

EPN = Emission Point Number



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Table 1(a) Emission Point Summary

Date:	July 2021	Permit No.:	TBD	Regulated Entity No.:	RN107697088
Area Name:	SpaceX Starbase Texas Launch Site - Ground Support Engineering Paint Shop			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

FIN = Facility Identification Number

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[illegible]

EPN = Emission Point Number
FIN = Facility Identification Number

Ground Support Engineering Paint Shop

EPN(s): GSESTACK-1
FIN(s): GSEPAINT-1

Starbase Texas Launch Site

30 TAC 106.433 PI-7 Registration
July 2021

Overview:

The GSE Paint Shop will include a surface coating area within an existing building which will vent out of a single stack through a fabric filter system (FIN GSEPAINT-1; EPN GSESTACK-1). The painting area will be used to coat flight tooling (support rings and assembly rings) as well as miscellaneous items at the site requiring corrosion control.

Coatings will be applied using spray guns (conservatively assuming a transfer efficiency of 50% for air atomized per TCEQ guidance) and will be allowed to air dry once applied. Calculations have been based on a filter efficiency 95% as required by Best Available Control Technology (BACT), however, actual control will be significantly greater. Emissions will include volatile organic compounds (VOCs), particulate matter (PM), and hazardous air pollutants (HAPs).

Although painting will occur with all openings of the building closed to ensure maximum capture, due to the filter set up of the painting area, face velocities as required by the PBR for enclosed operations may not be met, therefore, the booth will be authorized as an unenclosed operation and meet the applicable requirements of the PBR for unenclosed operations.

Authorization:

Permit By Rule 30 TAC 106.433; Registration No. TBD

General Paint Usage Data ¹		AMERCOAT 385		AMERCOAT 450H	
		Part A	Part B	Part A	Part B
Paint Name	-	385 Black Resin	385 Cure (Hardener)	450H Black Resin	450H Cure (Hardener)
Manufacturer	-	PPG	PPG	PPG	PPG
SDS Number (Inventory No.)/Product Code	-	AT385-9/00334373	AT385-B	AT45H9	AT45H-B
SDS Date	-	05/29/2021	06/07/2021	06/07/2021	06/07/2021
Ratio in which component parts are mixed ²	-	1	1	4	1
Maximum Hourly Quantity Used ³	(gal/hr)	2.38		2.33	
Maximum Hourly Quantity Used Per Component	(gal/hr)	1.19	1.19	1.86	0.47
Weekly Quantity Used ⁴	(gal/wk)	39.00		39.00	
Weekly Quantity Used Per Component	(gal/wk)	19.50	19.50	31.20	7.80
Annual Quantity Used ⁴	(gal/yr)	2,028.00		2,028.00	
Annual Quantity Used Per Component	(gal/yr)	1,014.00	1,014.00	1,622.40	405.60
Application Method		Spray Gun		Spray Gun	

1. Coatings are a best representation of coatings expected to be used at the GSE Paint Shop. If coatings not listed are used, compliance with PBR limits will be maintained, and demonstrated through recordkeeping.

2. The coatings are mixed prior to application. The ratios indicate how much of each component goes into the as applied coating.

3. Maximum hourly usage has been conservatively set to meet the amount allowed by the PBR (6 lb/hr averaged over 5-hours) for each coating.

4. Per SpaceX, weekly usage based on maximum of 6.5 gallons of total coating used per day for 6 days a week. Annual usage was scaled up from weekly usage to 52 weeks. Usage amounts are total for all coatings.

General Paint Chemical Properties ¹				AMERCOAT 385		AMERCOAT 450H	
				Part A	Part B	Part A	Part B
Paint Name	CAS	Type	-	385 Black Resin	385 Cure (Hardener)	450H Black Resin	450H Cure (Hardener)
Total Density	-	-	(lb/gal)	11.02	10.35	10.26	8.60
VOC Weight Percent	-	-	(Wt %)	19.33%	28.00%	23.23%	38.42%
VOC Density	-	-	(lb/gal)	2.13	2.90	2.38	3.30
VOC Density of Mixed Paint	-	-	(lb/gal)	2.51		2.57	
Solids Weight Percent ²	-	-	(Wt %)	80.67%	72.00%	76.77%	61.58%
Total HAPs	-	-	(Wt %)	1.00%	3.00%	1.00%	0.00%
Individual Constituents ³							
Heptan-2-one	110-43-0	VOC	(Wt %)	9.10%			
Solvent naphtha (petroleum), heavy arom.	64742-94-5	VOC	(Wt %)	5.00%	8.10%		
Solvent naphtha (petroleum), light aromatic	64742-95-6	VOC	(Wt %)	4.80%	11.00%	5.00%	3.50%
1,2,4-trimethylbenzene	95-63-6	VOC	(Wt %)	3.20%	10.00%		2.00%
3-butoxypropan-2-ol	5131-66-8	VOC	(Wt %)	4.00%			
Naphthalene	91-20-3	VOC/HAP	(Wt %)	1.00%	1.00%		
4-nonylphenol, branched	84852-15-3	VOC	(Wt %)		10.00%		
3,6-diazaoctanethylenediamin	112-24-3	VOC	(Wt %)		1.80%		
Ethylbenzene	100-41-4	VOC/HAP	(Wt %)		1.00%	1.00%	
Cumene	98-82-8	VOC/HAP	(Wt %)		1.00%		
n-butyl acetate	123-86-4	VOC	(Wt %)			20.00%	50.00%
2-methoxy-1-methylethyl acetate	108-65-6	VOC	(Wt %)			5.00%	
4-isocyanatosulphonyltoluene	4083-64-1	VOC	(Wt %)			1.00%	
Hexamethylene diisocyanate, oligomers	28182-81-2	Solid	(Wt %)				75.00%
Crystalline silica, respirable powder (<10 microns)	14808-60-7	Solid	(Wt %)			1.00%	
Wollastonite	13983-17-0	Solid	(Wt %)			20.00%	
Fatty acids,	68082-29-1	Solid	(Wt %)		20.00%		
Talc, not containing asbestiform fibers	14807-96-6	Solid	(Wt %)		50.00%		
Bis-[4-(2,3-epoxipropoxy)phenyl]propane	1675-54-3	Solid	(Wt %)	50.00%			
Carbon black	1333-86-4	Solid	(Wt %)	1.00%		5.00%	
Non-HAP/Non-Toxic Solids	-	Solid	(Wt %)	21.90%		42.00%	
Total Exempt Solvents			(Wt %)	0.00%	0.00%	0.00%	0.00%

1. Coating properties taken from Safety Data Sheets (SDS) found in Section 7, Supporting Information.

2. If solids weight percent was not provided on SDS, it was assumed to be 100% - VOC%.

3. If a range was provided for weight percent of an individual constituent on the SDS, the upper end of the range was conservatively used per guidance from TCEQ's Michael Coldiron via E-mail (02/12/21).

Spray Gun Transfer Efficiency	50%	Spray gun with an estimated transfer efficiency of 50% (air atomized), per Painting Basics and Emission Calculations for TCEQ Air Quality Permit Applications , Table 1, November 5, 2012.
Paint Booth Control Efficiency	95%	Booth will achieve a minimum control of what is required by BACT. Actual control is expected to be significantly higher.

Ground Support Engineering Paint Shop

EPN(s): GSESTACK-1

FIN(s): GSEPAINT-1

Starbase Texas Launch Site

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July 2021

Emissions				AMERCOAT 385		AMERCOAT 450H		Maximum Emissions ²	
				Part A	Part B	Part A	Part B		
Paint Name:	CAS	Type	-	385 Black Resin	385 Cure (Hardener)	450H Black Resin	450H Cure (Hardener)		
VOC ¹	-	-	lb/hr	2.53	3.45	4.44	1.54	5.98	lb/hr
			lb/wk	41.54	56.51	74.35	25.77	100.13	lb/wk
			tpy	1.08	1.47	1.93	0.67	2.60	tpy
PM ²	-	-	lb/hr	0.26	0.22	0.37	0.06	0.49	lb/hr
			lb/wk	4.33	3.63	6.14	1.03	7.97	lb/wk
			tpy	0.11	0.09	0.16	0.03	0.21	tpy
Total HAPs	-	-	lb/hr	0.13	0.37	0.19	0.00E+00	0.50	lb/hr
			lb/wk	2.15	6.05	3.20	0.00E+00	8.20	lb/wk
			tpy	0.06	0.16	0.08	0.00E+00	0.21	tpy
Heptan-2-one	110-43-0	VOC	lb/hr	1.19	0.00E+00	0.00E+00	0.00E+00	1.19	lb/hr
			lb/wk	19.55	0.00E+00	0.00E+00	0.00E+00	19.55	lb/wk
			tpy	0.51	0.00E+00	0.00E+00	0.00E+00	0.51	tpy
Solvent naphtha (petroleum), heavy arom.	64742-94-5	VOC	lb/hr	0.66	1.00	0.00E+00	0.00E+00	1.65	lb/hr
			lb/wk	10.74	16.35	0.00E+00	0.00E+00	27.09	lb/wk
			tpy	0.28	0.43	0.00E+00	0.00E+00	0.70	tpy
Solvent naphtha (petroleum), light aromatic	64742-95-6	VOC	lb/hr	0.63	1.35	0.96	0.14	1.98	lb/hr
			lb/wk	10.31	22.20	16.01	2.35	32.52	lb/wk
			tpy	0.27	0.58	0.42	0.06	0.85	tpy
1,2,4-trimethylbenzene	95-63-6	VOC	lb/hr	0.42	1.23	0.00E+00	0.08	1.65	lb/hr
			lb/wk	6.88	20.18	0.00E+00	1.34	27.06	lb/wk
			tpy	0.18	0.52	0.00E+00	0.03	0.70	tpy
3-butoxypropan-2-ol	5131-66-8	VOC	lb/hr	0.52	0.00E+00	0.00E+00	0.00E+00	0.52	lb/hr
			lb/wk	8.60	0.00E+00	0.00E+00	0.00E+00	8.60	lb/wk
			tpy	0.22	0.00E+00	0.00E+00	0.00E+00	0.22	tpy
Naphthalene	91-20-3	VOC/HAP	lb/hr	0.13	0.12	0.00E+00	0.00E+00	0.25	lb/hr
			lb/wk	2.15	2.02	0.00E+00	0.00E+00	4.17	lb/wk
			tpy	0.06	0.05	0.00E+00	0.00E+00	0.11	tpy
4-nonylphenol, branched	84852-15-3	VOC	lb/hr	0.00E+00	1.23	0.00E+00	0.00E+00	1.23	lb/hr
			lb/wk	0.00E+00	20.18	0.00E+00	0.00E+00	20.18	lb/wk
			tpy	0.00E+00	0.52	0.00E+00	0.00E+00	0.52	tpy
3,6-diazaoctanethylenediamin	112-24-3	VOC	lb/hr	0.00E+00	0.22	0.00E+00	0.00E+00	0.22	lb/hr
			lb/wk	0.00E+00	3.63	0.00E+00	0.00E+00	3.63	lb/wk
			tpy	0.00E+00	0.09	0.00E+00	0.00E+00	0.09	tpy
Ethylbenzene	100-41-4	VOC/HAP	lb/hr	0.00E+00	0.12	0.19	0.00E+00	0.19	lb/hr
			lb/wk	0.00E+00	2.02	3.20	0.00E+00	3.20	lb/wk
			tpy	0.00E+00	0.05	0.08	0.00E+00	0.08	tpy
Cumene	98-82-8	VOC/HAP	lb/hr	0.00E+00	0.12	0.00E+00	0.00E+00	0.12	lb/hr
			lb/wk	0.00E+00	2.02	3.20	0.00E+00	3.20	lb/wk
			tpy	0.00E+00	0.05	0.00E+00	0.00E+00	0.05	tpy
n-butyl acetate	123-86-4	VOC	lb/hr	0.00E+00	0.00E+00	3.82	2.00	5.83	lb/hr
			lb/wk	0.00E+00	0.00E+00	64.02	33.54	97.56	lb/wk
			tpy	0.00E+00	0.00E+00	1.66	0.87	2.54	tpy
2-methoxy-1-methylethyl acetate	108-65-6	VOC	lb/hr	0.00E+00	0.00E+00	0.96	0.00E+00	0.96	lb/hr
			lb/wk	0.00E+00	0.00E+00	16.01	0.00E+00	16.01	lb/wk
			tpy	0.00E+00	0.00E+00	0.42	0.00E+00	0.42	tpy
4-isocyanatosulphonyltoluene	4083-64-1	VOC	lb/hr	0.00E+00	0.00E+00	0.19	0.00E+00	0.19	lb/hr
			lb/wk	0.00E+00	0.00E+00	3.20	0.00E+00	3.20	lb/wk
			tpy	0.00E+00	0.00E+00	0.08	0.00E+00	0.08	tpy
Hexamethylene diisocyanate, oligomers	28182-81-2	Solid	lb/hr	0.00E+00	0.00E+00	0.00E+00	0.08	0.08	lb/hr
			lb/wk	0.00E+00	0.00E+00	0.00E+00	1.26	1.26	lb/wk
			tpy	0.00E+00	0.00E+00	0.00E+00	0.03	0.03	tpy
Crystalline silica, respirable powder (<10 microns)	14808-60-7	Solid	lb/hr	0.00E+00	0.00E+00	4.78E-03	0.00E+00	4.78E-03	lb/hr
			lb/wk	0.00E+00	0.00E+00	0.08	0.00E+00	0.08	lb/wk
			tpy	0.00E+00	0.00E+00	2.08E-03	0.00E+00	2.08E-03	tpy
Wollastonite	13983-17-0	Solid	lb/hr	0.00E+00	0.00E+00	0.10	0.00E+00	0.10	lb/hr
			lb/wk	0.00E+00	0.00E+00	1.60	0.00E+00	1.60	lb/wk
			tpy	0.00E+00	0.00E+00	0.04	0.00E+00	0.04	tpy
Fatty acids,	68082-29-1	Solid	lb/hr	0.00E+00	0.06	0.00E+00	0.00E+00	0.06	lb/hr
			lb/wk	0.00E+00	1.01	0.00E+00	0.00E+00	1.01	lb/wk
			tpy	0.00E+00	0.03	0.00E+00	0.00E+00	0.03	tpy
Talc, not containing asbestiform fibers	14807-96-6	Solid	lb/hr	0.00E+00	0.15	0.00E+00	0.00E+00	0.15	lb/hr
			lb/wk	0.00E+00	2.52	0.00E+00	0.00E+00	2.52	lb/wk
			tpy	0.00E+00	0.07	0.00E+00	0.00E+00	0.07	tpy
Bis-[4-(2,3-epoxipropoxy)phenyl]propane	1675-54-3	Solid	lb/hr	0.16	0.00E+00	0.00E+00	0.00E+00	0.16	lb/hr
			lb/wk	2.69	0.00E+00	0.00E+00	0.00E+00	2.69	lb/wk
			tpy	0.07	0.00E+00	0.00E+00	0.00E+00	0.07	tpy
Carbon black	1333-86-4	Solid	lb/hr	3.28E-03	0.00E+00	0.02	0.00E+00	0.02	lb/hr
			lb/wk	0.05	0.00E+00	0.40	0.00E+00	0.40	lb/wk
			tpy	1.40E-03	0.00E+00	0.01	0.00E+00	0.01	tpy

Ground Support Engineering Paint Shop

EPN(s): GSESTACK-1
FIN(s): GSEPAIN-1

Starbase Texas Launch Site

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Non-HAP/Non-Toxic Solids	-	Solid	lb/hr	0.07	0.00E+00	0.20	0.00E+00	0.20	lb/hr
			lb/wk	1.18	0.00E+00	3.36	0.00E+00	3.36	lb/wk
			tpy	0.03	0.00E+00	0.09	0.00E+00	0.09	tpy
Total Exempt Solvents ¹			lb/hr	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	lb/hr
			lb/wk	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	lb/wk
			tpy	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	tpy

1. VOC/HAP/Exempt Emissions (lb/time) = Usage (gallons of paint /time) x Density (lb /gallon) x Weight Percent of Pollutant (%); annual emissions are divided by 2,000 lb/ton to convert to tpy.
2. PM/Solid (lb/time) = Usage (gallons of paint /time) x Density (lb /gallon) x Weight Percent of Solid (%) x (100% - Transfer Efficiency (%)) x (100% - Control Efficiency (%)); annual emissions are divided by 2,000 lb/ton to convert to tpy.
3. Maximum emissions are determined by taking the maximum emissions from the highest emissions generating paint for each pollutant (i.e, Super Paint method).

Ground Support Engineering Paint Shop

EPN(s): GSESTACK-1
FIN(s): GSEPAINT-1

Starbase Texas Launch Site

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Maximum Hourly VOC Emissions, Averaged Over a 5-Hour Period:

		AMERCOAT 385	AMERCOAT 450H
Maximum Amount of Paint Used in any Single 5-Hour Period	gal	11.90	11.65
VOC Content of As Mixed Paints	lb/gal	2.51	2.57
Maximum Hourly VOC Emissions, 5-Hour Average	lb/hr	5.98	5.98