An emissions inventory generally reflects either the “actual” or “potential” emissions from a source. Actual emissions generally represent a specific period of time and are based on actual operation and controls. Potential emissions, referred to as potential to emit (PTE), generally represent the maximum capacity of a source to emit a pollutant under its physical and operational design, taking into consideration regulatory restrictions, but only required control devices. PTE is often used to determine applicability to several EPA programs, including Title V, PSD and CAA Section 112 MACT.

The equation below represents the general technique for estimating emissions (in tons per year or “tpy”) from each emission unit at the facility. Emissions are calculated by multiplying an emission factor by an operational parameter. To estimate actual emissions, the permittee will need to track the actual operational rates. Note that emission factors may be improved over time.

\[ E = EF \times OP \times K \]

Where:
- \( E \) = pollutant emissions in tons per year (tpy)
- \( EF \) = emission factor
- \( OP \) = operational rate (or capacity for PTE)
- \( K = 1 \text{ ton}/2000 \text{ lbs. for conversion from pounds per year to tpy} \)

**TSD Appendix - Table of Contents**

- **Emission Unit:** Paint Booth *EU-1-PB* ................................................................. TSD Appendix - Page 2
- **Emission Unit:** Plasma Cutting Table *EU-2-PCT* (installed 2014) .................. TSD Appendix - Page 4
- **Emission Unit:** Shot Blast Machine *EU-3-SBM* .................................................. TSD Appendix - Page 6
- **Emission Unit:** Parts Washer *EU-4-PW* ............................................................ TSD Appendix - Page 7
- **Emission Unit:** Welding- Gas Metal Arc Welding (GMAW) *EU-5-GMAW* .......... TSD Appendix - Page 8
- **Emission Unit:** Welding- Flux Cored Arc Welding (FCAW) *EU-6-FCAW* .......... TSD Appendix - Page 8
- **Emission Unit:** Fabrication Machine 1 – with Plasma Torch *EU-7-FM1* ........ TSD Appendix - Page 9
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- **Emission Units:** Makeup Air Combustion Units 1 and 2 ***EXEMPT*** ........ TSD Appendix - Page 11

**SUMMARY OF FACILITY-WIDE ANNUAL EMISSIONS** ........................................................................ TSD Appendix - Page 12
Emission Unit: Paint Booth EU-1-PB

Activity: Primer, Top Coat & Solvent Application
Type of Coating Sprayer: HPLV Guns
Maximum Hourly Paint Use: 21 gals./hour
Maximum Yearly Paint Use: 183,960 gals./year (21 gals./hour x 8760 hours/year)

Uncontrolled PTE Emissions inventory for Spray Paint Booth

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Uncontrolled Emission Factor (lb./gal)</th>
<th>Maximum Operation (gallons/year)</th>
<th>Uncontrolled PTE (tons per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM</td>
<td>1.145</td>
<td>183,960</td>
<td>105.3</td>
</tr>
<tr>
<td>PM_{10}</td>
<td>1.145</td>
<td>183,960</td>
<td>105.3</td>
</tr>
<tr>
<td>PM_{2.5}</td>
<td>1.145</td>
<td>183,960</td>
<td>105.3</td>
</tr>
<tr>
<td>VOC</td>
<td>5.65</td>
<td>183,960</td>
<td>519.7</td>
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<tr>
<td>Xylene</td>
<td>3.03</td>
<td>183,960</td>
<td>278.7</td>
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<tr>
<td>Ethyl benzene</td>
<td>0.510</td>
<td>183,960</td>
<td>46.91</td>
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<tr>
<td>Toluene</td>
<td>0.291</td>
<td>183,960</td>
<td>26.77</td>
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<tr>
<td>Naphthalene</td>
<td>0.249</td>
<td>183,960</td>
<td>22.90</td>
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<tr>
<td>Hexane</td>
<td>0.176</td>
<td>183,960</td>
<td>16.19</td>
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<tr>
<td>Methanol</td>
<td>0.141</td>
<td>183,960</td>
<td>12.93</td>
</tr>
<tr>
<td>Total HAP</td>
<td>4.40</td>
<td>183,960</td>
<td>404.4</td>
</tr>
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</table>

Uncontrolled Emissions Factor References

PM Average of highest Solids weights for Primer, Top Coat and Solvent used per data received in 2013:
QAP 581 (Primer) + Q900BL413 Jet Blue Polyurethane (Top Coat) + MEK (Solvent)
[(10.7 lbs./gal x 0.5869 Solid) + (10.35 lbs./gal x 0.72 Solid) + 6.71 lbs./gal x 0 Solid)] ÷ 3 = 4.58 lbs./gal

Control Efficiency = 0 (without control equipment)
Solids transfer efficiency for HVLP Painting = 0.75

PM Uncontrolled EF Calculation:
Average of Solids weights x (1-Control Efficiency) x (1-Transfer Efficiency) =
PM Uncontrolled EF = 4.58 lbs./gal x (1 - 0) x (1 - .75) = 1.145 lbs./gal

PM_{10} Assumed to be same as for PM
PM_{2.5} Assumed to be same as for PM
CO No known emissions of this pollutant from this source category.
NOx No known emissions of this pollutant from this source category.
SO₂ No known emissions of this pollutant from this source category.
Lead No known emissions of this pollutant from this source category.

VOC VOC EF Calculation: Average of highest VOC weights for Primer, Top Coat and Solvent used:
QAP582 (Primer) + DM19126/05 (Top Coat) + MEK (Solvent)
[(11.6 * 0.4375) + (8.51 * 0.6085) + (6.68 * 100)]
VOC EF = [5.08 lbs./gal + 5.18 lbs./gal + 6.68 lbs./gal] ÷ 3 = 5.65 lbs./gal

HAP Individual HAP EF Calculation: Avg. of the highest HAP weights for Primer, Top Coat and Solvent used:
Xylene: QAP111/05 (Primer) + DM19126/05 (Top Coat) + PAS72651 (Solvent)
(9.68 * 0.40) + (8.51* 0.60) + (6.68 * 0.018)
Xylene EF = [3.87 lbs./gal + 5.11 lbs./gal + 0.119 lbs./gal] ÷ 3 = 3.03 lbs./gal
Emission Unit: Paint Booth EU-1-PB - Continued

**Ethyl Benzene:**
QAP111/05 (Primer) + DM19126/05 (Top Coat) + MEK (Solvent)
(9.68 * 0.07) + (8.51 * 0.10) + (6.68 * 0.0)

Ethyl benzene EF = (0.678 + 0.851 + 0.0) ÷ 3 = **0.510 lbs./gal.**

**Toluene:**
QAP111/05 (Primer) + DM19152/05 (Top Coat) + MEK (Solvent)
(9.68 * 0.01) + (7.76 * 0.10) + (6.68 * 0.0)

Toluene EF = [0.0968 + 0.776 + 0.0] ÷ 3 = **0.291 lbs./gal**

**Naphthalene:**
DM19126/05 (Top Coat) + Aromatic 150 (Solvent)
(0.0) + (8.51* 0.01) + (6.68 * 0.099)

Naphthalene EF = [0.0 + 0.0851 + 0.661] ÷ 3 = **0.249 lbs./gal**

**Hexane:**
(Primer) + (Top Coat) + PAS72651 (Solvent)
(0.0) + (0.0) + (6.6 * 0.08)

Hexane EF = [0.0 + 0.0 + 0.176] ÷ 3 = **0.176 lbs./gal**

**Methanol:**
DM18998 (Primer) + (Top Coat) + PAS71251 (Solvent)
(9.18 * 0.01) + (0.0) + (6.6 * 0.05)

Methanol EF = [0.0918 + 0.0 + 0.33] ÷ 3 = **0.141 lbs./gal**

**Total HAP EF Calculation:** Xylene EF + Ethyl Benzene EF + Toluene EF + Naphthalene EF
Total HAP EF = **4.04 lbs./gal**

Controlled PM, PM<sub>10</sub> and PM<sub>2.5</sub> PTE Emissions inventory for Spray Paint Booth

Control Equipment: Fabric Filters and Manometer
Control Efficiency: 90%

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Controlled Emission Factor (lb./gal)</th>
<th>Maximum Operation (gallons/year)</th>
<th>Controlled PTE (tons per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM</td>
<td>0.1145</td>
<td>183,960</td>
<td>1.053</td>
</tr>
<tr>
<td>PM&lt;sub&gt;10&lt;/sub&gt;</td>
<td>0.1145</td>
<td>183,960</td>
<td>1.053</td>
</tr>
<tr>
<td>PM&lt;sub&gt;2.5&lt;/sub&gt;</td>
<td>0.1145</td>
<td>183,960</td>
<td>1.053</td>
</tr>
</tbody>
</table>

*Controlled PM, PM<sub>10</sub> and PM<sub>2.5</sub> Emissions Factor References*

PM  
*Average of highest Solids weights for Primer, Top Coat and Solvent used per data received in 2013:*
QAP S81 (Primer) + Q900BL413 Jet Blue Polyurethane (Top Coat) + MEK (Solvent)

\[[(10.7 \text{ lbs./gal} \times 0.5869 \text{ Solid}) + (10.35 \text{ lbs./gal} \times 0.72 \text{ Solid}) + 6.71 \text{ lbs./gal} \times 0 \text{ Solid})] ÷ 3 = 4.58 \text{ lbs./gal}\

Control Efficiency = 0.90 (per 2015 email: 0.90)
Solids transfer efficiency for HVLP Painting = 0.75

**PM Controlled EF Calculation:**
Average of Solids weights x (1-Control Efficiency) x (1-Transfer Efficiency) =

PM Controlled EF = 4.58 lbs./gal x (1 − 0.90) x (1 - .75) = **0.1145 lbs./gal**

PM<sub>10</sub>  
Assumed to be same as for PM

PM<sub>2.5</sub>  
Assumed to be same as for PM
Emission Unit: Plasma Cutting Table **EU-2-PCT** (installed 2014)

8’ x 44’ downdraft table with Mega Hornet 1000 CNC plasma cutting machine & HPR260XD Plasma Torch

**POTENTIAL EMISSIONS - PM$_{2.5}$/PM$_{10}$**  
**SCC:** 30903008 Plasma Torch

(http://www.epa.gov/ttnchie1/efdocs/welding.pdf)

Cutting Technique: Dry  
Base Metal: Mild Steel (standard carbon steel)  
Metal Thickness: 0.5 inch  
Kerf (width of cut): 0.188 inch  
Metal Cutting Speed: 145 inch/min  
Metal Density: 0.283 lb./in$^3$  
Fume Generation: 5 % of particulate generated  
Hours of Operation: 8760 hours/year  
Control Efficiency 90 %

Emission Factor (lbs./in) = Metal Density (lbs./in$^3$) x Metal Thickness (in) x Average Kerf (in) x Fume Generation

Emission Factor (lbs./in) = 0.0013295 lbs./inch

Metal Feed Rate (in/hr.) = Metal Travel Speed (in/min) x Number of plasma torch units x 60 min/hr.  
Metal Feed Rate (in/hr.) = 8700 inches/hr.

Emissions (lbs./hr.) = Metal Feed Rate (in/hr.) x Emission Factor (lbs./inch) x Control Efficiency

Emissions (lbs./hr.) = 11.57 lbs./hr.  
Control

Emissions = Emissions (lbs./hr.) x Hours of Operation (hrs./yr.) x Control Efficiency / 2000 lbs./ton

Emissions = 50.7 tons/yr.  
Control

**Estimated Actual Emissions - PM$_{2.5}$/PM$_{10}$**

Metal Thickness: 0.5 inch  
Kerf (width of cut): 0.188 inch  
Metal Cutting Speed: 16.67 inch/min (1,000 in/hr.)  
Metal Density: 0.283 lb./in$^3$  
Fume Generation: 5 % of particulate generated  
Total Metal Cut 1,000,200 inches/yr.  
Hours of Operation: 1000 hours/year  
Control Efficiency 90 %

PM$_{2.5}$/PM$_{10}$ Emission Factor (lbs./in) = Metal Density (lbs./in$^3$) x Metal Thickness (in) x Average Kerf (in) x Fume Generation

PM$_{2.5}$/PM$_{10}$ Emission Factor (lbs./in) = 0.00132951 lbs./inch

Metal Feed Rate (in/hr.) = Metal Travel Speed (in/min) x Number of units x 60 min/hr.  
Metal Feed Rate (in/hr.) = 1000.2 inches/hr.

PM$_{2.5}$/PM$_{10}$ Emissions (lbs./hr.) = Metal Feed Rate (in/hr.) x Emission Factor (lbs./inch)

PM$_{2.5}$/PM$_{10}$ Emissions (lbs./hr.) = 1.33 lbs./hr.

PM$_{2.5}$/PM$_{10}$ Emissions (ton/yr.) = Emissions (lbs./hr.) x Hours of Operation (hrs./yr.) x Control Efficiency / 2000 lbs./ton

PM$_{2.5}$/PM$_{10}$ Emissions (ton/yr.) = 0.07 tons/year (based on estimated actual hours and speed)
**Emission Unit:** Plasma Cutting Table *EU-2-PCT* - Continued

8’ x 44’downdraft table with Mega Hornet 1000 CNC plasma cutting machine & HPR260XD Plasma Torch

**POTENTIAL EMISSIONS – Manganese (Mn)   SCC: 30903008 Plasma Torch**

Cutting Technique: Dry
Base Metal: Mild Steel (standard carbon steel)
Base Metal Mn content: 1.65 % weight (worst case Mn content for standard carbon steel)
Maximum Hours of Operation: 8760 hours/yr.
Control Efficiency: 90 %

Mn Emissions (lbs./hr.) = PM$_{10}$ Emissions (lbs./hr.) * % weight Mn = 11.57 lbs./hr. * 0.0165 = 0.191 lbs./hr. **Uncontrolled**

Mn Emissions (tons/yr.) = Mn Emissions (lbs./hr.) x 8,760 (hr./yr.) / 2000 lbs./ton = 0.8366 tons/yr. **Uncontrolled**

**Estimated Actual Emissions – Manganese**

Estimated Actual Mn Emissions = Estimated Actual PM$_{10}$/PM$_{2.5}$ Emissions * % weight Mn = 1.33 lbs./hr. * 0.0165 = 0.022 lbs./hr.

= 0.07 tons/yr. * 0.0165 = 0.00116 tons/yr. **Controlled**

**POTENTIAL EMISSIONS – NOx   SCC: 30903008 Plasma Torch**


(http://www.epa.gov/ttnchie1/efdocs/welding.pdf)

NOx Emission Factor = 6.6 grams/minute (for mild steel; 8 mm (0.32 inch) plate thickness; 2 – 3 mm (0.08 - 0.12 inch) kerf; 2.7 - 4.5 meter/min (106 - 177 inch/ min) cutting speed; using dry cutting technique)

Cutting Technique: Dry
Base Metal: Mild Steel (standard carbon steel)
Metal Thickness: 0.5 inch **(per 2015 emails: 0.5 inch)**
Kerf (width of cut): 0.188 inch **(per 2015 emails: 0.188 inch)**
Metal Cutting Speed: 145 inch/min. **(per HPR260XD specs - Approx. Cutting Speed For ½ Inch Mild Steel: 145 ipm)**
Maximum Hours of Operation: 8760 hours/yr.
Control Equipment for NOx: None

NOx Emissions (lbs./hr.) = NOx Emission Factor * 60 min/hr. * 1 / 453.59 g/lbs. = 0.873 lbs./hr.

NOx Emissions (tons/yr.) = NOx Emissions (lbs./hr.) * 8760 hours/year * 2000 lbs. = 3.82 ton/yr.
**Emission Unit:** Shot Blast Machine *EU-3-SBM*

- **Make/Model:** Viking Corporation/MR-72108
- **Abrasive Type:** Steel Shot
- **No. Shot Valves for Blast Wheels:** 12
- **Maximum Shot Valve Diameter:** 2.25 inch
- **Maximum Shot Valve Pressure:** 90 PSI
- **Maximum Shot Throughput:** 79,000 tons/year = 1.58E+08 lbs./year = 18,040 lbs./hour = 0.1503 tons/minute
- **Control Equipment:** Cartridge Filter System (Dust Collector)
- **Control Efficiency:** 99%

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Maximum Shot Throughput (ton/year)</th>
<th>Uncontrolled Emission Factor (lbs. of pollutant per ton of shot)</th>
<th>Uncontrolled PTE (ton/year)</th>
<th>Controlled Emission Factor</th>
<th>Controlled PTE (tons/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM</td>
<td>79,000</td>
<td>5.40</td>
<td>213.3</td>
<td>0.0540</td>
<td>2.13</td>
</tr>
<tr>
<td>PM$_{10}$</td>
<td>79,000</td>
<td>2.60</td>
<td>102.7</td>
<td>0.0260</td>
<td>1.03</td>
</tr>
<tr>
<td>PM$_{2.5}$</td>
<td>79,000</td>
<td>0.26</td>
<td>10.27</td>
<td>0.0026</td>
<td>0.103</td>
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</table>

**PM, PM$_{10}$, PM$_{2.5}$ Emission Factors (EF):**

Derived from AP-42 Table 13.2.6-1, 9/97, p. 13.2.6-2 for abrasive blasting using sand (SCC 3-09-002-02)

*Note: Reference 3 For AP-42 Section 13.2.6 indicates that total PM emissions from abrasive blasting using shot are about 10 percent of total PM emissions from abrasive blasting with sand.*

EF for SCC 3-09-002-02 blasting using sand $\times$ 10% = EF for SCC 3-09-002-07 blasting using shot

- **PM EF** = 2.7 lbs. PM/1000 lbs. shot $\times$ 10% $\times$ 2000 lbs./ton = 5.4 lbs. PM/ton of shot
- **PM$_{10}$ EF** = 1.3 lbs. PM$_{10}$/1000 lbs. shot $\times$ 10% $\times$ 2000 lbs./ton = 2.6 lbs. PM$_{10}$/ton of shot
- **PM$_{2.5}$ EF** = 0.13 lbs. PM$_{2.5}$/1000 lbs. shot $\times$ 10% $\times$ 2000 lbs./ton = 0.26 lbs. PM$_{2.5}$/ton of shot

**Controlled PM, PM$_{10}$, PM$_{2.5}$ Emission Factor** = \text{Uncontrolled EF} \times [1 - \text{control efficiency}]

= \text{Uncontrolled EF} \times 0.01
Emission Unit: Parts Washer **EU-4-PW**

Viking Model D72P – Pass-Through Production Spray-Cleaning Machine
- with 200,000 BTU Natural Gas fired Heater:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Emission Factor (lbs./MMSCF)</th>
<th>Emission Rate (lbs./hr.)</th>
<th>Emission Rate (tons/year)</th>
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</thead>
<tbody>
<tr>
<td>PM</td>
<td>1.9</td>
<td>3.73e-4</td>
<td>0.00163</td>
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<tr>
<td>PM10</td>
<td>7.6</td>
<td>0.00149</td>
<td>0.00653</td>
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<tr>
<td>PM2.5</td>
<td>7.6</td>
<td>0.00149</td>
<td>0.00653</td>
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<td>SO₂</td>
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<td>NO₂</td>
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<td>84</td>
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<td>CH₄</td>
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<td>GHGs (as Mass)</td>
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<td>102.4</td>
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<tr>
<td>GHGs (as CO₂e)</td>
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<td>Benzene</td>
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<td>Dichlorobenzene</td>
<td>0.0012</td>
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<td>Formaldehyde</td>
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<td>Hexane</td>
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<td>Toluene</td>
<td>0.0034</td>
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<td>3.0e-6</td>
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<td>Subtotal HAP - Organics</td>
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<td>1.67e-3</td>
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<td>Lead</td>
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<td>Chromium</td>
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<td>Manganese</td>
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<td>Nickel</td>
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<td>Subtotal HAP - Metals</td>
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<tr>
<td>TOTAL HAP</td>
<td></td>
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<td>1.67E-03</td>
</tr>
</tbody>
</table>

Methodology

MMBtu = 1,000,000 Btu

MMCF = 1,000,000 Cubic Feet of Gas

Potential Throughput (MMCF/hr.) = Heat Input Capacity (MMBtu/hr.) x 8,760 hours/yr. x 1 MMCF/1,020 MMBtu

Emission (tons/yr.) = Throughput (MMCF/yr.) x Emission Factor (lbs./MMCF)/2,000 lbs./ton

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. The N2O Emission Factor for uncontrolled is 2.2. The N2O Emission Factor for low NOx burner is 0.64.

Global Warming Potentials (GWP) from Table A-1 of 40 CFR Part 98 Subpart A.

Emission (tons/yr.) = Throughput (MMCF/yr.) x Emission Factor (lbs./MMCF)/2,000 lbs./ton

### Emission Unit: Welding- Gas Metal Arc Welding (GMAW)  *EU-5-GMAW*

- **SCC:** 30905254 (GMAW w E70 electrode)
- **Manufacturer/Model:** Miller/Deltaweld 452
- **Number of Welding Units:** 12
- **Per unit max wire/rod/electrode usage (lbs./hr.):** 21.7
- **Total maximum hourly usage (lbs./hr.):** 260.4
- **Control Efficiency (%):** 0

<table>
<thead>
<tr>
<th>Wire/Rod/Electrode</th>
<th>Usage lbs./yr.</th>
<th>PM$<em>{2.5}$/PM$</em>{10}$ EF lbs./1,000 lbs.</th>
<th>PM$<em>{2.5}$/PM$</em>{10}$ EF tons/yr.</th>
<th>Mn EF lbs./1,000 lbs.</th>
<th>Mn EF tons/yr.</th>
<th>Ni EF lbs./1,000 lbs.</th>
<th>Ni EF tons/yr.</th>
<th>Cr EF lbs./1,000 lbs.</th>
<th>Cr EF tons/yr.</th>
<th>Cr-VI EF lbs./1,000 lbs.</th>
<th>Cr-VI EF tons/yr.</th>
<th>Co EF lbs./1,000 lbs.</th>
<th>Co EF tons/yr.</th>
<th>Pb EF lbs./1,000 lbs.</th>
<th>Pb EF tons/yr.</th>
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</thead>
<tbody>
<tr>
<td>E70S</td>
<td>2,281,104</td>
<td>5.2</td>
<td>5.931</td>
<td>0.318</td>
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<td>0.000</td>
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<td>0.000</td>
</tr>
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</table>

Note: Emission Factors (EF) for Welding Operations were taken from AP-42 Section 12.19, Tables 1 & 2

- **SCC:** 30905212 (GMAW w E308 electrode)
- **Manufacturer/Model:** not specified  *(observed onsite: Thermal Arc/Fabstar 4030)*
- **Number of Welding Units:** not specified *(assume 4)*
- **Max lbs./hr. wire/rod/electrode per unit:** not specified *(284.09 if assumed 4 welders accurate)*
- **Maximum hourly usage (lbs./hr.):** 1136.36
- **Control Efficiency (%):** 0

<table>
<thead>
<tr>
<th>Wire/Rod/Electrode</th>
<th>Usage lbs./yr.</th>
<th>PM$<em>{2.5}$/PM$</em>{10}$ EF lbs./1,000 lbs.</th>
<th>PM$<em>{2.5}$/PM$</em>{10}$ EF tons/yr.</th>
<th>Mn EF lbs./1,000 lbs.</th>
<th>Mn EF tons/yr.</th>
<th>Ni EF lbs./1,000 lbs.</th>
<th>Ni EF tons/yr.</th>
<th>Cr EF lbs./1,000 lbs.</th>
<th>Cr EF tons/yr.</th>
<th>Cr-VI EF lbs./1,000 lbs.</th>
<th>Cr-VI EF tons/yr.</th>
<th>Co EF lbs./1,000 lbs.</th>
<th>Co EF tons/yr.</th>
<th>Pb EF lbs./1,000 lbs.</th>
<th>Pb EF tons/yr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E308L</td>
<td>9,954,514</td>
<td>5.4</td>
<td>26.877</td>
<td>0.346</td>
<td>1.722</td>
<td>0.184</td>
<td>0.916</td>
<td>0.524</td>
<td>2.608</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.001</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Note: Emission Factors (EF) for Welding Operations were taken from AP-42 Section 12.19, Tables 1 & 2

### Emission Unit: Welding- Flux Cored Arc Welding (FCAW)  *EU-6-FCAW*

- **SCC:** 30905354 (FCAW w E70 Electrode)
- **Manufacturer/Model:** Lincoln/IdealArc CV-400
- **Number of Welding Units:** 7
- **Per unit max wire/rod/electrode usage (lbs./hr.):** 16.5
- **Maximum hourly usage (lbs./hr.):** 115.5
- **Control Efficiency (%):** 0

<table>
<thead>
<tr>
<th>Wire/Rod/Electrode</th>
<th>Usage lbs./yr.</th>
<th>PM$<em>{2.5}$/PM$</em>{10}$ EF lbs./1,000 lbs.</th>
<th>PM$<em>{2.5}$/PM$</em>{10}$ EF tons/yr.</th>
<th>Mn EF lbs./1,000 lbs.</th>
<th>Mn EF tons/yr.</th>
<th>Ni EF lbs./1,000 lbs.</th>
<th>Ni EF tons/yr.</th>
<th>Cr EF lbs./1,000 lbs.</th>
<th>Cr EF tons/yr.</th>
<th>Cr-VI EF lbs./1,000 lbs.</th>
<th>Cr-VI EF tons/yr.</th>
<th>Co EF lbs./1,000 lbs.</th>
<th>Co EF tons/yr.</th>
<th>Pb EF lbs./1,000 lbs.</th>
<th>Pb EF tons/yr.</th>
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<tbody>
<tr>
<td>E70T</td>
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<td>15.1</td>
<td>7.639</td>
<td>0.891</td>
<td>0.451</td>
<td>0.005</td>
<td>0.003</td>
<td>0.004</td>
<td>0.002</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
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</tbody>
</table>

Note: Emission Factors (EF) for Welding Operations were taken from AP-42 Section 12.19, Tables 1 & 2
Peddinghaus Model #FPB 500 with Hypertherm Model HySpeed HT2000 Plasma Torch **EU-7-FM1**

**POTENTIAL EMISSIONS - PM$_{2.5}$ / PM$_{10}$ SCC: 30903008 Plasma Torch**

(http://www.epa.gov/ttnchie1/efdocs/welding.pdf)

Cutting Technique: Dry
Base Steel: Mild Steel (standard carbon steel)
Metal Thickness: 0.5 inch (rev 2015 emails: 0.5 inch)
Kerf (width of cut): 0.128 inch (per HT2000 reference – estimated kerf width compensation for 0.5 inch thick mild steel 200A O2/Air: 0.128 inch)
Metal Cutting Speed: 118 inch/min (per HT2000 reference - Approx. Cutting Speed For 0.49 Inch Mild Steel 200A O2/Air: 118 ipm)
Metal Density: 0.283 lbs./in$^3$ (Reference Density of Mild Steel: 0.283 lbs./in$^3$)
Fume Generation: 5 % of particulate generated
Hours of Operation: 8760 hours/yr.
Control Efficiency: 90 %

PM$_{2.5}$ / PM$_{10}$ Emission Factor (lbs./in$^2$) = Metal Density (lbs./in$^3$) x Metal Thickness (in) x Average Kerf (in) x Fume Generation
PM$_{2.5}$ / PM$_{10}$ Emission Factor (lbs./in$^2$) = 0.009052 lbs./in$^2$

PM$_{2.5}$ / PM$_{10}$ Emissions (lbs./hr.) = Metal Feed Rate (in/hr.) x Number of plasma torch units x 60 min/hr.
PM$_{2.5}$ / PM$_{10}$ Emissions (lbs./hr.) = 7080 inches/hr.

PM$_{2.5}$ / PM$_{10}$ Emissions (tons/yr.) = Emissions (lbs./hr.) x Hours of Operation (hr./yr.) x Control Efficiency / 2000 lbs./ton
PM$_{2.5}$ / PM$_{10}$ Emissions (tons/yr.) = 28.1 tons/yr. Uncontrolled
PM$_{2.5}$ / PM$_{10}$ Emissions (tons/yr.) = 2.81 tons/yr. Controlled

**POTENTIAL EMISSIONS – Manganese (Mn) SCC: 30903008 Plasma Torch**

Cutting Technique: Dry
Base Steel: Mild Steel (standard carbon steel)
Maximum Hours of Operation: 8760 hours/yr.
Control Efficiency: 90 %

Mn Emissions (lbs./hr.) = PM$_{10}$ Emissions (lbs./hr.) * % weight Mn x Control Efficiency = 6.41 lbs./hr. * 0.0165 = 0.106 lbs./hr. Uncontrolled
Mn Emissions (lbs./hr.) = 0.641 lbs./hr. * 0.0165 = 0.0106 lbs./hr. Controlled
Mn Emissions (tons/yr.) = Mn Emissions (lbs./hr.) x 8,760 (hrs./yr.) / 2000 lbs./ton = 0.464 tons/yr. Uncontrolled
Mn Emissions (tons/yr.) = 0.0464 tons/yr. Controlled

**POTENTIAL EMISSIONS – NOx SCC: 30903008 Plasma Torch**

(http://www.epa.gov/ttnchie1/efdocs/welding.pdf)

NOx Emission Factor = 6.6 grams/minute (for mild steel; 8 mm (0.32 inch) plate thickness; 2 – 3 mm (0.08 - 0.12 inch) kerf; 2.7 - 4.5 meter/min (106 - 177 inch/ min) cutting speed; using dry cutting technique)

Cutting Technique: Dry
Base Steel: Mild Steel (standard carbon steel)
Metal Thickness: 0.5 inch (per HT2000 reference – estimated kerf width compensation for 0.5 inch thick mild steel 200A O2/Air: 0.128 inch)
Metal Cutting Speed: 118 inch/min (per HT2000 reference - Approx. Cutting Speed For 0.49 Inch Mild Steel 200A O2/Air: 118 ipm)
Maximum Hours of Operation: 8760 hours/yr.
Control Equipment for NOx: None

NOx Emissions (lbs./hr.) = NOx Emission Factor * 60 min/hr. * 1 / 453.59 g/lbs. = 0.873 lbs./hr.
NOx Emissions (tons/yr.) = NOx Emissions (lbs./hr.) * 8760 hours/year * ton/2000 lbs. = 3.82 ton/yr.
Emission Unit: Fabrication Machine 2 – with Plasma Torch \textit{EU-8-FM2}

Peddinghaus Model FPB 1800 with Hypertherm Model HPR260XD Plasma Torch cutting Mild Steel

**POTENTIAL EMISSIONS - PM$_{2.5}$ / PM$_{10}$**


(http://www.epa.gov/ttnchie1/efdocs/welding.pdf)

**Cutting Technique:** Dry  
**Base Metal:** Mild Steel (standard carbon steel)  
**Metal Thickness:** 0.5 inch  
**Kerf (width of cut):** 0.11 inch  
**Metal Cutting Speed:** 145 inch/min  
**Metal Density:** 0.283 lbs./in$^3$  
**Fume Generation:** 5 % of particulate generated  
**Control Efficiency:** 90 %

PM$_{2.5}$/ PM$_{10}$ Emission Factor (lbs./in) = Metal Density (lbs./in$^3$) x Metal Thickness (in) x Average Kerf (in) x Fume Generation  
PM$_{2.5}$/ PM$_{10}$ Emission Factor (lbs./in) = 0.0007779 lbs./in

Metal Feed Rate (in/hr.) = Metal Travel Speed (in/min) x Number of plasma torch units x 60 min/hr.  
Metal Feed Rate (in/hr.) = 8700 inches/hr.

PM$_{2.5}$/ PM$_{10}$ Emissions (lbs./hr.) = Metal Feed Rate (in/hr.) x Emission Factor (lbs./in) x Control Efficiency  
PM$_{2.5}$/ PM$_{10}$ Emissions (lbs./hr.) = 6.77 lbs./hr. Uncontrolled  
= 0.677 lbs./hr. Controlled

PM$_{2.5}$/ PM$_{10}$ Emissions (tons/hr.) = Emissions (lbs./hr.) x Hours of Operation (hr./yr.) x Control Efficiency / 2000 lbs./ton  
PM$_{2.5}$/ PM$_{10}$ Emissions (tons/hr.) = 29.6 tons/hr. Uncontrolled  
= 2.96 tons/hr. Controlled

**POTENTIAL EMISSIONS – Manganese (Mn)**

**SCC:** 30903008 Plasma Torch

Cutting Technique: Dry  
**Base Metal:** Mild Steel (standard carbon steel)  
**Maximum Hours of Operation:** 8760 hours/yr.  
**Control Efficiency:** 90 %

Mn Emissions (lbs./hr.) = PM$_{10}$ Emissions (lbs./hr.) x % weight Mn x Control Efficiency = 6.77 lbs./hr. x 0.0165 = 0.112 lbs./hr. Uncontrolled  
= 0.677 lbs./hr. x 0.0116 = 0.0112 lbs./hr. Controlled

Mn Emissions (tons/yr.) = Mn Emissions (lbs./hr.) x 8,760 (hr./yr.) / 2000 lbs./ton = 0.489 tons/yr. Uncontrolled  
= 0.0489 tons/yr. Controlled

**POTENTIAL EMISSIONS – NOx**

**SCC:** 30903008 Plasma Torch


(http://www.epa.gov/ttnchie1/efdocs/welding.pdf)

**NOx Emission Factor** = 6.6 grams/minute (for mild steel; 8 mm (0.32 inch) plate thickness; 2 – 3 mm (0.08 - 0.12 inch) kerf; 2.7 - 4.5 meter/min (106 - 177 inch/ min) cutting speed; using dry cutting technique)

Cutting Technique: Dry  
**Base Metal:** Mild Steel (standard carbon steel)  
**Metal Thickness:** 0.5 inch  
**Kerf (width of cut):** 0.11 inch  
**Metal Cutting Speed:** 145 inch/min  
**Maximum Hours of Operation:** 8760 hours/yr.  
**Control Equipment for NOx:** None

NOx Emissions (lbs./hr.) = NOx Emission Factor x 60 min/hr. x 1 / 453.59 g/lbs. x 0.873 lbs./hr.  
NOx Emissions (tons/yr.) = NOx Emissions (lbs./hr.) x 8760 hours/yr x ton/2000 lbs. x 3.82 ton/yr.
Emission Units: Makeup Air Combustion Units 1 and 2 ***EXEMPT***

Exemption added by 2014 amended rule is 40 CFR 49.153 (c) (11) (iii):

Furnaces or boilers used for space heating that use only gaseous fuel, with a total maximum heat input (i.e., from all units combined) of 10 MMBtu/hour or less in attainment areas.

Makeup air combustion unit on south side: Weather-Rite; Model #: AR TT218VTL; Input BTU: 1,944,000
Makeup air combustion unit on north side: Rupp; Model #: DCM227; Maximum BTU/hr.: 4,860,000


Maximum Heat Input: 6.8 MMBtu/hr.
Heat Content of Natural Gas: 1,020 MMBtu/MMSCF
Potential Throughput: 0.0068 MMSCF/hr.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Emission Factor (lbs./MMSCF)</th>
<th>Emission Rate (lbs./hr.)</th>
<th>Emission Rate (tons/year)</th>
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<tbody>
<tr>
<td>PM</td>
<td>1.9</td>
<td>0.01275</td>
<td>0.05585</td>
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<tr>
<td>PM10</td>
<td>7.6</td>
<td>0.05066</td>
<td>0.22189</td>
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<tr>
<td>PM2.5</td>
<td>7.6</td>
<td>0.05066</td>
<td>0.22189</td>
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<td>SOx</td>
<td>0.6</td>
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<td>0.01757</td>
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<td>NOx</td>
<td>100</td>
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<td>CO</td>
<td>84</td>
<td>0.561</td>
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<td>VOC</td>
<td>5.5</td>
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<td>CO2</td>
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<td>N2O</td>
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<td>0.001462</td>
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<td>GHGs (as Mass)</td>
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<td>Dichlorobenzene</td>
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<td>0.0022338</td>
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<td>Hexane</td>
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<td>0.0536112</td>
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<td>Toluene</td>
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<td>0.0001013</td>
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<td>Subtotal HAP - Organics</td>
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<td>-</td>
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<td>Lead</td>
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<tr>
<td>Cadmium</td>
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<td>Manganese</td>
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<td>Nickel</td>
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<tr>
<td>Subtotal HAP - Metals</td>
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<td>-</td>
<td>0.00015323</td>
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<tr>
<td>TOTAL HAP</td>
<td></td>
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<td>0.0562</td>
</tr>
</tbody>
</table>

Methodology

MMBtu = 1,000,000 Btu
MMCF = 1,000,000 Cubic Feet of Gas

Potential Throughput (MMCF/hr.) = Heat Input Capacity (MMBtu/hr.) x 8,760 hours/yr. x 1 MMCF/1,020 MMBtu

Emission (tons/yr.) = Throughput (MMCF/hr.) x Emission Factor (lbs./MMCF)/2,000 lbs./ton

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. The N2O Emission Factor for uncontrolled is 2.2. The N2O Emission Factor for low NOx burner is 0.64.

Global Warming Potentials (GWP) from Table A-1 of 40 CFR Part 98 Subpart A.


TSD Appendix - Page 11
## SUMMARY OF FACILITY-WIDE ANNUAL EMISSIONS

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
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</tr>
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<tbody>
<tr>
<td>PM</td>
<td>105.8 EU-1-PB 50.7 EU-2-PCT 213.3 EU-3-SBM 0.00163 EU-4-PW 32.81 EU-5-GMAW 7.64 EU-6-FCAW 28.1 EU-7-FM1 29.6 EU-8-FM2</td>
<td>10.53 EU-1-PB 5.07 EU-2-PCT 2.13 EU-3-SBM 0.00653 EU-4-PW 32.81 EU-5-GMAW 7.64 EU-6-FCAW 2.81 EU-7-FM1 2.96 EU-8-FM2</td>
<td>64 (Sum of Controlled PTE for each Emission Unit)</td>
<td>10.6</td>
<td>100 or 250</td>
<td></td>
<td></td>
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<tr>
<td>Total PM</td>
<td>467.46</td>
<td>63.95</td>
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<td>10.53 EU-1-PB 5.07 EU-2-PCT 1.03 EU-3-SBM 0.00653 EU-4-PW 32.81 EU-5-GMAW 7.64 EU-6-FCAW 2.81 EU-7-FM1 2.96 EU-8-FM2</td>
<td>63 (Sum of Controlled PTE for each Emission Unit)</td>
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<td>100 or 250</td>
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<td>Total PM&lt;sub&gt;10&lt;/sub&gt;</td>
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<td>62.86</td>
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<tr>
<td>PM&lt;sub&gt;2.5&lt;/sub&gt;</td>
<td>105.3 EU-1-PB 50.7 EU-2-PCT 10.27 EU-3-SBM 0.00653 EU-4-PW 32.81 EU-5-GMAW 7.64 EU-6-FCAW 28.1 EU-7-FM1 29.6 EU-8-FM2</td>
<td>10.53 EU-1-PB 5.07 EU-2-PCT 0.103 EU-3-SBM 0.00653 EU-4-PW 32.81 EU-5-GMAW 7.64 EU-6-FCAW 2.81 EU-7-FM1 2.96 EU-8-FM2</td>
<td>62 (Sum of Controlled PTE for each Emission Unit)</td>
<td>3</td>
<td>100 or 250</td>
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<td></td>
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<tr>
<td>Total PM&lt;sub&gt;2.5&lt;/sub&gt;</td>
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<td>61.93</td>
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<td>CO</td>
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<td>0.07 EU-4-PW</td>
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<tr>
<td>NO&lt;sub&gt;x&lt;/sub&gt;</td>
<td>3.82 EU-2-PCT 0.09 EU-4-PW 3.82 EU-7-FM1 3.82 EU-8-FM2</td>
<td>3.82 EU-2-PCT 0.09 EU-4-PW 3.82 EU-7-FM1 3.82 EU-8-FM2</td>
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<tr>
<td>Total NO&lt;sub&gt;x&lt;/sub&gt;</td>
<td>11.55</td>
<td>11.55</td>
<td>11.6 (Sum of Controlled PTE for each Emission Unit)</td>
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<td>SO&lt;sub&gt;2&lt;/sub&gt;</td>
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<td>VOC</td>
<td>519.7 EU-1-PB 0.005 EU-4-PW</td>
<td>519.7 EU-1-PB 0.005 EU-4-PW</td>
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<td>75 (requested) 10.87 11.37</td>
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<td>102.4 EU-4-PW</td>
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<td>GHG (as CO&lt;sub&gt;2&lt;/sub&gt;-e)</td>
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<td>103.0 EU-4-PW</td>
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<td></td>
<td>100,000</td>
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### SUMMARY OF FACILITY-WIDE ANNUAL EMISSIONS

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<tr>
<th>Regulated HAP Pollutants</th>
<th>Uncontrolled PTE (tons/year) Emission Unit ID</th>
<th>Controlled PTE (tons/year) Emission Unit ID</th>
<th>Proposed Allowable Emissions* (tons/year)</th>
<th>2011 Actual Emissions (tons/year) [Based on avail. Info]</th>
<th>2012 Actual Emissions (tons/year) [Based on avail. Info]</th>
<th>Title V Major Source Threshold (tons/year)</th>
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<tbody>
<tr>
<td>Chromium</td>
<td>2.609 EU-5-GMAW 0.002 EU-6-FCAW</td>
<td>2.609 EU-5-GMAW 0.002 EU-6-FCAW</td>
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<td></td>
<td></td>
<td>10</td>
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<tr>
<td>Total Chromium</td>
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<td>2.611</td>
<td>2.611 {Sum of Controlled PTE for each Emission Unit}</td>
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<td>Cobalt</td>
<td>0.01 EU-5-GMAW</td>
<td>0.01 EU-5-GMAW</td>
<td>0.01 {Sum of Controlled PTE for each Emission Unit}</td>
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<td>Manganese</td>
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<td>0.084 EU-2-PCT 2.09 EU-5-GMAW 0.45 EU-6-FCAW 0.046 EU-7-FM1 0.049 EU-8-FM2</td>
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<td>10</td>
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<td>Total Manganese</td>
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<td>2.72 {Sum of Controlled PTE for each Emission Unit}</td>
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<td>10</td>
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<td>0.917 EU-5-GMAW 0.003 EU-6-FCAW</td>
<td>0.917 EU-5-GMAW 0.003 EU-6-FCAW</td>
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<tr>
<td>Total Nickel</td>
<td>0.920</td>
<td>0.920</td>
<td>0.920 {Sum of Controlled PTE for each Emission Unit}</td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>{Subtotal HAP – Metals}</td>
<td>7.871</td>
<td>6.261</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Xylene</td>
<td>278.7 EU-1-1PB</td>
<td>278.7 EU-1-1PB</td>
<td>9 {requested}</td>
<td>5.0</td>
<td>3.9</td>
<td>10</td>
</tr>
<tr>
<td>Ethyl benzene</td>
<td>46.91 EU-1-1PB</td>
<td>46.91 EU-1-1PB</td>
<td>9 {requested}</td>
<td>0.97</td>
<td>0.80</td>
<td>10</td>
</tr>
<tr>
<td>Toluene</td>
<td>26.77 EU-1-1PB</td>
<td>26.77 EU-1-1PB</td>
<td>9 {requested}</td>
<td>0.14</td>
<td>0.07</td>
<td>10</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>22.90 EU-1-1PB</td>
<td>22.90 EU-1-1PB</td>
<td>9 {requested}</td>
<td>0.05</td>
<td>0.05</td>
<td>10</td>
</tr>
<tr>
<td>Hexane</td>
<td>16.19 EU-1-1PB</td>
<td>16.19 EU-1-1PB</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Methanol</td>
<td>12.93 EU-1-1PB</td>
<td>12.93 EU-1-1PB</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>{Subtotal HAP – Organics}</td>
<td>404.4</td>
<td>404.4</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Highest HAP-Individual</td>
<td>278.7</td>
<td>278.7</td>
<td>9 {requested}</td>
<td>5.0</td>
<td>3.9</td>
<td>10</td>
</tr>
<tr>
<td>Total HAP</td>
<td>412.3</td>
<td>410.7</td>
<td>24 {requested}</td>
<td></td>
<td></td>
<td>25</td>
</tr>
</tbody>
</table>

*§49.152 Definitions. (d) Allowable emissions means “allowable emissions” as defined in §52.21(b)(16) of this chapter, except that the allowable emissions for any emissions unit are calculated considering any emission limitations that are enforceable as a practical matter on the emissions unit’s potential to emit.