



December 3, 2019

Air Permits Initial Review Team (APIRT)
Texas Commission on Environmental Quality
Mail Code 161
12100 Park 35 Circle
Building C, Third Floor, Room 300W
Austin, Texas 78753

**RE: 30 TAC 106.224 PI-7 Registration for Aerospace Manufacturing
Space Exploration Technologies Rocket Development Facility
McGregor, McLennan County, Texas
Space Exploration Technologies Corporation
CN: 602867657
RN: 100250844**

Dear APIRT,

On behalf of Space Exploration Technologies Corporation (SpaceX), please find enclosed a PI-7 Registration for Permit By Rule (PBR) 30 TAC 106.224, *Aerospace Equipment and Parts Manufacturing* for Raptor engine development and testing conducted at the Tripod location at the SpaceX Rocket Development Facility in McGregor, Texas. Operations at this location involve the assembly and disassembly of aerospace engine components and testing of those components. Per previous guidance provided by Mr. James Nolan (TCEQ) via e-mail on May 10, 2018 and subsequently approved in Registration No. 151947, 30 TAC 106.224 can be used for the operations and controls as described in this submittal.

This submittal contains a Form PI-7, PBR applicability checklists, process description, process flow diagram, emissions calculations, and other supporting information.

SpaceX would like to request James Nolan as the TCEQ permit engineer on this project. He has worked on previous SpaceX submittals and is familiar with SpaceX's unique operations.

Should you have any questions or require additional information, please contact me at 512-596-7929 or Ms. Samantha Smith at 254-382-5308.

Thank You,
Greenthink Consulting, L.L.C.

Rajiv Y. Patel, P.E.
Managing Engineer

Greenthink Consulting, L.L.C.
120 Archipelago Trl, Austin, TX 78717
512.596.7929



Attachment: **30 TAC 106.224 PI-7 Registration**

Cc: Samantha Smith – Space Exploration Technologies
TCEQ – Region 9, Waco

Rajiv Patel

From: James Nolan <james.nolan@tceq.texas.gov>
Sent: Thursday, May 10, 2018 9:40 AM
To: Rajiv Patel; kevin.ponton@spacex.com
Subject: TCEQ Project 282024: SpaceX

Mr. Patel and Mr. Ponton –

We had a chance to speak with our management and everyone agreed that PBR 106.224 can be used for the engine component assembly and testing using methane. I will need a separate request to withdraw the PCP Standard Permit project, as it will not be required for this authorization. A letter will be issued acknowledging the withdraw and will have the fee receipt number that can be re-used for another project.

If you have any questions or concerns, please feel free to contact David or I.

James Nolan
Technical Specialist
Air Permits Division: Rules Registrations Section
Texas Commission on Environmental Quality (TCEQ)
(512) 239-6634
james.nolan@tceq.texas.gov



30 TAC §106.224 Permit by Rule Registration

For:

Raptor Test Stand - Tripod
McGregor Rocket Development Facility

Space Exploration Technologies
McGregor, Texas

November 2019

Prepared by:

Greenthink Consulting, L.L.C.



www.greenthinkconsulting.com

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1.0 INTRODUCTION

Space Exploration Technologies Corporation (SpaceX; CN602867657) owns and operates the SpaceX Rocket Development Facility (SpaceX RSF: RN100250844) located in McGregor, Texas of McLennan County. SpaceX would like to register and authorize Raptor engine testing and associated methane control conducted at the facility Tripod location under 30 TAC 106.224, Aerospace Equipment and Parts Manufacturing per previous guidance from the Texas Commission on Environmental Quality (Confirmed via e-mail by James Nolan of TCEQ on May 5, 2018). Operations will involve the assembly and disassembly of aerospace engine components and testing of those components.

The remainder of this application includes a completed PI-7 and all required supporting information.

2.0 FORM PI-7

This section contains the completed Form PI-7.

Texas Commission on Environmental Quality
Registration for Permits by Rule (PBR)
Form PI-7
(Page 1)

I. Registrant Information		
A. Company or Other Legal Customer Name: Space Exploration Technologies Corp.		
B. Company Official Contact Information (☐ Mr. ☐ Mrs. ☒ Ms. ☐ Other:) _____		
Name: Samantha Smith		
Title: Environmental, Health & Safety Manager		
Mailing Address: 1 Rocket Road		
City: McGregor	State: Texas	ZIP Code: 76657
Phone: 254-382-5308	Fax: _____	
E-mail Address: samantha.smith@spacex.com		
<i>All PBR registration responses will be sent via e-mail.</i>		
C. Technical Contact Information (☒ Mr. ☐ Mrs. ☐ Ms. ☐ Other:) _____		
Name: Rajiv Y. Patel, PE		
Title: Principal Engineer		
Company Name: Greenthink Consulting, LLC		
Mailing Address: 120 Archipelago Trl		
City: Austin	State: Texas	ZIP Code: 78717
Phone: 512-596-7929	Fax: _____	
E-mail: rajiv@greenthinkconsulting.com		
II. Facility and Site Information		
A. Name and Type of Facility		
Facility Name: Raptor Test Stand - Tripod		
Type of Facility: ☒ Permanent ☐ Temporary		
For portable units, please provide the serial number of the equipment being authorized below.		
Serial No: _____	Serial No: _____	

Texas Commission on Environmental Quality
Registration for Permits by Rule (PBR)
Form PI-7
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II. Facility and Site Information (<i>continued</i>)		
B. Facility Location Information		
Street Address: 1 Rocket Road		
If there is no street address, provide written driving directions to the site and provide the closest city or town, county, and ZIP code for the site (attach description if additional space is needed).		
City: McGregor	County: McLennan	ZIP Code: 76657
C. TCEQ Core Data Form		
Is the Core Data Form (TCEQ Form Number 10400) attached?		☐ YES ☒ NO
If "NO," provide customer reference number (CN) and regulated entity number (RN) below.		
Customer Reference Number (CN): CN602867657		
Regulated Entity Number (RN): RN100250844		
D. TCEQ Account Identification Number (if known):		
E. Type of Action		
☒ Initial Application ☐ Change to Registration		
For Change to Registration provide the Registration Number:		
F. PBR number(s) claimed under 30 TAC Chapter 106		
(List all the individual rule number(s) that are being claimed.)		
106.224	106.	
106.	106.	
106.	106.	
G. Historical Standard Exemption or PBR		
Are you claiming a historical standard exemption or PBR?		☐ YES ☐ NO
If "YES," enter rule number(s) and associated effective date in the spaces provided below.		
Rule Number(s)	Effective Date	

Texas Commission on Environmental Quality
Registration for Permits by Rule (PBR)
Form PI-7
(Page 3)

II. Facility and Site Information (<i>continued</i>)	
H. Previous Standard Exemption or PBR Registration Number	
Is this authorization for a change to an existing facility previously authorized under a standard exemption or PBR?	☐ YES ☒ NO
If "YES," enter previous standard exemption number(s) and PBR registration number(s), and associated effective date in the spaces provided below.	
Standard Exemption and PBR Registration Number(s)	Effective Date
I. Other Facilities at this Site Authorized by Standard Exemption, PBR, or Standard Permit	
Are there any other facilities at this site that are authorized by an Air Standard Exemption, PBR, or Standard Permit?	☒ YES ☐ NO
If "YES," enter standard exemption number(s), PBR registration number(s), and Standard Permit registration number(s), and associated effective date in the spaces provided below.	
Standard Exemption, PBR Registration, and Standard Permit Registration Number(s)	Effective Date
Multiple	
J. Other Air Preconstruction Permits	
Are there any other air preconstruction permits at this site?	☒ YES ☐ NO
If "YES," enter permit number(s) in the spaces provided below.	
154827	Pending Approval
K. Affected Air Preconstruction Permits	
Does the PBR being claimed directly affect any permitted facility?	☐ YES ☒ NO
If "YES," enter the permit number(s) in the spaces provided below.	

Texas Commission on Environmental Quality
Registration for Permits by Rule (PBR)
Form PI-7
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II. Facility and Site Information (continued)	
L. Federal Operating Permit (FOP) Requirements (30 TAC Chapter 122 Applicability)	
Is this facility located at a site that is required to obtain an FOP pursuant to 30 TAC Chapter 122?	☐ YES ☐ NO ☒ To Be Determined
If the site currently has an existing FOP, enter the permit number: _____	
1. Check the requirements of 30 TAC Chapter 122 that will be triggered if this claim is accepted <i>(check all that apply)</i> .	
☐ Initial Application for an FOP ☐ Significant Revision for an SOP ☐ Minor Revision for an SOP ☐ Operational Flexibility/Off Permit Notification for an SOP ☐ Revision for a GOP ☐ To be Determined ☒ None	
2. Identify the type(s) of FOP issued and/or FOP application(s) submitted/pending for the site. <i>(check all that apply)</i>	
☐ SOP ☐ GOP ☐ GOP application/revision (submitted or under APD review) ☒ N/A ☐ SOP application/revision (submitted or under APD review)	
III. Fee Information (see Section VII. for address to send fee or go to www.tceq.texas.gov/epay to pay online)	
A. Fee Requirements	
Is a fee required per 30 TAC § 106.50?	☒ YES ☐ NO
If "NO," specify the exception. There are three exceptions to paying a PBR fee. <i>(check all that apply)</i>	
1. Registration is solely to establish a federally enforceable emission limit.	☐
2. Registration is within six months of an initial PBR review, and is addressing deficiencies, administrative changes, or other allowed changes.	☐
3. Registration is for a remediation project (30 TAC § 106.533).	☐
B. Fee Amount	
1. A \$100 fee is required if <i>any</i> of the answers in III.B.1 are "YES."	
This business has less than 100 employees.	☐ YES ☒ NO
This business has less than \$6 million dollars in annual gross receipts.	☐ YES ☒ NO
This registration is submitted by a governmental entity with a population of less than 10,000.	☐ YES ☒ NO
This registration is submitted by a non-profit organization.	☐ YES ☒ NO
2. A \$450 fee is required for all other registrations.	

**Texas Commission on Environmental Quality
Registration for Permits by Rule (PBR)
Form PI-7
(Page 5)**

III. Fee Information (see Section VII. for address to send fee or go to www.tceq.texas.gov/epay to pay online) (continued)		
C. Payment Information		
Check/money order/transaction or voucher number: 582EA000367237		
Individual or company name on check:		
Fee Amount: \$450		
Was fee paid online?		☒ YES ☐ NO
IV. Selected Facility Reviews and Voluntary Registrations Only		
<i>Note: If registering any of the PBRs listed in IV.B., or if voluntarily registering any other PBR(s), complete this section, then skip to Section VI. below:</i>		
A. List any PBRs that are being voluntarily registered.		
106.	106.	106.
106.	106.	106.
B. PBR Checklists		
If you are registering any of the following PBRs, did you attach the applicable PBR checklists that shows your facility meets all general and specific requirements? Animal Feeding Operations § 106.161, Livestock Auction Facilities § 106.162, Saw Mills § 106.223, Grain Handling, Storage and Drying § 106.283, Auto Body Refinishing Facilities § 106.436, or Air Curtain Incinerator § 106.496 (If "NO" then you must provide all technical information outlined in Section V.)		☐ YES ☐ NO
C. Distances to Property Line and Nearest Off-Property Structure		
Distance from this facility's emission release point to the nearest property line:		feet
Distance from this facility's emission release point to the nearest off-property structure:		feet

**Texas Commission on Environmental Quality
Registration for Permits by Rule (PBR)
Form PI-7
(Page 6)**

V. Technical Information Including State and Federal Regulatory Requirements

Check the appropriate box to indicate what is included in your submittal.

NOTE: Any technical or essential information needed to confirm that facilities are meeting the requirements of the PBR must be provided. Not providing key information could result in a deficiency of the project.

A. PBR requirements (Checklists are optional; however, your review will go faster if you provide applicable checklists.)

Did you demonstrate that the general requirements in 30 TAC § 106.4 are met?	☒ YES ☐ NO
--	---

Did you demonstrate that the individual requirements of the specific PBR are met?	☒ YES ☐ NO
---	---

B. Confidential Information Included (If confidential information is submitted with this registration, all confidential pages must be properly marked "CONFIDENTIAL.")	☐ YES ☒ NO
---	---

C. Process Flow Diagram	☒ YES ☐ NO
--------------------------------	---

D. Process Description	☒ YES ☐ NO
-------------------------------	---

E. Maximum Emissions Data and Calculations	☒ YES ☐ NO
---	---

Note: If the facilities listed in this registration are subject to the Mass Emissions Cap & Trade program under **30 TAC Chapter 101, Subchapter H, Division 3**, the owner/operator of these facilities must possess NO_x allowances equivalent to the actual NO_x emissions from these facilities.

F. Distance from Property Line and Nearest Off-Property Structure

Distance from this facility's emission release point to the nearest property line:	5,270	feet
--	-------	------

Distance from this facility's emission release point to the nearest off-property structure:	10,915	feet
---	--------	------

G. Project Status

Has the company implemented the project or waiting on a response from TCEQ?	☐ Implemented ☒ Waiting
---	--

H. Projected Start of Construction and Projected Start of Operation Dates:

Projected Start of Construction (provide date): **Upon Approval**

Project Start of Operation (provide date): **Upon Approval**

VI. Delinquent Fees and Penalties

This form **will not be processed** until all delinquent fees and/or penalties owed to the TCEQ or the Office of the Attorney General on behalf of the TCEQ is paid in accordance with the Delinquent Fee and Penalty Protocol. For more information regarding Delinquent Fees and Penalties, go to the TCEQ website at www.tceq.texas.gov/agency/financial/fees/delin/index.html.

**Texas Commission on Environmental Quality
Registration for Permits by Rule (PBR)
Form PI-7
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VII. Copies of the Registration		
Processing delays may occur if copies are not sent as noted. Copies must be sent as listed below:		
Who	Where	What
Air Permits Initial Review Team (APIRT)	Regular, Certified, Priority Mail MC 161, P.O. Box 13087 Austin, Texas 78711-3087 Hand Delivery, Overnight Mail MC 161, 12100 Park 35 Circle, Building C, Third Floor Austin, Texas 78753	Originals of Form PI-7, Core Data Form, and all attachments. Not required if using ePermits ¹
Revenue Section, TCEQ	Regular, Certified, Priority Mail MC 214, P.O. Box 13088 Austin, Texas 78711-3088 Hand Delivery, Overnight Mail MC 214, 12100 Park 35 Circle, Building A, Third Floor Austin, Texas 78753	Original Money Order or Check, Copy of Form PI-7, and Core Data Form. Not required if fee was paid using ePay ² .
Appropriate TCEQ Regional Office	To find your Regional Office address, go to the TCEQ website at www.tceq.texas.gov/agency/directory/region or call (512) 239-1250.	Copy of Form PI-7, Core Data Form, and all attachments. Not required if using ePermits ¹ .
Appropriate Local Air Pollution Control Program(s)	To Find your local or Regional Air Pollution Control Programs go to the TCEQ, APD website at www.tceq.texas.gov/permitting/air/local_programs.html or call (512) 239-1250	Copy of Form PI-7, Core Data Form, and all attachments

¹ ePermits located at www3.tceq.texas.gov/steers/

² ePay located at www.tceq.texas.gov/epay/

TCEQ-10228 (APDG 5096v27 revised 07/19) PI-7

This form is used by sources subject to air quality permit requirements and may be revised periodically.

3.0 30 TAC §106.4 and §106.224 APPLICABILITY CHECKLISTS

This section contains the completed checklists demonstrating compliance with 30 TAC §106.4 and §106.224 requirements.

Texas Commission on Environmental Quality
Permit by Rule Applicability Checklist
Title 30 Texas Administrative Code § 106.4

The following checklist was developed by the Texas Commission on Environmental Quality (TCEQ), **Air Permits Division**, to assist applicants in determining whether or not a facility meets all of the applicable requirements. Before claiming a specific Permit by Rule (PBR), a facility must first meet all of the requirements of **Title 30 Texas Administrative Code § 106.4** (30 TAC § 106.4), "Requirements for Permitting by Rule." Only then can the applicant proceed with addressing requirements of the specific Permit by Rule being claimed.

The use of this checklist is not mandatory; however, it is the responsibility of each applicant to show how a facility being claimed under a PBR meets the general requirements of 30 TAC § 106.4 and also the specific requirements of the PBR being claimed. If all PBR requirements cannot be met, a facility will not be allowed to operate under the PBR and an application for a construction permit may be required under 30 TAC § 116.110(a).

Registration of a facility under a PBR can be performed by completing **Form PI-7** (Registration for Permits by Rule) or **Form PI-7-CERT** (Certification and Registration for Permits by Rule). The appropriate checklist should accompany the registration form. Check the most appropriate answer and include any additional information in the spaces provided. If additional space is needed, please include an extra page and reference the question number. The PBR forms, tables, checklists, and guidance documents are available from the TCEQ, Air Permits Division website at: www.tceq.texas.gov/permitting/air/nav/air_pbr.html.

1. 30 TAC § 106.4(a)(1) and (4): Emission Limits	
List emissions in tpy for each facility (add additional pages or table if needed):	
Are the SO₂, PM, VOC, or other air contaminant emissions claimed for each facility in this PBR submittal less than 25 tpy?	☒ YES ☐ NO
Are the PM₁₀ emission less than 15 TPY and are the PM_{2.5} emissions less than 10 TPY for each claimed facility in the PBR submittal?	☒ YES ☐ NO
Are the NO_x and CO emissions claimed for each facility in this PBR submittal less than 250 tpy?	☒ YES ☐ NO
<i>If the answer to both is "Yes," continue to the question below. If the answer to either question is "No," a PBR cannot be claimed.</i>	
Has any facility at the property had public notice and opportunity for comment under 30 TAC Section 116 for a regular permit or permit renewal? (This does not include public notice for voluntary emission reduction permits, grandfathered existing facility permits, or federal operating permits.)	☒ YES ☐ NO
<i>If "Yes," skip to Section 2. If "No," continue to the questions below.</i>	

Texas Commission on Environmental Quality
Permit by Rule Applicability Checklist
Title 30 Texas Administrative Code § 106.4

1. 30 TAC § 106.4(a)(1) and (4): Emission Limits (<i>continued</i>)	
If the site has had no public notice, please answer the following:	
• Are the SO ₂ , PM ₁₀ , VOC, or other emissions claimed for all facilities in this PBR submittal less than 25 tpy?	☐ YES ☐ NO
• Are the PM ₁₀ emission less than 15 TPY and are the PM _{2.5} emissions less than 10 TPY for all claimed facilities in this PBR submittal?	☐ YES ☐ NO
• Are the NO _x and CO emissions claimed for all facilities in this PBR submittal less than 250 tpy?	☐ YES ☐ NO
<i>If the answer to both questions is "Yes," continue to Section 2.</i>	
<i>If the answer to either question is "No," a PBR cannot be claimed. A permit will be required under Chapter 116.</i>	
2. 30 TAC § 106.4(a)(2): Nonattainment Check	
• Are the facilities to be claimed under this PBR located in a designated ozone nonattainment county?	☐ YES ☒ NO
<i>If "Yes," please indicate which county by checking the appropriate box to the right.</i>	
(Moderate) - Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller counties:	☐ HGB
(Moderate) - Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise counties:	☐ DFW
<i>If "Yes," to any of the above, continue to the next question. If "No," continue to Section 3.</i>	
• Does this project trigger a nonattainment review?	☐ YES ☐ NO
• Is the project's potential to emit (PTE) for emissions of VOC or NO _x increasing by 100 tpy or more? <i>PTE is the maximum capacity of a stationary source to emit any air pollutant under its worst-case physical and operational design unless limited by a permit, rules, or made federally enforceable by a certification.</i>	☐ YES ☐ NO
• Is the site an existing major nonattainment site and are the emissions of VOC or NO _x increasing by 40 tpy or more?	☐ YES ☐ NO
<i>If needed, attach contemporaneous netting calculations per nonattainment guidance.</i>	
Additional information can be found at: www.tceq.texas.gov/permitting/air/forms/newsourcereview/tables/nsr_table8.html and www.tceq.texas.gov/permitting/air/nav/air_docs_newsourcereview.html	
<i>If "Yes," to any of the above, the project is a major source or a major modification and a PBR may not be used. A Nonattainment Permit review must be completed to authorize this project. If "No," continue to Section 3.</i>	

Texas Commission on Environmental Quality
Permit by Rule Applicability Checklist
Title 30 Texas Administrative Code § 106.4

3. 30 TAC § 106.4(a)(3): Prevention of Significant Deterioration (PSD) Check	
Does this project trigger a review under PSD rules?	
To determine the answer, review the information below:	
• Are emissions of any regulated criteria pollutant increasing by 100 tpy of any criteria pollutant at a named source?	☐ YES ☒ NO
• Are emissions of any criteria pollutant increasing by 250 tpy of any criteria pollutant at an unnamed source?	☐ YES ☒ NO
• Are emissions increasing above significance levels at an existing major site?	☐ YES ☒ NO
PSD information can be found at: www.tceq.texas.gov/assets/public/permitting/air/Forms/NewSourceReview/Tables/10173tbl.pdf and www.tceq.texas.gov/permitting/air/nav/air_docs_newsource.html <i>If "Yes," to any of the above, a PBR may not be used. A PSD Permit review must be completed to authorize the project.</i> <i>If "No," continue to Section 4.</i>	
4. 30 TAC § 106.4(a)(6): Federal Requirements	
• Will all facilities under this PBR meet applicable requirements of Title 40 Code of Federal Regulations (40 CFR) Part 60, New Source Performance Standards (NSPS)?	☐ YES ☐ NO ☒ NA
<i>If "Yes," which Subparts are applicable?</i>	
• Will all facilities under this PBR meet applicable requirements of 40 CFR Part 63, Hazardous Air Pollutants Maximum Achievable Control Technology (MACT) standards?	☐ YES ☐ NO ☒ NA
<i>If "Yes," which Subparts are applicable?</i>	
• Will all facilities under this PBR meet applicable requirements of 40 CFR Part 61, National Emissions Standards for Hazardous Air Pollutants (NESHAPs)?	☐ YES ☐ NO ☒ NA
<i>If "Yes," which Subparts are applicable?</i>	
<i>If "Yes" to any of the above, please attach a discussion of how the facilities will meet any applicable standards.</i>	

Texas Commission on Environmental Quality
Permit by Rule Applicability Checklist
Title 30 Texas Administrative Code § 106.4

5. 30 TAC § 106.4(a)(7): PBR Prohibition Check		
Are there any air permits at the site containing conditions which prohibit or restrict the use of PBRs?	☐ YES ☒ NO	
<i>If "Yes," PBRs may not be used or their use must meet the restrictions of the permit. A new permit or permit amendment may be required.</i>		
List permit number(s):		
6. 30 TAC § 106.4(a)(8): NO_x Cap and Trade		
Is the facility located in Harris, Brazoria, Chambers, Fort Bend, Galveston, Liberty, Montgomery, or Waller County?	☐ YES ☒ NO	
<i>If "Yes," answer the question below. If "No," continue to Section 7.</i>		
Will the proposed facility or group of facilities obtain required allowances for NO_x if they are subject to 30 TAC Chapter 101, Subchapter H, Division 3 (relating to the Mass Emissions Cap and Trade Program)?	☐ YES ☐ NO	
7. Highly Reactive Volatile Organic Compounds (HRVOC) Check		
Is the facility located in Harris County?	☐ YES ☒ NO	
<i>If "Yes," answer the next question. If "No," skip to the box below.</i>		
Will the project be constructed after June 1, 2006?	☐ YES ☒ NO	
<i>If "Yes," answer the next question. If "No," skip to the box below.</i>		
Will one or more of the following HRVOC be emitted as a part of this project?	☐ YES ☒ NO	
<i>If "Yes," complete the information below:</i>		
	lb/hr	tpy
▶ 1,3-butadiene		
▶ all isomers of butene (e.g., isobutene [2-methylpropene or isobutylene])		
▶ alpha-butylene (ethylethylene)		
▶ beta-butylene (dimethylethylene, including both cis- and transisomers)		
▶ ethylene		
▶ propylene		

**Texas Commission on Environmental Quality
Permit by Rule Applicability Checklist
Title 30 Texas Administrative Code § 106.4**

7. Highly Reactive Volatile Organic Compounds (HRVOC) Check (<i>continued</i>)		
Is the facility located in Brazoria, Chambers, Fort Bend, Galveston, Liberty, Montgomery, or Waller County?	☐ YES ☒ NO	
<i>If "Yes," answer the next question. If "No," the checklist is complete.</i>		
Will the project be constructed after June 1, 2006?	☐ YES ☐ NO	
<i>If "Yes," answer the next question. If "No," the checklist is complete.</i>		
Will one or more of the following HRVOC be emitted as a part of this project?	☐ YES ☐ NO	
<i>If "Yes," complete the information below:</i>		
	lb//hr	tpy
▶ ethylene		
▶ propylene		

Save Form

Reset Form

Texas Commission on Environmental Quality
Title 30 Texas Administrative Code § 106.224 Checklist
(Previously Standard Exemption 123)
Aerospace Equipment and Parts Manufacturing

The following checklist has been developed by the Texas Commission on Environmental Quality (TCEQ) to provide verification that the basic requirements of Title 30 Texas Administrative Code (TAC) Section 106.224, previously Standard Exemption 123, are met. The questions below are derived from § 106.4 and the permit by rule (PBR). Please read all of the questions and check each answer "YES" or "NO," or provide specific information as applicable to the facility. Total plant site emissions cannot exceed 25 tons per year. If all conditions of a specific PBR are not met, the facility will not be allowed to operate under that PBR and an application for a construction permit will be required pursuant to § 116.110 prior to construction.

For additional assistance with your application, including resources to help calculate your emissions, please visit the Small Business and Local Government Assistance (SBLGA) webpage at the following link:

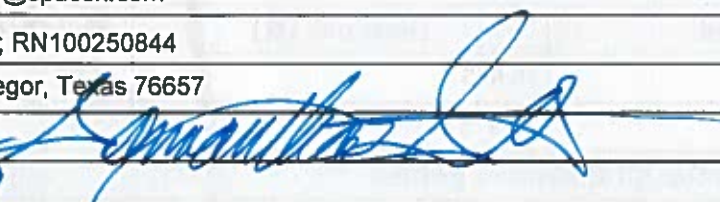
www.TexasEnviroHelp.org.

Please Provide the Information Requested Below				
Facility Type: Raptor Test Stand - Tripod				
Operating Schedule:	24	hours/day	7	days/week 52 weeks/year
Production Rate: 1 test per hour; 260 tests per year				units/time
Description				
Emission points are located at least 100 feet from any off-plant receptor*.				☒ YES ☐ NO
Note: Off-plant receptor means any recreational area or residence or other structure not occupied or used solely by the owner or operator of the aerospace equipment and parts manufacturing plant or the owner of the property upon which the aerospace plant is located. Controlled access recreational areas owned by the property owner or the owner or operator of the aerospace plant are not off-plant receptors.				
List the increase in the emissions of the following air contaminants authorized under this exemption, on a cumulative basis, from the entire aerospace manufacturing plant (tpy):				
Particulate matter (<5 tpy): 0.0		VOC(<15 tpy): 0.37		
Acid gases or vapors(<5 tpy): 0.0		Nonvolatile hydrocarbons(<10 tpy): 0.0		
Total of all air contaminants (< 25 tpy): 13.17				
The increases are less than the limits shown in parenthesis.				☒ YES ☐ NO
Hourly emissions of total new or increased emissions will not exceed the hourly emission rate defined by the equation $E=L/K$. The compound specific values of L (mg/m ³) are listed in Table 118(A) of TCEQ Standard Exemption 118. Values of K are listed in Table 123A of this exemption. You may calculate the value(s) of E or complete the following section.				☒ YES ☐ NO
The facility will be registered with the TCEQ central office using an exemption application, Form PI-7, before construction of the facility is begun. This registration will include a project description, emissions calculations, and a description of pollution control equipment to be used.				☒ YES ☐ NO

Texas Commission on Environmental Quality
Title 30 Texas Administrative Code § 106.224 Checklist
(Previously Standard Exemption 123)
Aerospace Equipment and Parts Manufacturing

Please Provide the Information Requested Below		
Emissions data will include all process emission sources at the plant, both existing and proposed, and shall be the maximum allowed emissions for permitted units, the actual emissions for existing grandfathered or exempted units, and the projected maximum allowable emissions for proposed units.	☒ YES ☐ NO	
Emissions will be speciated by chemical compound and stack parameters, as appropriate, for each emission source provided.	☒ YES ☐ NO	
If "YES", please fill in the following table:		
Compound	Distance (ft)	Proposed Emission Rate (lb/hr)
NO _x	10,915	15.92
CO	10,915	15.67
Repeat This Section for All Emission Points:		
Distance from emission point to nearest off-plant receptor: 10,915 feet		
An emissions inventory will be compiled and/or updated on an annual basis for all process emission sources on the property, and be maintained on a two-year rolling retention cycle.	☒ YES ☐ NO	
Note: <i>Inventory records should include the basis for all emissions estimates, sample calculations, and material usage records. Material and solvent usage records should be maintained in sufficient detail to document compliance.</i>		
There are/will be no visible emissions from this facility.	☐ YES ☒ NO	
The facility will handle or store any of the chemicals listed below as a liquid or a compressed gas in a compound mixture of a concentration greater than 10% by weight or an aqueous solution of any of these same chemicals greater than 50% by weight.	☐ YES ☒ NO	
Chemical List: Acrolein, Ammonia, Bromine, Carbon Disulfide, Chlorine, Ethyl Mercaptan, Hydrogen Chloride, Hydrogen Bromide, Hydrogen Cyanide, Hydrogen Fluoride, Hydrogen Sulfide, Phosphine, SO ₂ , Methyl Bromide, Methyl Isocyanate, Methyl Mercaptan, Nickel Carbonyl, and Phosgene.		
If "YES", answer the following:		
The facility shall be located at least 300 feet from the nearest property line and 600 feet from any off-plant receptor.	☐ YES ☐ NO	
The cumulative amount of any one of the chemicals listed above resulting from one or more authorizations under this PBR shall not exceed 500 pounds on the plant property.	☐ YES ☐ NO	
Any chemical listed above shall be handled, contained and transported, in compliance with U.S. Department of Transportation regulations (49 CFR Parts 171 through 178).	☐ YES ☐ NO	

**Texas Commission on Environmental Quality
Title 30 Texas Administrative Code § 106.224 Checklist
(Previously Standard Exemption 123)
Aerospace Equipment and Parts Manufacturing**

Please Complete the Following Section:	
Name: Samantha Smith	
Company: Space Exploration Technologies Corp.	
Title: Environmental, Health & Safety Manager	
Facility Name: SpaceX Rocket Development Facility - Raptor Test Stand - Tripod	
Phone No.: 254-382-5308	Fax No.:
Email Address: samantha.smith@spacex.com	
Account ID No.: CN602867657; RN100250844	
Location: 1 Rocket Road, McGregor, Texas 76657	
Signature of Company Officer: 	
Date: 12/3/2019	

Reset Form

**Texas Commission on Environmental Quality
Title 30 Texas Administrative Code § 106.224 Checklist
(Previously Standard Exemption 123)
Aerospace Equipment and Parts Manufacturing**

Please Complete the Following Section:	
Name: Samantha Smith	
Company: Space Exploration Technologies Corp.	
Title: Environmental, Health & Safety Manager	
Facility Name: SpaceX Rocket Development Facility - Raptor Test Stand - Tripod	
Phone No.: 254-382-5308	Fax No.:
Email Address: samantha.smith@spacex.com	
Account ID No.: CN602867657; RN100250844	
Location: 1 Rocket Road, McGregor, Texas 76657	
Signature of Company Officer:	
Date:	

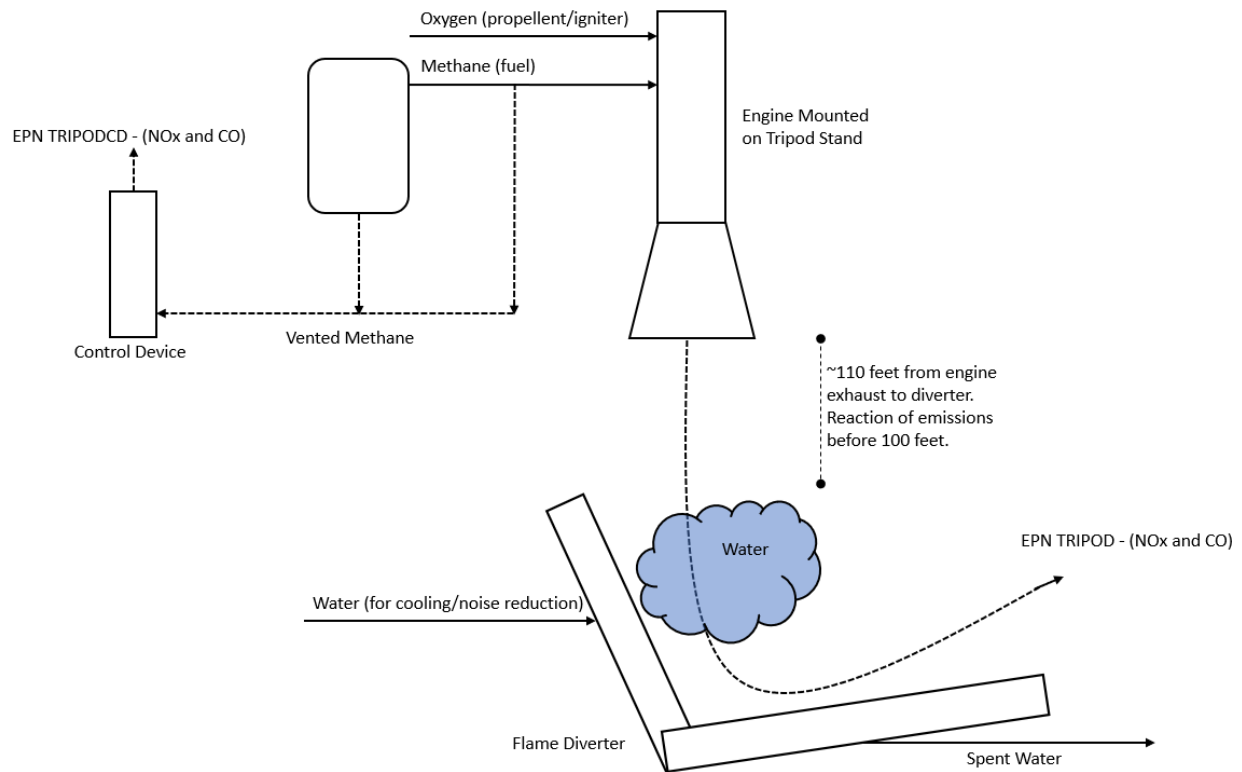
Reset Form

4.0 PROCESS DESCRIPTION

The Raptor engine testing conducted at the Tripod location at the SpaceX RDF involves the assembly and disassembly of aerospace engine components and testing of those components. During development, methane and oxygen are used to fuel the engine components during testing. Combustion of the fuel during testing results in emissions of carbon monoxide (CO; authorized by this registration), oxides of nitrogen (NO_x; authorized by this registration), and unburned methane (non-VOC; unregulated) which are vented vertically downward from the engine exhaust to a water cooled flame diverter approximately 110 feet below which routes the plume upward and into the atmosphere at a slight angle (EPN TRIPOD-1). Through a variety of industry specific engine models, SpaceX has determined that the reaction of emissions stop by 100 feet, and the addition of water quenching at the diverter does not impact reaction of emissions further. Methane emissions that are vented at various points during the rocket development process are routed to a combustion control device (EPN TRIPODCD-1). The control device is used to voluntarily reduce methane emissions for health and safety purposes.

5.0 PROCESS FLOW DIAGRAM

This section contains the process flow diagram.



6.0 TABLE 1(a) / MAXIMUM EMISSIONS DATA AND CALCULATIONS

This section contains maximum emissions data and calculations.



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Table 1(a) Emission Point Summary

Date:	November 2019	Permit No.:	TBD	Regulated Entity No.:	RN100250844
Area Name:	Raptor Test Stand - Tripod			Customer Reference No.:	CN602867657

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			2. Component or Air Contaminant Name	3. Air Contaminant Emission Rate	
(A) EPN	(B) FIN	(C) NAME		(A) POUND	(B) TPY
TRIPOD-1	TRIPOD	Raptor Test Stand - Tripod - Engine Testing	NOx	14.40	0.29
			CO	14.40	0.29
TRIPODCD-1	TRIPOD	Raptor Test Stand - Tripod - Control Device	NOx	1.52	6.64
			CO	1.27	5.58
			VOC	0.08	0.37

EPN = Emission Point Number
FIN = Facility Identification Number

Space Exploration Technologies Corp
McGregor Rocket Development Facility

Site: Raptor Test Stand - Tripod
EPN: TRIPOD-1
Name: Raptor Test Stand - Tripod - Engine Testing

Description:

The Raptor engine testing conducted at the Tripod location at the SpaceX RDF involves the assembly and disassembly of aerospace engine components and testing of those components. During development, methane and oxygen are used to fuel the engine components during testing. Combustion of the fuel during testing results in emissions of carbon monoxide (CO; authorized by this registration), oxides of nitrogen (NOx; authorized by this registration), and unburned methane (non-VOC; unregulated) which are vented vertically downward from the engine exhaust to a water cooled flame diverter approximately 110 feet below which routes the plume upward and into the atmosphere at a slight angle (EPN TRIPOD-1). Through a variety of industry specific engine models, SpaceX has determined that the reaction of emissions stop by 100 feet, and the addition of water quenching at the diverter does not impact reaction of emissions further.

Operational Data:

Average Length of Test (s/test) ¹	60
Maximum Length of Test (s/test) ¹	200
Maximum Tests Per Hour (test/hr) ¹	3
Maximum Tests Per Year (test/yr) ¹	400

¹ Provided by SpaceX.

Emissions Factors:

Pollutant	Emission Factor ^{1, 2}
	(lb/sec)
NOx	0.024
CO	0.024

¹ Emission factors developed by SpaceX using a combination of industry specific models for the combustion reaction of the fuels (PERCORP, VIPER, SPF Code, and TDK Code).

² Combustion reaction modeling conducted by SpaceX resulted in no emissions of VOC, SOx, and PM.

Component Testing Emissions:

Pollutant	Emissions	
	(lb/hr) ¹	(tpy) ²
NOx	14.40	0.29
CO	14.40	0.29

¹ CO/NOx Emissions (lb/hr) = Length of Test (sec/test) x Tests per Hour (test/hr) x Emissions Factor (lb/sec)

² CO/NOx Emissions (tpy) = Length of Test (sec/test) x Tests per Year (test/yr) x Emissions Factor (lb/sec) / 2,000 (lb/ton)

Space Exploration Technologies Corp
McGregor Rocket Development Facility

Site: Raptor Test Stand - Tripod
EPN: TRIPODCD-1
Name: Raptor Test Stand - Tripod - Control Device

Description:

The Raptor engine testing conducted at the Tripod location at the SpaceX RDF involves the assembly and disassembly of aerospace engine components and testing of those components. During development, methane and oxygen are used to fuel the engine components during testing. Methane emissions that are vented at various points during the rocket development process are routed to a combustion control device (EPN TRIPODCD-1). The control device is used to voluntarily reduce methane emissions for health and safety purposes.

Operational Data:

Daily Methane Boil Off (scf/day) ¹	364,053
Methane Boil Off (scf/hr)	15,169
Methane Boil Off (scf/yr)	132,879,345

1 Daily methane boil off estimate provided by SpaceX.

2 Conservative estimate on control efficiency. As built control efficiency will be greater than 98%.

Emissions Factors:

Pollutant	Emissions Factor ¹
	(lb/MMscf)
NOx	100
CO	84
VOC	5.5

1 Emission factors from EPA, AP-42 Section 1.4, Table 1.4-1 for natural gas combustion as an approximation of methane.

2 Control device will operate smokeless, therefore no PM emissions. Per SDS (see Section 7), the methane contains no sulfur, therefore no SOx emissions.

Component Testing Emissions:

Pollutant	Emissions ¹	
	(lb/hr)	(tpy)
NOx	1.52	6.64
CO	1.27	5.58
VOC	0.08	0.37

1 Emissions (lb/time) = Methane Boil Off (MMscf/time) x Emissions Factor (lb/MMscf).

7.0 SUPPORTING INFORMATION

This section contains supporting information including Safety Data Sheets

SAFETY DATA SHEET

Airgas

Methane

Section 1. Identification

GHS product identifier	: Methane
Chemical name	: methane
Other means of identification	: Methane or natural gas; Marsh gas; Methyl hydride; CH ₄ ; Fire Damp;
Product use	: Synthetic/Analytical chemistry.
Synonym	: Methane or natural gas; Marsh gas; Methyl hydride; CH ₄ ; Fire Damp;
SDS #	: 001033
Supplier's details	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
24-hour telephone	: 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Classification of the substance or mixture	: FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Compressed gas

GHS label elements

Hazard pictograms



Signal word

: Danger

Hazard statements

: Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General

: Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Approach suspected leak area with caution.

Prevention

: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response

: Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage

: Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal

: Not applicable.

Hazards not otherwise classified

: In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance
Chemical name : methane
Other means of identification : Methane or natural gas; Marsh gas; Methyl hydride; CH₄; Fire Damp;

CAS number/other identifiers

CAS number : 74-82-8
Product code : 001033

Ingredient name	%	CAS number
methane	100	74-82-8

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

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

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

Section 4. First aid measures

Description of necessary first aid measures

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

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Wash contaminated skin with soap and water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation : No known significant effects or critical hazards.
Skin contact : Contact with rapidly expanding gas may cause burns or frostbite.
Frostbite : Try to warm up the frozen tissues and seek medical attention.
Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.
Inhalation : No specific data.
Skin contact : No specific data.
Ingestion : No specific data.

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

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
Specific treatments : No specific treatment.

Section 4. First aid measures

- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

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

- Specific hazards arising from the chemical** : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

- Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

- Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
- For emergency responders** : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

- Environmental precautions** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

- Small spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.
- Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

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

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
methane	Oxygen Depletion [Asphyxiant]

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

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

Individual protection measures

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

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

Skin protection

Section 8. Exposure controls/personal protection

- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
- Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

- Physical state** : Gas. [Compressed gas.]
- Color** : Colorless.
- Molecular weight** : 16.05 g/mole
- Molecular formula** : C-H4
- Boiling/condensation point** : -161.48°C (-258.7°F)
- Melting/freezing point** : -187.6°C (-305.7°F)
- Critical temperature** : -82.45°C (-116.4°F)
- Odor** : Odorless.
- Odor threshold** : Not available.
- pH** : Not available.
- Flash point** : Closed cup: -188.15°C (-306.7°F)
- Burning time** : Not applicable.
- Burning rate** : Not applicable.
- Evaporation rate** : Not available.
- Flammability (solid, gas)** : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.
- Lower and upper explosive (flammable) limits** : Lower: 5%
Upper: 15%
- Vapor pressure** : Not available.
- Vapor density** : 0.55 (Air = 1) Liquid Density@BP: 26.5 lb/ft3 (424.5 kg/m3)
- Specific Volume (ft³/lb)** : 24.3956
- Gas Density (lb/ft³)** : 0.040991 (25°C / 77 to °F)
- Relative density** : Not applicable.
- Solubility** : Not available.
- Solubility in water** : 0.0244 g/l
- Partition coefficient: n-octanol/water** : 1.09
- Auto-ignition temperature** : 287°C (548.6°F)
- Decomposition temperature** : Not available.
- SADT** : Not available.

Section 9. Physical and chemical properties

Viscosity : Not applicable.

Section 10. Stability and reactivity

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

Chemical stability : The product is stable.

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

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

Incompatible materials : Oxidizers

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

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Not available.

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Section 11. Toxicological information

Eye contact	: Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	: No known significant effects or critical hazards.
Skin contact	: Contact with rapidly expanding gas may cause burns or frostbite.
Ingestion	: As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact	: No specific data.
Inhalation	: No specific data.
Skin contact	: No specific data.
Ingestion	: No specific data.

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

Short term exposure

Potential immediate effects	: Not available.
Potential delayed effects	: Not available.

Long term exposure

Potential immediate effects	: Not available.
Potential delayed effects	: Not available.

Potential chronic health effects

Not available.

General	: No known significant effects or critical hazards.
Carcinogenicity	: No known significant effects or critical hazards.
Mutagenicity	: No known significant effects or critical hazards.
Teratogenicity	: No known significant effects or critical hazards.
Developmental effects	: No known significant effects or critical hazards.
Fertility effects	: No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	LogP _{ow}	BCF	Potential
methane	1.09	-	low

Mobility in soil

Section 12. Ecological information

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

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

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1971	UN1971	UN1971	UN1971	UN1971
UN proper shipping name	Methane, compressed	Methane, compressed or Methane or Natural gas, compressed (with high methane content)	Methane, compressed	Methane, compressed	Methane, compressed
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	-	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2). <u>Explosive Limit and Limited Quantity Index</u> 0.125 <u>ERAP Index</u> 3000 <u>Passenger Carrying Ship Index</u> Forbidden <u>Passenger Carrying Road or Rail Index</u> Forbidden	-	-	<u>Passenger and Cargo Aircraft</u> Quantity limitation: 0 Forbidden <u>Cargo Aircraft Only</u> Quantity limitation: 150 kg

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 14. Transport information

Transport in bulk according : Not available.
to Annex II of MARPOL
73/78 and the IBC Code

Section 15. Regulatory information

U.S. Federal regulations : TSCA 8(a) CDR Exempt/Partial exemption: Not determined
United States inventory (TSCA 8b): This material is listed or exempted.
Clean Air Act (CAA) 112 regulated flammable substances: methane

Clean Air Act Section 112 : Not listed
(b) Hazardous Air
Pollutants (HAPs)

Clean Air Act Section 602 : Not listed
Class I Substances

Clean Air Act Section 602 : Not listed
Class II Substances

DEA List I Chemicals : Not listed
(Precursor Chemicals)

DEA List II Chemicals : Not listed
(Essential Chemicals)

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
methane	100	Yes.	Yes.	No.	No.	No.

State regulations

Massachusetts : This material is listed.
New York : This material is not listed.
New Jersey : This material is listed.
Pennsylvania : This material is listed.

International regulations

International lists

National inventory

Australia : This material is listed or exempted.
Canada : This material is listed or exempted.
China : This material is listed or exempted.
Europe : This material is listed or exempted.
Japan : This material is listed or exempted.
Malaysia : This material is listed or exempted.
New Zealand : This material is listed or exempted.
Philippines : This material is listed or exempted.
Republic of Korea : This material is listed or exempted.

Section 15. Regulatory information

Taiwan : This material is listed or exempted.

Canada

WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.
CEPA Toxic substances: This material is listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.

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

Health	0
Flammability	4
Physical hazards	3

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)



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Procedure used to derive the classification

Classification	Justification
Flam. Gas 1, H220 Press. Gas Comp. Gas, H280	Expert judgment According to package

History

Date of printing : 5/9/2016
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Section 16. Other information

Key to abbreviations

: ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References

: Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.