From: Eggiman, Jennifer
To: Omar El-rjoob
Cc: Tyson W. Long
Subject: Application No. 035-47686-00089- Calculations
Date: Monday, April 8, 2024 1:59:15 PM
Attachments: image001.png
44165_PTEcalcs_Progress Rail_Muncie_Permit Revision_03282024.xlsx

Hi Omar,

Tyson Long at Progress Rail forwarded me your request for the calculations for the Progress Rail – Muncie, IN air permit revision application.

Please see the attached spreadsheet with the calculations. If you have any questions or need any additional information, please feel free to contact me.

Thank you,

Jennifer Eggiman
Senior Engineer

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Appendix A: Emission Calculations
Summary of Unlimited Emissions

Company Name: Progress Rail Manufacturing Corp
Source Address: 3500 S. Cowan Road, Muncie, IN 47302
Administrative Amendment No.: 035-44165-00089
Reviewer: Hachem Ismaili Alaoui

Unlimited Potential to Emit (tons/year)										
Process	**PM**	**PM10**	**PM2.5**	**SO2**	**NOx**	**VOC**	**CO**	**Total HAPs**	**Single HAP**	
Spray Booths (PB-01 & PB-02)	41.34	41.34	41.34	--	--	32.27	--	9.73	3.75	Xylene
Finishing Spray Booths (PB-04, PB-05, & PB-07)	68.25	68.25	68.25	--	--	66.51	--	56.33	27.75	Xylene
Pre-wash (PWASH)	--	--	--	--	--	2.06E-03	--	--	--	--
Primary Wash (WASH-1)	--	--	--	--	--	0.08	--	--	--	--
Vacuum Pressure Impregnation (VPI-1) Coating Process	--	--	--	--	--	11.84	--	--	--	--
Spray Booth (PB-08)	0.63	0.63	0.63	--	--	2.83	--	2.83	2.83	Xylene
Hand Wiping Cleaning (WIPE)	--	--	--	--	--	0.75	--	4.87E-03	4.87E-03	Toluene
Welding and Plasma Cutting	3.85	3.85	3.85	--	--	-	--	0.28	negl.	--
Locomotive Component Testing	0.52	0.52	0.52	0.13	8.80	1.32	5.03	negl.	negl.	--
Shot blaster (SB-01)	976.11	976.11	976.11	--	--	--	--	--	--	--
Degreasing operation	--	--	--	--	--	0.46	--	negl.	negl.	--
Fire Suppression Pump Engine	0.10	0.10	0.10	0.09	1.36	0.11	0.29	negl.	negl.	--
Existing Natural Gas-Fired Oven and Heaters	1.16	4.64	4.64	0.37	61.01	3.36	51.25	1.15	1.10	Hexane
Storage Tanks	--	--	--	--	--	0.02	--	--	--	--
Engine-1	1.94	1.94	1.94	1.81	27.32	2.22	5.89	0.02	-	
New Natural Gas-fired Combustion Units	0.27	1.09	1.09	0.09	14.39	0.79	12.08	0.27	0.26	Hexane
Dry Ice Blasting Process	9.64	8.29	8.29	--	--	--	--	--	--	--
Washer Units	--	--	--	--	--	2.02	--	--	--	--
WAG Process Line	--	--	--	--	--	0.08	--	--	--	--
CNC router woodworking machine	1.24	1.24	1.24	--	--	--	--	--	--	--
Total	**1,105.05**	**1,108.00**	**1,108.00**	**2.48**	**112.86**	**124.65**	**74.54**	**70.62**	**34.33**	**Xylene**

Emission Calculations
Summary of Unlimited Emissions WITH REVISIONS

Company Name: Progress Rail Manufacturing Corp
Source Address: 3500 S. Cowan Road, Muncie, IN 47302
Permit No.: 035-44165-00089

=changes to the permit

Unlimited Potential to Emit (tons/year)										
Process	PM	PM10	PM2.5	SO2	NOx	VOC	CO	Total HAPs	Single HAP	
Spray Booths (PB-01 & PB-02)	41.34	41.34	41.34	--	--	32.27	--	9.73	3.75	Xylene
Finishing Spray Booths (PB-04, PB-05, & PB-07)	68.25	68.25	68.25	--	--	66.51	--	56.33	27.75	Xylene
Pre-wash (PWASH)	--	--	--	--	--	2.06E-03	--	--	--	--
Primary Wash (WASH-1)	--	--	--	--	--	0.08	--	--	--	--
Vacuum Pressure Impregnation (VPI-1) Coating Process	--	--	--	--	--	11.84	--	--	--	--
Spray Booth (PB-08)	0.63	0.63	0.63	--	--	2.83	--	2.83	2.83	Xylene
Hand Wiping Cleaning (WIPE)	--	--	--	--	--	0.75	--	4.87E-03	4.87E-03	Toluene
Welding and Plasma Cutting	3.85	3.85	3.85	--	--	-	--	0.28	negl.	--
Locomotive Component Testing	0.52	0.52	0.52	0.13	8.80	1.32	5.03	negl.	negl.	--
NEW - Engine Testing	0.42	0.42	0.42	1.20	49.80	0.62	7.08	negl.	negl.	--
Shot blaster (SB-01)	976.11	976.11	976.11	--	--	--	--	--	--	--
Fire Suppression Pump Engine	0.10	0.10	0.10	0.09	1.36	0.11	0.29	negl.	negl.	--
Existing Natural Gas-Fired Oven and Heaters	1.16	4.64	4.64	0.37	61.01	3.36	51.25	1.15	1.10	Hexane
Storage Tanks	--	--	--	--	--	0.02	--	--	--	--
Engine-1	1.94	1.94	1.94	1.81	27.32	2.22	5.89	0.02	-	
New Natural Gas-fired Combustion Units	0.27	1.09	1.09	0.09	14.39	0.79	12.08	0.27	0.26	Hexane
Dry Ice Blasting Process	9.64	8.29	8.29	--	--	--	--	--	--	--
Washer Units	--	--	--	--	--	2.02	--	--	--	--
WAG Process Line	--	--	--	--	--	0.08	--	--	--	--
CNC router woodworking machine	1.24	1.24	1.24	--	--	--	--	--	--	--
Total	**1,105.47**	**1,108.42**	**1,108.42**	**3.68**	**162.66**	**124.81**	**81.62**	**70.62**	**34.33**	**Xylene**

Appendix A: Emission Calculations
Summary of Limited Emissions

Company Name: Progress Rail Manufacturing Corp
Source Address: 3500 S. Cowan Road, Muncie, IN 47302
Administrative Amendment No.: 035-44165-00089
Reviewer: Hachem Ismaili Alaoui

Limited Potential to Emit After Issuance of Part 70 Operating Permit (tons/year)										
Process	**PM**	**PM10**	**PM2.5**	**SO2**	**NOx**	**VOC**	**CO**	**Total HAPs**	**Single HAP**	
Spray Booths (PB-01 & PB-02)[1,2]	2.07	2.07	2.07	--	--	32.27	--	23.17	9.90	Xylene
Finishing Spray Booths (PB-04, PB-05, & PB-07)[1,2]	68.25	68.25	68.25	--	--	66.51	--			
Spray Booth (PB-08)[1,2]	0.03	0.03	0.03	--	--	2.83	--			
Pre-wash (PWASH)	--	--	--	--	--	2.06E-03	--	--	--	--
Primary Wash (WASH-1)	--	--	--	--	--	0.08	--	--	--	--
Vacuum Pressure Impregnation (VPI-1) Coating Process	--	--	--	--	--	11.84	--	--	--	--
Hand Wiping Cleaning (WIPE)	--	--	--	--	--	0.75	--	4.87E-03	4.87E-03	Toluene
Welding and Plasma Cutting	3.85	3.85	3.85	--	--	--	--	0.28	negl.	--
Locomotive Component Testing	0.52	0.52	0.52	0.13	8.80	1.32	5.03	negl.	negl.	--
Shot blaster (SB-01)[3]	65.15	65.15	65.15	--	--	--	--	--	--	--
Degreasing operation	--	--	--	--	--	0.46	-	negl.	negl.	--
Fire Suppression Pump Engine	0.10	0.10	0.10	0.09	1.36	0.11	0.29	negl.	negl.	--
Existing Natural Gas-Fired Oven and Heaters	1.16	4.64	4.64	0.37	61.01	3.36	51.25	1.15	1.10	Hexane
Storage Tanks	--	--	--	--	--	0.02	--	--	--	--
Engine-1	1.94	1.94	1.94	1.81	27.32	2.22	5.89	0.02		--
New Natural Gas-fired Combustion Units	0.27	1.09	1.09	0.09	14.39	0.79	12.08	0.27	0.26	Hexane
Dry Ice Blasting Process	9.64	8.29	8.29	--	--	--	--	--	--	--
Washer Units	--	--	--	--	--	2.02	--	--	--	--
WAG Process Line	--	--	--	--	--	0.08	--	--	--	--
CNC router woodworking machine	1.24	1.24	1.24	--	--	--	--	--	--	--
Total	**154.21**	**157.16**	**157.16**	**2.48**	**112.86**	**124.65**	**74.54**	**24.90**	**9.90**	**Xylene**

[1] Total HAP emissions have been limited to render 326 IAC 2-4.1 (Major Source of HAPs) not applicable.
[2] Any single HAP emitted from these processes has been limited to render 326 IAC 2-4.1 (Major Source of HAPs) not applicable.
[3] PM, PM10, and PM2.5 emissions have been limited to render 326 IAC 2-2 (PSD) not applicable.

Emission Calculations
Summary of Limited Emissions WITH REVISIONS

Company Name: Progress Rail Manufacturing Corp
Source Address: 3500 S. Cowan Road, Muncie, IN 47302
Permit No.: 035-44165-00089

=changes to the permit

Limited Potential to Emit After Issuance of Part 70 Operating Permit (tons/year)										
Process	**PM**	**PM 10**	**PM 2.5**	**SO2**	**NOx**	**VOC**	**CO**	**Total HAPs**	**Single HAP**	
Spray Booths (PB-01 & PB-02)[1,2]	2.07	2.07	2.07	--	--	32.27	--	23.17	9.90	Xylene
Finishing Spray Booths (PB-04, PB-05, & PB-07)[1,2]	68.25	68.25	68.25	--	--	66.51	--			
Spray Booth (PB-08)[1,2]	0.03	0.03	0.03	--	--	2.83	--			
Pre-wash (PWASH)	--	--	--	--	--	2.06E-03	--	--	--	--
Primary Wash (WASH-1)	--	--	--	--	--	0.08	--	--	--	--
Vacuum Pressure Impregnation (VPI-1) Coating Process	--	--	--	--	--	11.84	--	--	--	--
Hand Wiping Cleaning (WIPE)	--	--	--	--	--	0.75	--	4.87E-03	4.87E-03	Toluene
Welding and Plasma Cutting	3.85	3.85	3.85	--	--	-	--	0.28	negl.	--
Locomotive Component Testing	0.52	0.52	0.52	0.13	8.80	1.32	5.03	negl.	negl.	--
NEW - Engine Testing	0.42	0.42	0.42	1.20	49.80	0.62	7.08	negl.	negl.	--
Shot blaster (SB-01)[3]	65.15	65.15	65.15	--	--	--	--	--	--	--
Fire Suppression Pump Engine	0.10	0.10	0.10	0.09	1.36	0.11	0.29	negl.	negl.	--
Existing Natural Gas-Fired Oven and Heaters	1.16	4.64	4.64	0.37	61.01	3.36	51.25	1.15	1.10	Hexane
Storage Tanks	--	--	--	--	--	0.02	--	--	--	--
Engine-1	1.94	1.94	1.94	1.81	27.32	2.22	5.89	0.02		--
New Natural Gas-fired Combustion Units	0.27	1.09	1.09	0.09	14.39	0.79	12.08	0.27	0.26	Hexane
Dry Ice Blasting Process	9.64	8.29	8.29	--	--	--	--	--	--	--
Washer Units	--	--	--	--	--	2.02	--	--	--	--
WAG Process Line	--	--	--	--	--	0.08	--	--	--	--
CNC router woodworking machine	1.24	1.24	1.24	--	--	--	--	--	--	--
Total	**154.63**	**157.58**	**157.58**	**3.68**	**162.66**	**124.81**	**81.62**	**24.90**	**9.90**	**Xylene**

[1] Total HAP emissions have been limited to render 326 IAC 2-4.1 (Major Source of HAPs) not applicable.
[2] Any single HAP emitted from these processes has been limited to render 326 IAC 2-4.1 (Major Source of HAPs) not applicable.
[3] PM, PM10, and PM2.5 emissions have been limited to render 326 IAC 2-2 (PSD) not applicable.

Appendix A: Emission Calculations
Modification Summary

Company Name: Progress Rail Manufacturing Corp
Source Address: 3500 S. Cowan Road, Muncie, IN 47302
Administrative Amendment No.: 035-44165-00089
Reviewer: Hachem Ismaili Alaoui

Emission Unit	PM	PM10	PM2.5 *	SO_2	NOx	VOC	CO	Total HAPs	Single HAP
CNC router woodworking machine (CNC1	1.24	1.24	1.24	--	--	--	--	--	--

Appendix A: Emissions Calculations
Natural Gas Combustion Only
MM BTU/HR <100
New Natural Gas Combustion Units

Company Name: Progress Rail Manufacturing Corp
Source Address: 3500 S. Cowan Road, Muncie, IN 47302
Administrative Amendment No.: 035-44165-00089
Reviewer: Hachem Ismaili Alaoui

Heat Input Capacity MMBtu/hr	HHV mmBtu / mmscf	Potential Throughput MMCF/yr
33.5	1020	287.7

	Pollutant						
	PM*	PM10*	direct PM2.5*	SO2	NOx	VOC	CO
Emission Factor in lb/MMCF	1.9	7.6	7.6	0.6	100 **see below	5.5	84
Potential Emission in tons/yr	0.27	1.09	1.09	0.09	14.39	0.79	12.08

*PM emission factor is filterable PM only. PM10 emission factor is filterable and condensable PM10 combined.
PM2.5 emission factor is filterable and condensable PM2.5 combined.
**Emission Factors for NOx: Uncontrolled = 100, Low NOx Burner = 50, Low NOx Burners/Flue gas recirculation = 32

Methodology
All emission factors are based on normal firing.
MMBtu = 1,000,000 Btu
MMCF = 1,000,000 Cubic Feet of Gas
Emission Factors are from AP 42, Chapter 1.4, Tables 1.4-1, 1.4-2, 1.4-3, SCC #1-02-006-02, 1-01-006-02, 1-03-006-02, and 1-03-006-03
Potential Throughput (MMCF) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1 MMCF/1,020 MMBtu
Emission (tons/yr) = Throughput (MMCF/yr) x Emission Factor (lb/MMCF)/2,000 lb/ton

Hazardous Air Pollutants (HAPs)

	HAPs - Organics					
	Benzene	Dichlorobenzene	Formaldehyde	Hexane	Toluene	**Total - Organics**
Emission Factor in lb/MMcf	2.1E-03	1.2E-03	7.5E-02	1.8E+00	3.4E-03	
Potential Emission in tons/yr	3.0E-04	1.7E-04	1.1E-02	0.26	4.9E-04	**0.27**

	HAPs - Metals					
	Lead	Cadmium	Chromium	Manganese	Nickel	**Total - Metals**
Emission Factor in lb/MMcf	5.0E-04	1.1E-03	1.4E-03	3.8E-04	2.1E-03	
Potential Emission in tons/yr	7.2E-05	1.6E-04	2.0E-04	5.5E-05	3.0E-04	**7.9E-04**
					Total HAPs	**0.27**
					Worst HAP	**0.26**

Methodology is the same as above.
The five highest organic and metal HAPs emission factors are provided above.
Additional HAPs emission factors are available in AP-42, Chapter 1.4.

Appendix A: Emissions Calculations
Natural Gas Combustion Only
MM BTU/HR <100
Existing Natural Gas Combustion Units

Company Name: Progress Rail Manufacturing Corp
Source Address: 3500 S. Cowan Road, Muncie, IN 47302
Administrative Amendment No.: 035-44165-00089
Reviewer: Hachem Ismaili Alaoui

Heat Input Capacity	HHV	Potential Throughput
MMBtu/hr	mmBtu / mmscf	MMCF/yr
142.07	1020	1220.2

Emission Unit	Heat Input
Existing Heaters	137.57
Three (3) NG	4.50
Total	**142.07**

	Pollutant						
	PM*	PM10*	direct PM2.5*	SO2	NOx	VOC	CO
Emission Factor in lb/MMCF	1.9	7.6	7.6	0.6	100 **see below	5.5	84
Potential Emission in tons/yr	1.16	4.64	4.64	0.37	61.01	3.36	51.25

*PM emission factor is filterable PM only. PM10 emission factor is filterable and condensable PM10 combined.
PM2.5 emission factor is filterable and condensable PM2.5 combined.
**Emission Factors for NOx: Uncontrolled = 100, Low NOx Burner = 50, Low NOx Burners/Flue gas recirculation = 32

Methodology
All emission factors are based on normal firing.
MMBtu = 1,000,000 Btu
MMCF = 1,000,000 Cubic Feet of Gas
Emission Factors are from AP 42, Chapter 1.4, Tables 1.4-1, 1.4-2, 1.4-3, SCC #1-02-006-02, 1-01-006-02, 1-03-006-02, and 1-03-006-03
Potential Throughput (MMCF) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1 MMCF/1,020 MMBtu
Emission (tons/yr) = Throughput (MMCF/yr) x Emission Factor (lb/MMCF)/2,000 lb/ton

Hazardous Air Pollutants (HAPs)

	HAPs - Organics				
	Benzene	Dichlorobenzene	Formaldehyde	Hexane	Toluene
Emission Factor in lb/MMcf	2.1E-03	1.2E-03	7.5E-02	1.8E+00	3.4E-03
Potential Emission in tons/yr	1.281E-03	7.321E-04	4.576E-02	1.098E+00	2.074E-03

	HAPs - Metals				
	Lead	Cadmium	Chromium	Manganese	Nickel
Emission Factor in lb/MMcf	5.0E-04	1.1E-03	1.4E-03	3.8E-04	2.1E-03
Potential Emission in tons/yr	3.050E-04	6.711E-04	8.541E-04	2.318E-04	1.281E-03

Methodology is the same as above.
The five highest organic and metal HAPs emission factors are provided above.
Additional HAPs emission factors are available in AP-42, Chapter 1.4.

Total HAPs =	**1.15**	
Single HAP =	**1.10**	**Hexane**

Appendix A: Emissions Calculations
VOC and Particulate
From Surface Coating Operations

Company Name: Progress Rail Manufacturing Corp
Source Address: 3500 S. Cowan Road, Muncie, IN 47302
Administrative Amendment No.: 035-44165-00089
Reviewer: Hachem Ismaili Alaoui

Material	Gal of Mat. (gal/unit)	Maximum (unit/hour)*	Pounds VOC per gallon of coating	Potential VOC (lbs per hour)	Potential VOC (lbs per day)	Potential VOC (tons per year)	Uncontrolled Particulate Potential (ton/yr)	Controlled Particulate Potential (ton/yr)	lb solids/gal	Transfer Efficiency	Control Efficiency
Spray Booth (PB-01)											
CX7236J Black Primer	34.0	0.057	3.24	6.29	150.90	27.54	33.75	1.69	7.94	50%	95%
CX7274 Beige Primer	34.0	0.057	3.16	6.13	147.18	26.86	35.15	1.76	8.27	50%	95%
HSL917954Q with GXH1080 Hardener	34.0	0.057	3.46	6.71	161.15	29.41	19.64	0.98	4.62	50%	95%
HSC3007 Clearcoat with GXH1080 Hardener	34.0	0.057	2.97	5.76	138.33	25.25	22.27	1.11	5.24	50%	95%
9815 Epoxy Polyamide Primer Console Brown	34.0	0.057	3.14	6.09	146.25	26.69	36.89	1.84	8.68	50%	95%
SEP71294B Beige Epoxy Primer with GXM71295B	34.0	0.057	3.20	6.21	149.04	27.20	24.57	1.23	5.78	50%	95%
Spray Booth (PB-02)											
ALKYD Black Primer	3.0	0.057	2.30	0.39	9.45	1.73	3.98	0.20	10.60	50%	95%
Polyu Black	3.0	0.057	3.81	0.65	15.66	2.86	3.07	0.15	8.18	50%	95%
Urethane Hardener	3.0	0.057	1.83	0.31	7.52	1.37	3.45	0.17	9.20	50%	95%
TUFCOTE 3.3	3.0	0.057	3.30	0.57	13.56	2.48	4.45	0.22	11.87	50%	95%
IMRON 2.1 High Gloss	3.0	0.057	2.08	0.36	8.55	1.56	3.74	0.19	9.97	50%	95%
Activator	3.0	0.057	0.00	0.00	0.00	0.00	3.54	0.18	9.43	50%	95%
Finishing Spray Booths (PB-04, PB-05, & PB-07)											
Primer Coriar 2.8	60.0	0.057	2.91	9.97	239.18	43.65	63.00	3.15	8.4	50%	95%
Colors Imron	60.0	0.057	1.65	5.65	135.62	24.75	68.25	3.41	9.10	50%	95%
Black Fast Dry	60.0	0.057	3.49	11.95	286.85	52.35	43.50	2.18	5.80	50%	95%
Suede Grey	60.0	0.057	3.49	11.95	286.85	52.35	54.00	2.70	7.20	50%	95%
Imron 3.5 Clear	60.0	0.057	3.43	11.75	281.92	51.45	36.75	1.84	4.90	50%	95%
Lacquer Thinner (Cleanup)	8.0	0.057	7.08	3.23	77.59	14.16	0.00	0.00	0.00	100%	95%

Total Emissions from Spray Booths (PB-01 & PB02)**	**32.27**	**41.34**	**2.07**
Total Emissions from Finishing Spray Booths (PB-04, PB-05, & PB-07)**	**66.51**	**68.25**	**3.41**

Note
*Maximum capacity is 500 locomotives a year.

Methodology
Pounds of VOC per Gallon Coating and Pounds VOC per Gallons of Solids provided by source and is "as applied."
Potential VOC Pounds per Hour = Pounds of VOC per Gallon coating (lb/gal) * Gal of Material (gal/unit) * Maximum (units/hr)
Potential VOC Pounds per Day = Pounds of VOC per Gallon coating (lb/gal) * Gal of Material (gal/unit) * Maximum (units/hr) * (24 hr/day)
Potential VOC Tons per Year = Pounds of VOC per Gallon coating (lb/gal) * Gal of Material (gal/unit) * Maximum (units/hr) * (8760 hr/yr) * (1 ton/2000 lbs)
Uncontrolled Particulate Potential Tons per Year = (units/hour) * (gal/unit) * lb solids/gal * (1-Transfer efficiency) * (8760 hrs/yr) * (1 ton/2000 lbs)
Controlled Particulate Potential Tons per Year = (units/hour) * (gal/unit) * lb solids/gal * (1-Transfer efficiency) * (1-Control efficiency) * (8760 hrs/yr) * (1 ton/2000 lbs)
**Total = Worst Coating + Sum of all solvents used

Appendix A: Emission Calculations
HAP Emission Calculations

Company Name: Progress Rail Manufacturing Corp
Source Address: 3500 S. Cowan Road, Muncie, IN 47302
Administrative Amendment No.: 035-44165-00089
Reviewer: Hachem Ismaili Alaoui

Material	Gallons of Material (gal/unit)	Maximum* (unit/hour)	Xylene Content (lb/gal)	Toluene Content (lb/gal)	Cumene Content (lb/gal)	Ethyl Benzene Content (lb/gal)	HDI Content (lb/gal)	Methanol Content (lb/gal)	MMA Content (lb/gal)	Xylene Emissions (ton/yr)	Toluene Emissions (ton/yr)	Cumene Emissions (ton/yr)	Ethyl Benzene Emissions (ton/yr)	HDI Emissions (ton/yr)	Methanol Emissions (ton/yr)	MMA Emissions (ton/yr)
Spray Booth (PB-01)																
CX7236J Black Primer	34.0	0.057	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.51	0.51	0.00	0.00	0.00	0.00	0.00
CX7274 Beige Primer	34.0	0.057	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.51	0.51	0.00	0.00	0.00	0.00	0.00
HSL917954Q with GXH1080 Hardener	34.0	0.057	0.05	0.00	0.00	0.00	0.05	0.00	0.05	0.43	0.00	0.00	0.00	0.43	0.00	0.43
HSC3007 Clearcoat with GXH1080 Hardener	34.0	0.057	0.25	0.00	0.00	0.05	0.05	0.00	0.00	2.13	0.00	0.00	0.43	0.43	0.00	0.00
8815 Epoxy Polyamide Primer Console Brown	34.0	0.057	0.36	0.00	0.00	0.35	0.00	0.00	0.00	3.06	0.00	0.00	2.98	0.00	0.00	0.00
SEP71294B Beige Epoxy Primer with GXM71295B	34.0	0.057	0.21	0.00	0.00	0.05	0.00	0.00	0.00	1.79	0.00	0.00	0.43	0.00	0.00	0.00
Spray Booth (PB-02)																
CX7236J Black Primer	3.0	0.057	1.00	1.00	0.00	0.00	0.00	0.00	1.00	0.75	0.75	0.00	0.00	0.00	0.00	0.75
High Gloss Polyurethane - Black	3.0	0.057	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00
GXH1080 Hardener	3.0	0.057	0.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.75	0.00	0.75	0.00	0.00
Tufcote 3.3	3.0	0.057	3.00	0.00	0.00	0.60	0.00	0.00	0.00	2.25	0.00	0.00	0.45	0.00	0.00	0.00
Imron 2.1 High Gloss	3.0	0.057	5.00	0.00	0.00	1.00	0.00	0.00	0.00	3.75	0.00	0.00	0.75	0.00	0.00	0.00
Activator	3.0	0.057	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Finishing Spray Booths (PB-04, PB-05, & PB-07)																
Primer Coriar 2.8	60.0	0.057	0.02	0.49	0.02	0.00	0.00	0.00	0.00	0.24	7.35	0.24	0.00	0.00	0.00	0.00
Colors Imron	60.0	0.057	0.29	0.06	0.00	0.37	0.00	0.00	0.00	4.35	0.90	0.00	5.55	0.00	0.00	0.00
Black Fast Dry	60.0	0.057	1.85	0.00	0.00	0.46	0.00	0.00	0.00	27.75	0.00	0.00	6.90	0.00	0.00	0.00
Suede Grey	60.0	0.057	0.68	0.39	0.00	0.16	0.00	0.00	0.00	10.20	5.85	0.00	2.40	0.00	0.00	0.00
Imron 3.5 Clear	60.0	0.057	0.086	0.29	0.00	0.03	0.00	0.00	0.00	1.29	4.35	0.00	0.38	0.03	0.00	0.00
Lacquer Thinner (Cleanup)	8.0	0.057	0.00	4.20	0.00	0.00	0.00	2.83	0.00	0.00	8.40	0.00	0.00	0.00	5.66	0.00
									Total Emissions from Spray Booths (PB-01 & PB02)**	**3.75**	**0.75**	**0.75**	**2.98**	**0.75**	**0.00**	**0.75**
									Total Emissions from Finishing Spray Booths (PB-04, PB-05, & PB-07)**	**27.75**	**15.75**	**0.24**	**6.90**	**0.03**	**5.66**	**0.00**

Note
*Maximum capacity is 500 locomotives a year.

Methodology
HDI = Hexamethylene-1,6-diisocyanate
MMA = Methyl methacrylate
HAPs emission rate (tons/yr) = Gal of Material (gal/unit) * Maximum (unit/hr) * HAP Content (lb/gal) * 8760 hrs/yr * 1 ton/2000 lbs
**Total = Worst Coating + Sum of all solvents used

Appendix A: Emissions Calculations
VOC and Particulate
From Surface Coating Operations (PB-08)

Company Name: Progress Rail Manufacturing Corp
Source Address: 3500 S. Cowan Road, Muncie, IN 47302
Administrative Amendment No.: 035-44165-00089
Reviewer: Hachem Ismaili Alaoui

Material	Density (Lb/Gal)	Weight % Volatile (H20 & Organics)	Weight % Water	Weight % Organics**	Volume % Water	Volume % Non-Volatiles (solids)	Gal of Mat. (gal/unit)	Maximum (unit/day)	Pounds VOC per gallon of coating	Potential VOC (pounds per hour)**	Potential VOC (pounds per day)**	Potential VOC(tons per year)**	Uncontrolled Particulate Potential (ton/yr)***	Controlled Particulate Potential (ton/yr)	lb VOC/gal solids	Transfer Efficiency	Control Efficiency
Red Antifungal (As Applied)*	8.64	64.07%	0.00%	64.07%	0.00%	0.00%	0.28	10.00	5.53	0.65	15.50	2.83	0.63	0.03	NA	60%	95%
Black Anticorrosion	8.50	60.52%	40.52%	20.00%	0.00%	42.00%	0.28	10.00	1.70	0.20	4.76	0.87	0.69	0.03	NA	60%	95%
											Total Emissions	**2.83**	**0.63**	**0.03**			

* Red antifungal coating is thinned with xylene. As applied values provided by source.
*This coating contains 64.07% xylene, which is a HAP. Therefore, the single HAP (xylene) emissions are equal to the VOC emissions.
***Assumes PM10 and PM2.5 are equal to PM.

Methodology
Pounds of VOC per Gallon Coating = (Density (lb/gal) * Weight % Organics) 8.5345821
Potential VOC Pounds per Hour = Pounds of VOC per Gallon coating (lb/gal) * Gal of Material (gal/unit) * Maximum (units/day) / 24 (hr/day)
Potential VOC Pounds per Day = Pounds of VOC per Gallon coating (lb/gal) * Gal of Material (gal/unit) * Maximum (units/day)
Potential VOC Tons per Year = Pounds of VOC per Gallon coating (lb/gal) * Gal of Material (gal/unit) * Maximum (units/day) * 365 (day/yr) * (1 ton/2000 lbs)
Particulate Potential Tons per Year = (units/hour) * (gal/unit) * (lbs/gal) * (1- Weight % Volatiles) * (1-Transfer efficiency) * (8760 hrs/yr) *(1 ton/2000 lbs)
Controlled Particulate Potential Tons per Year = Uncontrolled Particulate Potential (tons/yr) * (1- CE (%))

Appendix A: Emissions Calculations
VOC
From Vacuum Pressure Impregnation (VP-1)

Company Name: Progress Rail Manufacturing Corp
Source Address: 3500 S. Cowan Road, Muncie, IN 47302
Administrative Amendment No.: 035-44165-00089
Reviewer: Hachem Ismaili Alaoui

Material	Gal of Mat. (gal/unit)	Maximum (unit/day)	Pounds VOC per gallon of coating	Potential VOC (pounds per hour)	Potential VOC (pounds per day)	Potential VOC (tons per year)	Uncontrolled Particulate Potential (ton/yr)	lb solids/gal	Transfer Efficiency
Resin (Sterling PB 302-LV-2) - AC Stator	5.00	10.00	1.10	2.29	55.00	10.04	0.00	0.00	100%
Resin (Sterling PB 302-LV-2) - DC Armatures	0.75	12.00	1.10	0.41	9.90	1.81	0.00	0.00	100%
					Total Emissions	**11.84**	**0.00**		

Methodology
Potential VOC Pounds per Hour = Pounds of VOC per Gallon coating (lb/gal) * Gal of Material (gal/unit) * Maximum (units/day) / 24 (hr/day)
Potential VOC Pounds per Day = Pounds of VOC per Gallon coating (lb/gal) * Gal of Material (gal/unit) * Maximum (units/day)
Potential VOC Tons per Year = Pounds of VOC per Gallon coating (lb/gal) * Gal of Material (gal/unit) * Maximum (units/day) * 365 (day/yr) * (1 ton/2000 lbs)
Uncontrolled Particulate Potential Tons per Year = (units/day) * (gal/unit) * lb solids/gal * (1-Transfer efficiency) * 365 (day/yr) * (1 ton/2000 lbs)

Appendix A: Emission Calculations
VOC Emissions from Pre-Wash Booth

Company Name: Progress Rail Manufacturing Corp
Source Address: 3500 S. Cowan Road, Muncie, IN 47302
Administrative Amendment No.: 035-44165-00089
Reviewer: Hachem Ismaili Alaoui

PRE-WASH (PWASH) WORST CASE EMISSIONS (trivial activity)			
The purpose of this table is to estimate the VOC emission from the pre-wash process (PWASH) using a method from a risk management program guidance document to estimate uncontrolled emissions from uncontrolled evaporation from a pool of liquid.			
PARAMETER	VALUE	UNIT	NOTE
Wash concentrate	Biosol		MSDS included in application
VOC in concentrate	11	% by wt	Provided by Progress Rail
Solution Diluted with	water		Concentrate is diluted with water prior to use
Dilution Ratio	0.18	parts concentrate per part of diluted solution	4.5:1, water: concentrate
VOC in wash solution (as applied)	2.00	%	After diluting with water
Calculate vapor pressure of diluted wash solution			
Molecular weight VOC	174.10	g/gmol	DBE is composed of three compounds ranging from 146.1 to 174.1 g/gmol
Molecular weight Water	18.02	g/gmol	Periodic table
Mass % of VOC	2.00	%	Used to calculate Mole Fraction
Mass % of water	98.00	%	Used to calculate Mole Fraction
Mole Fraction VOC (Xp)	0.0021		Equation B-4
Vapor Pressure of Pure VOC (VPp)	0.10	mm Hg @ 20°C	Provided by Progress Rail
Partial Pressure of VOC in Mixture (VPm)	0.0002	mm Hg @ 20°C	Equation B-6
Estimate evaporation rate of VOC			
Wind Speed (U)	1.00	m/s	Located indoors, assume low wind speed.
Molecular weight (MW)	174.10	g/gmol	Three components range from 146.1 to 174.1
Surface Area (A)	100.00	square feet	Assume area is 10 ft x 10 ft
Vapor Pressure (VP)	0.0002	mm Hg @ 20°C	From calculation above
Temperature (T)	293.00	K	Solution not heated, assume ambient
Evaporation Rate (QR)	0.00001	lb/min	Equation B-7
Hourly Emission	0.0005	lb/hr	(QR) * 60 min/hr
Daily Emission	0.0113	lb/day	Assume 24 hours per day
Annual Emission	0.0021	tpy	Assume 8760 hours per year

Equation B-4 → $Xr = (Wr / MWr) / \sum (Wi / Mwi)$

Where:
Wr = weight regulated VOC
MW = molecular weight of VOC
Wi & Mwi are the sum of individual weights divided by MW's

Equation B-6 → $VPm = (Xp) * (VPp)$

Equation B-7 → $(0.0035 * (U^{0.78}) * (MW^{0.67}) * A * VP) / T$

U = Wind Speed (since this process is indoors and covered, assume a low wind speed of 1.0 m/s
MW = Molecular weight
A = Area of exposed surface (this is assumed for this calculation)
VP = Vapor Pressure of compound
T = Temperature of liquid

Equation B-4, B-6, B-7 Reference → Risk Management Program Guidance for Offsite Consequence Analysis, U.S. EPA, April 1999.

This calculation is a worst case scenario and is only provided to demonstrate that the unit emits less than 1 lb/day to qualify as a trivial activity under 326 IAC 2-7-1(42)(C)(ii).

Appendix A: Emission Calculations
VOC Content of Wash Solutions in Primary Wash (Wash-1)

Company Name: Progress Rail Manufacturing Corp
Source Address: 3500 S. Cowan Road, Muncie, IN 47302
Administrative Amendment No.: 035-44165-00089
Reviewer: Hachem Ismaili Alaoui

VOC CONTENT OF WASH SOLUTIONS			
The purpose of this table is to determine the VOC % in each of the three wash stages in the main wash process (WASH-1).			
PARAMETER	WASH STAGE 1	WASH STAGE 2	WASH STAGE 3
Total Volume (gal)	1,400	700	700
Volume of Biogras A10 (gal)	53		
Volume of Antirust (gal)		79	79
Volume of Water (gal)	1,347	621	621
VOC Content of Biogras A10 (undiluted) (gal)	13%		
VOC Content of Antirust (undiluted) (gal)		3%	3%
Density of Water (lb/gal)	8.35	8.35	8.35
Density of Biogras A10 (undiluted) (lb/gal)	8.76		
Density of Antirust (undiluted) (lb/gal)		8.76	8.76
VOC Mass in wash solution (lb)	60.37	20.77	20.77
Total Mass of wash solution (lb)	11,705.68	5,874.74	5,874.74
VOC in wash solution (by wt)	0.52%	0.35%	0.35%

Because the wash solutions contain less than 1% VOC, the WASH-1 unit is not subject to "Organic Solvent Degreasing Operations" specified under 326 IAC 8-3-2 through 8-3-4.

Appendix A: Emission Calculations
VOC Emissions from Primary Wash (Wash-1)

Company Name: Progress Rail Manufacturing Corp
Source Address: 3500 S. Cowan Road, Muncie, IN 47302
Administrative Amendment No.: 035-44165-00089
Reviewer: Hachem Ismaili Alaoui

MAIN WASH [WASH-1] WORST CASE EMISSIONS (trivial activity)			
The purpose of this table is to estimate worst case emissions from the main wash process (WASH-1) using a method from a risk management program guidance document to estimate uncontrolled emissions from uncontrolled evaporation from a pool of liquid.			
The wash process uses 3 tanks; 1 tank contains Biogras A10 diluted with water and the other two identical tanks contain antirust diluted with water. These calculations estimate the evaporation rate of each VOC in the solutions.			
Wash Cycle 1 (1,400 gallon tank with Biogras A10 solution)			
DIBASIC ESTER (DBE) EMISSIONS FROM WASH CYCLE 1			
PARAMETER	VALUE	UNIT	NOTE
Wash concentrate	Biogras A10		MSDS included in application
DBE in Concentrate	11	% by wt	See MSDS
Solution Diluted with	water		Concentrate is diluted with water prior to use
Dilution Ratio	0.04	parts concentrate per part of diluted solution (by vol)	53 gal Biogras A10:1400 gal diluted solution
VOC in wash solution (as applied)	0.42	% by wt	After diluting with water, assume concentrate has similar density to water and that wt% = vol%
Determine Vapor Pressure of Pure VOC			
Vapor Pressure of Pure VOC (VP1)	0.13	mm Hg @ 20°C	Information from Invista Intermediates, mixtures of DBE without methanol range from 0.01 to 0.13 mm Hg @ 20°C
Use Clausious Clapyron Equation to find Vapor Pressure of Pure VOC at solution temperature			
Heat of Vaporization (ΔHv)	61,958	J/mol	Heat of vaporization for different DBE mixtures range from 79 to 85 cal/g; choose highest (85 cal/g).
Gas Constant (R)	8.3145	J/mol-K	Gas constant
Solution Temperature (T2)	355	K	Provided by Progress Rail (180°F)
Reference Temperature (T1)	293	K	Reference temperature
Vapor Pressure of Pure VOC at T2 (VP2)	11.04065	mm Hg @ T2	Clausious Clapyron Equation
Find Partial Pressure of VOC in Diluted Solution			
Molecular weight VOC	174.10	g/gmol	DBE is composed of three compounds ranging from 146.1 to 174.1 g/gmol
Molecular weight Water	18.02	g/gmol	Periodic table
Mass % of VOC	0.42	%	Used to calculate Mole Fraction
Mass % of water	99.58	%	Used to calculate Mole Fraction
Mole Fraction VOC (Xp)	0.0004	mol VOC/mol solution	Equation B-4
Partial Pressure of VOC in Mixture (VPm)	0.00478	mm Hg @ T2	Equation B-6
Estimate evaporation rate of VOC			
Wind Speed (U)	1.00	m/s	Located indoors, vented, assume low wind speed.
Molecular weight (MW)	174.10	g/gmol	Three components range from 146.1 to 174.1
Surface Area (A)	50.00	square feet	Assumes that tank has this much exposed area.
Vapor Pressure (VP)	0.00478	mm Hg @ T2	From calculation above
Temperature (T)	355	K	Solution heated to no more than 180°F
Evaporation Rate (QR)	7.34E-05	lb/min	Equation B-7
Hourly Emission	0.0044	lb/hr	(QR) * 60 min/hr
Daily Emission	0.1057	lb/day	Assume 24 hours per day
Annual Emission	0.0193	tpy	Assume 8760 hours per year

Appendix A: Emission Calculations
VOC Emissions from Primary Wash (Wash-1)
Continued

2-BUTOXYETHANOL (2BE) EMISSIONS FROM WASH CYCLE 1			
PARAMETER	VALUE	UNIT	NOTE
Wash concentrate	Biogras A10		MSDS Included
2BE in Concentrate	10	% by wt	See MSDS
Solution Diluted with	water		Concentrate is diluted with water prior to use
Dilution Ratio	0.04	parts concentrate per part of diluted solution (by vol)	53 gal Biogras A10:1400 gal diluted solution
VOC in wash solution (as applied)	0.38	% by wt	After diluting with water, assume concentrate has similar density to water and that wt% = vol%
Determine Vapor Pressure of Pure VOC			
Vapor Pressure of Pure VOC (VP1)	0.88	mm Hg @ 25°C	Information from EPA
Use Clausious Clapyron Equation to find Vapor Pressure of Pure VOC at solution temperature			
Heat of Vaporization (ΔHv)	47,100	J/mol	Heat of vaporization for different DBE mixtures range from 79 to 85 cal/g; choose highest (85 cal/g).
Gas Constant (R)	8.3145	J/mol-K	Gas constant
Solution Temperature (T2)	355	K	Provided by Progress Rail (180°F)
Reference Temperature (T1)	298.00	K	Reference temperature
Vapor Pressure of Pure VOC at T2 (VP2)	18.62	mm Hg @ T2	Clausious Clapyron Equation
Find Partial Pressure of VOC in Diluted Solution			
Molecular weight VOC	118.17	g/gmol	Periodic table
Molecular weight Water	18.02	g/gmol	Periodic table
Mass % of VOC	0.38	%	Used to calculate Mole Fraction
Mass % of water	99.62	%	Used to calculate Mole Fraction
Mole Fraction VOC (Xp)	0.0006	mol VOC/mol solution	Equation B-4
Partial Pressure of VOC in Mixture (VPm)	0.01079	mm Hg @ T2	Equation B-6
Estimate evaporation rate of VOC			
Wind Speed (U)	1.00	m/s	Located indoors, vented, assume low wind speed.
Molecular weight (MW)	118.17	g/gmol	Periodic table
Surface Area (A)	50.00	square feet	Assumes that tank has this much exposed area.
Vapor Pressure (VP)	0.01079	mm Hg @ T2	From calculation above
Temperature (T)	293	K	Solution heated to no more than 180°F
Evaporation Rate (QR)	1.55E-04	lb/min	Equation B-7
Hourly Emission	0.0093	lb/hr	(QR) * 60 min/hr
Daily Emission	0.2234	lb/day	Assume 24 hours per day
Annual Emission	0.0408	tpy	Assume 8760 hours per year

Appendix A: Emission Calculations
VOC Emissions from Primary Wash (Wash-1)
Continued

DIBASIC ESTER (DBE) EMISSIONS FROM WASH CYCLES 2 & 3			
PARAMETER	VALUE	UNIT	NOTE
Wash concentrate	Antirust		MSDS Included
DBE in Concentrate	3	% by wt	Information provided by Progress Rail
Solution Diluted with	water		Concentrate is diluted with water prior to use
Dilution Ratio	0.11	parts concentrate per part of diluted solution (by vol)	79 gal Antirust:700 gal diluted solution
VOC in wash solution (as applied)	0.34	% by wt	After diluting with water, assume concentrate has similar density to water and that wt% = vol%
Determine Vapor Pressure of Pure VOC			
Vapor Pressure of Pure VOC (VP1)	0.13	mm Hg @ 20°C	Information from Invista Intermediates, mixtures of DBE without methanol range from 0.01 to 0.13 mm Hg @ 20°C
Use Clausious Clapyron Equation to find Vapor Pressure of Pure VOC at solution temperature			
Heat of Vaporization (ΔHv)	61,958	J/mol	Heat of vaporization for different DBE mixtures range from 79 to 85 cal/g; choose highest (85 cal/g).
Gas Constant (R)	8.3145	J/mol-K	Gas constant
Solution Temperature (T2)	355	K	Provided by Progress Rail (180°F)
Reference Temperature (T1)	293	K	Reference temperature
Vapor Pressure of Pure VOC at T2 (VP2)	11.04065	mm Hg @ T2	Clausious Clapyron Equation
Find Partial Pressure of VOC in Diluted Solution			
Molecular weight VOC	174.10	g/gmol	DBE is composed of three compounds ranging from 146.1 to 174.1 g/gmol
Molecular weight Water	18.02	g/gmol	Periodic table
Mass % of VOC	0.34	%	Used to calculate Mole Fraction
Mass % of water	99.66	%	Used to calculate Mole Fraction
Mole Fraction VOC (Xp)	0.0004	mol VOC/mol solution	Equation B-4
Partial Pressure of VOC in Mixture (VPm)	0.00388	mm Hg @ T2	Equation B-6
Estimate evaporation rate of VOC			
Wind Speed (U)	1.00	m/s	Located indoors, vented, assume low wind speed.
Molecular weight (MW)	174.10	g/gmol	Three components range from 146.1 to 174.1
Surface Area (A)	50.00	square feet	Assumes that both tanks combined have this much exposed area.
Vapor Pressure (VP)	0.00388	mm Hg @ T2	From calculation above
Temperature (T)	355	K	Solution heated to no more than 180°F
Evaporation Rate (QR)	5.96E-05	lb/min	Equation B-7
Hourly Emission	0.0036	lb/hr	(QR) * 60 min/hr
Daily Emission	0.0859	lb/day	Assume 24 hours per day
Annual Emission	0.0157	tpy	Assume 8760 hours per year

Appendix A: Emission Calculations
VOC Emissions from Primary Wash (Wash-1)
Continued

TOTAL VOC EMISSION FROM WASH CYCLES 1, 2, & 3			
DBE Emission	0.0080	lb/hr	Sum of calculations above
2BE Emission	0.0093	lb/hr	Sum of calculations above
Total VOC Emission	0.0173	lb/hr	Sum of calculations above
DBE Emission	0.1916	lb/day	Sum of calculations above
2BE Emission	0.2234	lb/day	Sum of calculations above
Total VOC Emission	0.4150	lb/day	Sum of calculations above
DBE Emission	0.0350	tpy	Sum of calculations above
2BE Emission	0.0408	tpy	Sum of calculations above
Total VOC Emission	0.0757	tpy	Sum of calculations above

Clausious Clapyron → $ln\left(\frac{VP1}{VP2}\right) \quad \frac{\Delta Hv}{R}\left(\frac{1}{T2}-\frac{1}{T1}\right)$

VP1 = Vapor Pressure @ T1
VP2 = Vapor Pressure @ T2
ΔHv = Heat of vaporization
R = Gas Constant
T1, T2 = Temperatures

Equation B-4 → Xr = (Wr / MWr) / ∑ (Wi / Mwi)

Wr = weight regulated VOC
MW = molecular weight of VOC
Wi & MWi are the sum of individual weights divided by MW's

Equation B-6 → VPm = Xr * VP2

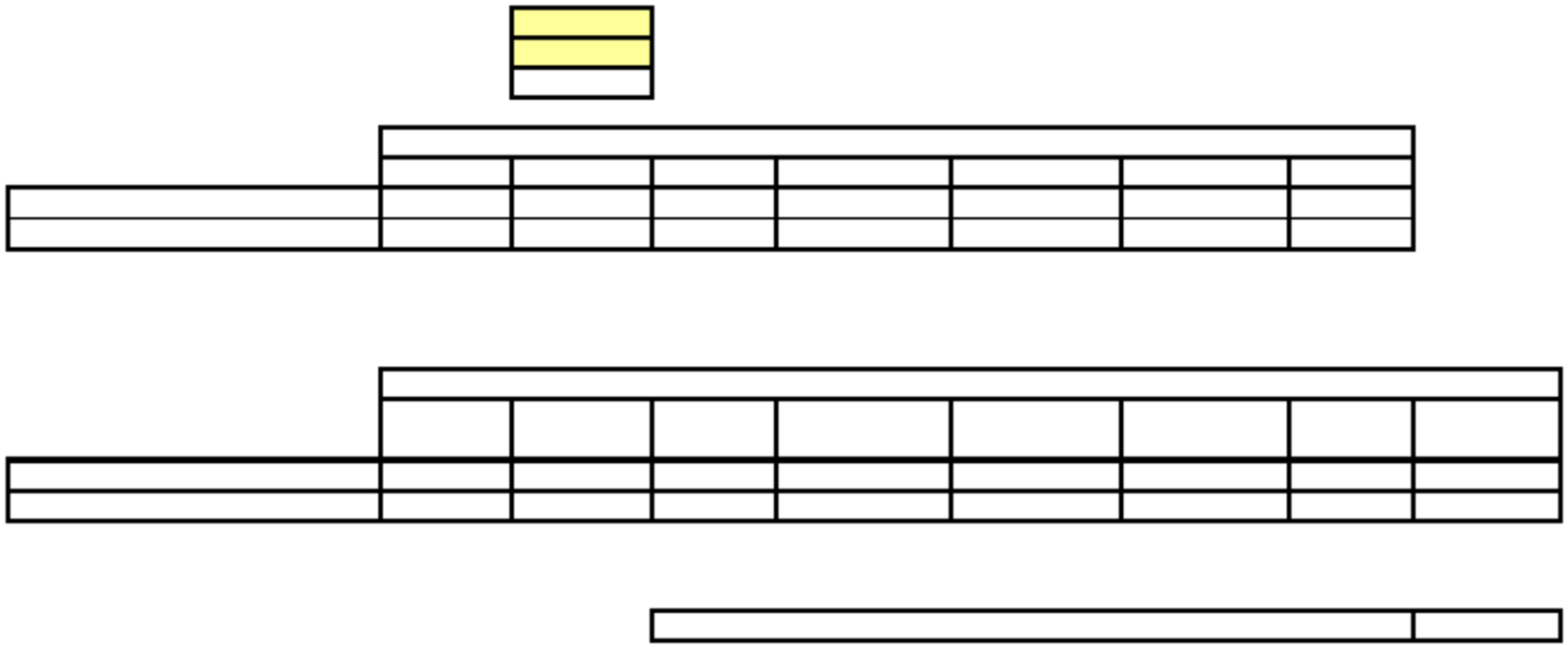
VPm = Vapor Pressure of compound in dilute solution
Xr = Mole fraction of compound
VP2 = Vapor Pressure of pure compound

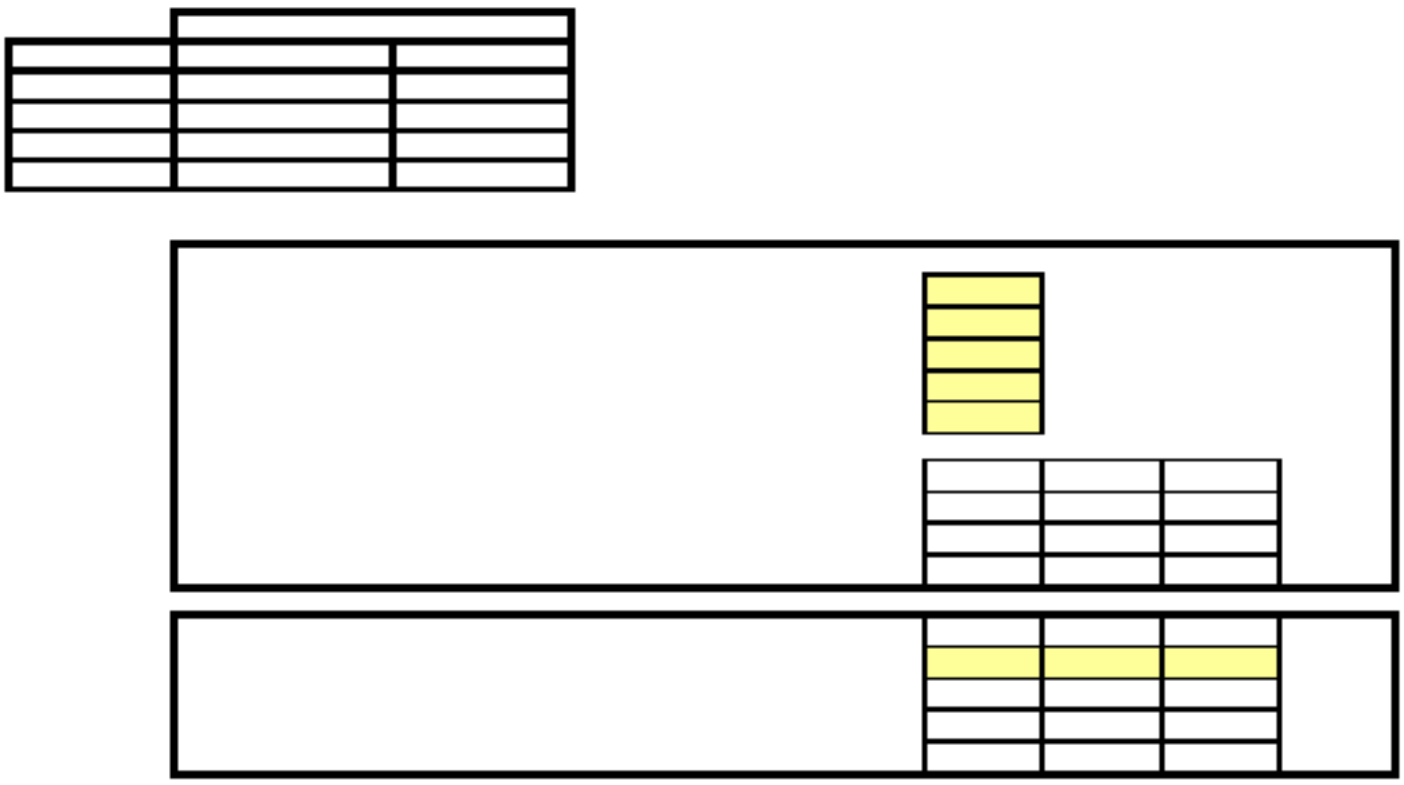
Equation B-7 → $(0.284 * (U^{0.78}) * (MW^{0.67}) * A * VP) / (82.05 * T)$

U = Wind Speed (since this process is indoors and covered, assume a low wind speed of 1.0 m/s
MW = Molecular weight
A = Area of exposed surface (this is assumed for this calculation)
VP = Vapor Pressure of compound
T = Temperature of liquid

Equation B-7 Reference: Risk Management Program Guidance for Offsite Consequence Analysis, U.S. EPA, April 1999.

NOTE: This calculation is a worst case scenario and is only provided to demonstrate that the unit emits less than 1 lb VOC/day and qualifies for classification as a trivial activity. Biogras A 10 contains 2-buyoxyethanol which is a glycol ether but is not a HAP.



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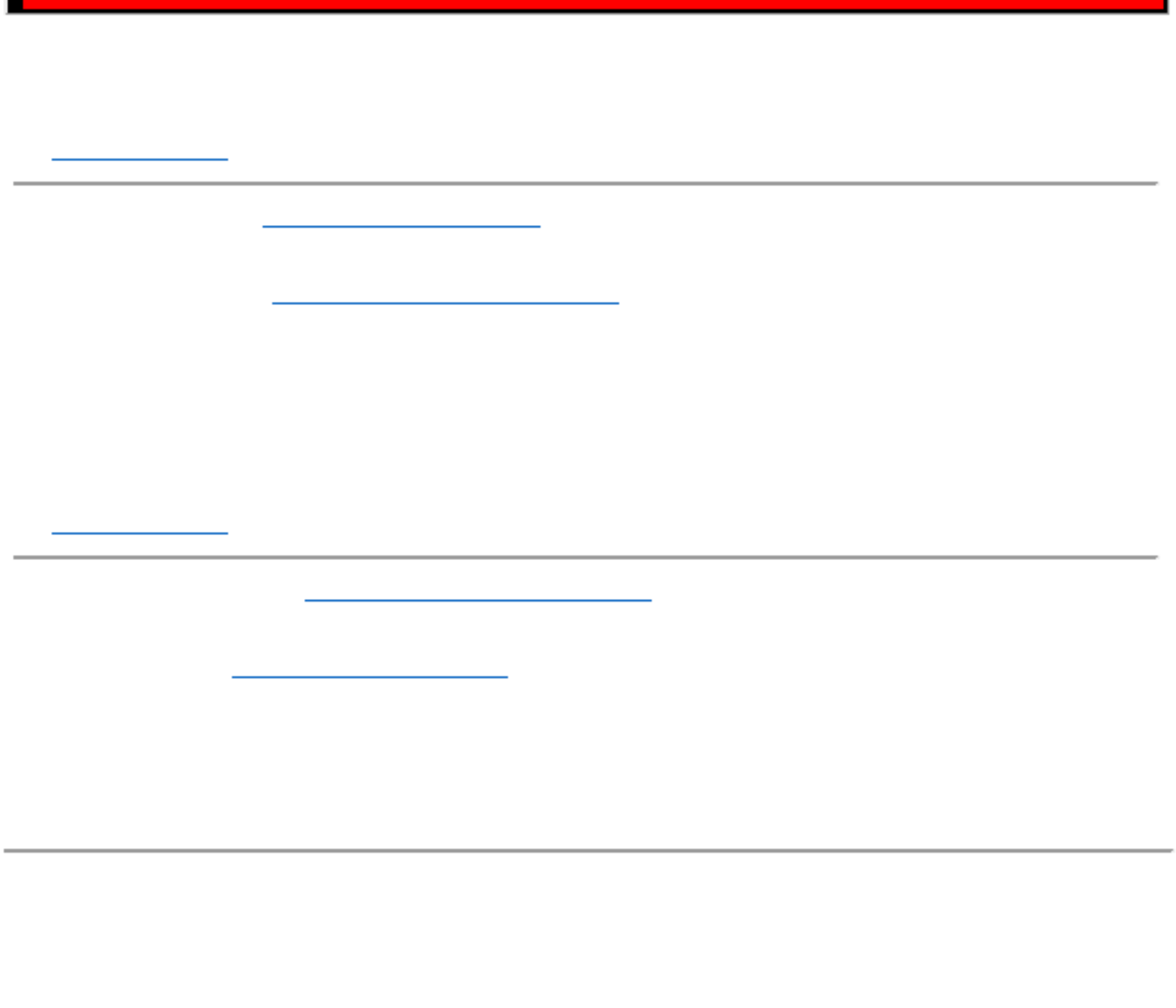

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