Coast AQMD) personnel upon request.

8. An afterburner combustion chamber temperature shall be maintained at a minimum of 1200 degrees Fahrenheit whenever the equipment it serves is in operation.

9. The afterburner shall emit no more than 60 ppm of oxides of nitrogen (NOx), calculated as NO2 measured by volume on a dry basis at 3% O2 and average over a period of 15 consecutive minutes.

10. The total quantity of volatile organic compound (VOC) emissions from all permitted equipment and associated operations at this facility shall be equal to or less than 667 pounds in any one calendar month. Associated operations include, but are not limited to, surface preparation, equipment clean-up, hand lay-up, and the application of any other materials to parts that are also processed in the permitted equipment.

11. Safety Data Sheets for all materials used at this facility shall be kept current and be made available to the Executive Officer or representative upon request.

12. The operator shall comply with Rule 109 (Recordkeeping for Volatile Organic Compound Emissions).

13. In addition to the recordkeeping requirements of Rule 109, the operator shall keep adequate records for this equipment to verify the calendar monthly VOC emissions in pounds and the VOC content of each material as applied (including water and exempt compounds). These records shall be prepared in a format which is acceptable to the district.

14. Materials used in this equipment shall not contain any toxic air contaminants identified in Rule 1401, Table 1, with an effective date of October 7, 2016 or earlier, except for Ammonia (CAS No.7664-41-7).

15. This equipment shall comply with the applicable requirements of Rule 431.1 and 1147.

South Coast Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178

PERMIT TO OPERATE

Permit No.
G65123
A/N 626264

NOTICE

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Executive Officer

BY JASON ASPELL/GA04
4/30/2021

South Coast Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178

South Coast Air Quality Management District
Certified Copy