September 23, 2024
Project No. M8006.63.001

Julia DeGagné
Oregon Department of Environmental Quality
700 NE Multnomah Street, Suite 600
Portland, Oregon 97232

Re: Response to DEQ request for information dated August 9, 2024

Dear Julia:

On behalf of Eagle Foundry Company (Eagle Foundry), Maul Foster & Alongi (MFA) is providing this response to your letter dated August 9, 2024 (the Letter) in which the Department of Environmental Quality (DEQ) requested additional information as well as changes to Eagle Foundry's air toxics emissions inventory. The Letter states that Eagle Foundry must submit responses to the Letter and an updated Cleaner Air Oregon (CAO) emissions inventory no later than September 23, 2024.

This response document is organized in the same manner as the information was requested in the Letter. The Letter comments are shown in bold followed by the response. To address the requests of the DEQ in the Letter, MFA has prepared a revised version of the CAO emissions inventory included as Attachment A. An updated copy of the AQ520 form has been prepared and will be provided electronically to the DEQ.

1. **Slag Handling (SLAG TEU): Provide the analytical report for the "slag dust analysis conducted by Apex Laboratories in September 2023" referred to on page 7 of Eagle's January 10, 2024, letter.**

MFA has included the analytical report for the slag dust analysis as Attachment B.

2. **Raw materials handling: DEQ requires additional information to determine whether these activities can be considered exempt under OAR 340-245-0060(3)(a):**

    a. **Provide Safety Data Sheets (SDSs) for all raw materials handled, including:**

        i. **High Carbon Ferrous Chromium (HCFeCr);**
        ii. **LC FerroChrome;**
        iii. **HC Ferromanganese Alloy;**
        iv. **LC Ferromanganese Alloy;**
        v. **Ferro Molybdenum;**
        vi. **Ferro Silicon;**
        vii. **Nickel;**
        viii. **Aluminum**
        ix. **Silicon/titanium**
        x. **Ferro Titanium; and**
        xi. **Carbon.**

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MFA has included SDSs for raw material handling as Attachment C.

b. **Provide maximum requested annual and daily throughputs for the HCFeCr; and**

The maximum daily HCFeCr delivery is 60 tons per day. The annual maximum HCFeCr is 1,000 tons per year.

c. **Indicate whether the bunker storing the HCFeCr is a sided enclosure, and provide a photo of the bunker**

Photos of the bunker are included as Attachment D. As noted in our response dated January 10, 2024, High Carbon Ferrous Chromium (HCFeCr) is received in loads that are screened in Portland by the supplier. Eagle Foundry receives ¼" and larger materials. Fines have been removed. When received, the material is deposited in a roof covered bunker on the back side of the casting cooling bunkers adjacent to the main foundry building. The bunker is enclosed on three sides. Dust has been removed prior to arriving and the material is stored in a sheltered area protected from any windy conditions.

3. **Submit to DEQ a revised Inventory (AQ520), along with all supporting calculations in Excel format, as well as all information required under OAR 340-245-0040(4), including the following updates:**

a. **<u>Grinding (TEUs Grind_NSS_C and GRIND_SS_C):</u> Update the emission factor for controlled emissions to use the "captured and uncontrolled" emission factor of 16.0 pounds per ton, following the methodology in RTI International (2012). Estimated control efficiencies may be applied to the 16 pounds per ton emission factor;**

The Total PM emission factor for the Grind_NSS_C and Grind _SS_C TEUs has been updated to 16.0 pounds per ton metal processed to reflect the median emission factor for grinding. MFA calculated Total PM emissions using the collection efficiencies of particulate control devices and particle size fractions in Table 3-4 and Table 6-2 of RTI International, *Emission Estimation Protocol for Iron and Steel Foundries,* December 2012 (RTI document). Additionally, MFA updated the particle size fractions of PM, PM_{10}, and $PM_{2.5}$ following the methodology in Table 6-2 of the RTI document.

b. **<u>Foundry Melting and Cooling</u> (TEU MF_STEEL): include silver and compounds (CASRN 7440-22-4) using an emission factor of 1.49x10-5 pounds per pound metal melted, per the source test data approved November 20, 2023**

The emission factor for silver and compounds (CAS 7440-22-4) has been added to the MF_STEEL TEU.

c. **<u>Welding (WELD TEU):</u>**

i. **The Lincore M welding wire SDS indicates that this is a flux-cored wire which would be used in FCAW welding, but the process is reported as GMAW/MIG which uses a solid electrode – update the process and emission factor to reflect FCAW welding if flux-cored wire is used;**

ii. **Correct the annual and daily emissions estimates for vanadium (CAS 7440-62-2) – Table 8 of the supporting calculations includes molybdenum emissions in the vanadium totals; and**

iii. In Worksheet 2 of the AQ520, update the annual Requested Potential to Emit (RPTE) to be consistent with the emissions calculations, which assume 10,688 pounds per year of wire/rod used.

MFA has incorporated the requested updates to the WELD TEU in the revised emissions inventory tables (Attachment A) and AQ520 form.

d. Mold-making (MOLD_BP and MOLD_SP TEUs):

i. For the Coated Cerabeads and Naigai Cerabeads;

1. Correct the annual and daily emissions estimates for aluminum and compounds (CASRN 7429-90-5) – aluminum emissions were reported using the nickel and compounds CASRN (CASRN 7440-02-0) in Table 14 and in the AQ520 for the MOLD_SP TEU;
2. The 10 percent "amorphous silica" listed on the SDS should not be reported – only crystalline silica is listed TAC;
3. Only the aluminum metal portion of the aluminum oxide should be reported as "aluminum and compounds" – the weight of the oxygen may be omitted from the total; and

The CAS number for aluminum and compounds in the MOLD TEUs has been updated in AQ520. MFA has updated the contents of Coated Cerabead and Naigai Cerabead to remove the amorphous silica portion of mullite from the total crystalline silica, and to omit the weight of oxygen from the reported aluminum. These updates are reflected in the revised emissions inventory tables (Attachment A) and AQ520 form.

ii. For the Unibond Corepaste, only the silica (SiO2) portion of the sodium silicate should be reported as crystalline silica; and;

MFA has updated the reported crystalline silica in Unibond Corepaste to include only the silica portion of sodium silicate in the revised emissions inventory tables (Attachment A) and AQ520 form.

iii. For the MOLD_SP TEU, use the AP-42 emission factor for baghouse-controlled sand handling of 0.2 pounds per ton sand handled (instead of the emission factor for uncontrolled sand handling and an estimated control efficiency);

MFA updated the emission factor for the MOLD_SP TEU to 0.2 pounds per ton of sand handled. The emission factor includes baghouse control.

e. Small Palmer (S_PALMER TEU): Update the missing references in Table 1 ("Small Palmer Molding Line (dust collected)") and Table 13 (footnote 1) of the supporting calculations;

MFA has incorporated the requested updates to the S_PALMER TEU references.

f. Update the AQ520 as follows:

i. On Worksheet 2, include any TEUs Eagle is requesting be considered exempt under OAR 340-245-0060(3)(a) and include the word "exempt" in the TEU description. Exempt TEUs must be included in the Inventory but emissions do not need to be quantified or included on Worksheet 3. Please include:

1. Scrap handling;
2. High Carbon Ferrous Chromium handling;
3. Raw alloy material super sack handling;
4. Raw alloy materials (drums and cans) handling;
5. Maintenance shop chemical usage; and
6. Any diesel or other fuels storage tanks operated on-site;

Worksheet 2 of AQ520 has been updated to include exempt TEUs.

ii. On Worksheet 2, update the daily RPTE throughput for the MESH TEU to be consistent with the emissions and the supporting calculations (3 tons per day);

MFA has incorporated the requested updates to Worksheet 2 of the AQ520 form.

iii. On Worksheet 2, for the WELD TEU, update the Emission Type to "Fugitive";

MFA has incorporated the requested updates to Worksheet 2 of the AQ520 form.

iv. On Worksheet 3, update control efficiency and reference documentation as follows:

1. indicate in column I the that the HOTTOP emission factor includes the 90 percent control;

The crystalline silica emission factor for the HOTTOP TEU is based on SDS data and the assumed percentage of product that becomes airborne. The emission calculation includes a 90 percent control efficiency from the baghouse. Column I of Worksheet 3 states that the emission calculation includes a control efficiency of 90 percent.

2. for TEUs MOLD_BP_V, MOLD_BP_I, and MOLD_SP_CC, remove any control efficiency listed in Column E and the note "Emission factor includes baghouse control" in the "Reference/Notes" column for isopropyl alcohol (CASRN 67-63-0) and phenol (CASRN 108-95-2);

For TEUs MOLD_SP_CC, MOLD_SP_G, MOLD_SP_U, and MOLD_SP_C, the control efficiencies listed on Column E have been updated to 0% for phenol and isopropyl alcohol. The note in Column E has been updated to "Emission factor includes baghouse control" for silica, crystalline and aluminum and compounds.

3. For TEUs MOLD_BP_V, MOLD_BP_I, MOLD_BP_C, and MOLD_BP_U, update Column E to indicate the control efficiency assumed is 90 percent.

For TEUs MOLD_BP_V, MOLD_BP_I, MOLD_BP_C, and MOLD_BP_U, the control efficiencies listed on Column E have been updated to 0% for isopropyl alcohol. The note in Column E has been updated to "Emission factor includes baghouse control" for silica, crystalline and aluminum and compounds.

4. For TEUs GRIND_SS_C, GRIND_SS_F, GRIND_NSS_C and GRIND_NSS_F, update the "Reference/Notes" column to describe the metal speciation as the greater of the March 2021 baghouse dust data and the alloy percent composition instead of the "greater of

March 2021 baghouse dust analysis and source test approved on November 20, 2023";

The references for the GRIND TEUs have been updated in AQ520 as requested.

5. For TEUs D1-1, D1-3, D1-4, update the "Reference/Notes" column to include that TAC speciation comes from the product SDS as well as baghouse dust analysis where appropriate; and

The references for TEUs D1-1, D1-3, and D1-4 have been updated in AQ520 as requested.

6. For the SCREENING TEU, update the "Reference/Notes" column to note: "AP-42 Chapter 12.10, Table 12.10-7. Assumes value for baghouse-controlled sand handling with sand-to-metal ratio of 1.16 tons per ton";

The reference for the SCREENING TEU has been updated in AQ520 as requested.

iv. On Worksheet 3, correct the annual and daily emission factors for TEU GRIND_SS_F – they appear to have been transposed for chromium VI (CASRN 18540-29-9), nickel (CASRN 7440-02-0), and manganese (CASRN 7439-96-5); and

The emission factors for the GRIND_SS_F TEU have been updated in AQ520 as requested.

v. On Worksheet 3, update emission factors for the SCREENING TEU to be consistent with the supporting calculations (in units of pounds per ton metal poured).

The emission factors for the SCREENING TEU are unchanged. However, the emission factor units have been updated to pounds per ton of sand handled. Sand throughput remains based on the 1.16 sand-to-metal ratio.

MFA made additional edits to the emissions inventory. As recommended by the DEQ, MFA updated the annual TAC compositions (percent TAC in alloy) for the GRIND, AIRARC, and MF_STEEL TEUs, to a production weighted value based on 2022 production of each alloy. MFA also increased throughput of the Coated Cerabead, G-29 sand, and Naigai Cerabead based on the 1.16 sand-to metal ratio. Velvacoat St 803 (Mold Wash Z) throughput was also increased, based on an analysis of future needs.

Thank you for working with us throughout this process. Please reach out with any questions you may have.

Sincerely,

Maul Foster & Alongi, Inc.

Chad Darby
Principal Air Quality Specialist

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Attachments

A—CAO Emissions Inventory (Rev9.23.24)

B—Slag Dust Report

C—Material Handling SDS

D—Bunker Photos

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Attachment A

CAO Emissions Inventory REV9.23.2024

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Table 1
Input Process Rates and Parameters
Eagle Foundry Company

Source	Production or Throughput Rate							
	2021				PTE			
	Daily		Annual		Daily		Annual	
Facility								
Facility Hours of Operation	20.0	(hrs/day) [1]	6,240	(hrs/yr) [a]	24.0	(hrs/day) [2]	8,760	(hrs/yr) [2]
Foundry								
Total Metal Melted	23.6	(tons/day) [b]	5,675	(tons/yr) [1]	31.0	(tons/day) [4]	8,060	(tons/yr) [1]
Total White Iron Melted	18.9	(tons/day) [c]	4,540	(tons/yr) [c]	0	(tons/day) [5]	6,448	(tons/yr) [c]
Total Steel Melted	4.72	(tons/day) [c]	1,135	(tons/yr) [c]	31.0	(tons/day) [5]	1,612	(tons/yr) [c]
Total Metal Processed	14.5	(tons/day) [d]	3,482	(tons/yr) [d]	19.0	(tons/day) [d]	4,945	(tons/yr) [d]
Total Hot Top	92.3	(lb/day) [b]	24,005	(lb/yr) [1]	142	(lb/day) [b]	34,093	(lb/yr) [e]
Heat Treat								
Total Propane Usage	633	(gal/day) [b]	151,830	(gal/yr) [1]	898	(gal/day) [b]	215,639	(gal/yr) [e]
AirArc								
AirArc Process Hours of Operation	10.0	(hrs/day) [1]	3,120	(hrs/yr) [a]	24.0	(hrs/day) [b]	4,431	(hrs/yr) [e]
Cutting Torch Hours of Operation	2.80	(hrs/day) [f]	859	(hrs/yr) [f]	6.60	(hrs/day) [f]	1,220	(hrs/yr) [f]
Welding								
Percentage of Welding Wire to Waste	--		5	(%) [1]	--		5	(%) [1]
Total Wire - Excluding Waste	29.8	(lb/day) [h]	7,150	(lb/yr) [h]	42.3	(lb/day) [b]	10,155	(lb/yr) [h]
Lincore M WIRE HF LCM 1/16 25# SP	3.33	(lb/day) [b]	800	(lb/yr) [1]	--		1,136	(lb/yr) [e]
Sandvik WIRE 309LSI .035 X 33 LB	0.14	(lb/day) [b]	33.0	(lb/yr) [1]	--		46.9	(lb/yr) [e]
Avesta 2205 ELECTR SS E2209 1/8 10#	1.25	(lb/day) [b]	300	(lb/yr) [1]	--		426	(lb/yr) [e]
Prostar S-6 WIRE MS 70S6 035 33# SP PRS	3.35	(lb/day) [b]	803	(lb/yr) [1]	--		1,140	(lb/yr) [e]
Stoody WIRE HF 965-G 045 33# SP	3.71	(lb/day) [b]	891	(lb/yr) [1]	--		1,265	(lb/yr) [e]
Hobart WIRE EXCELARC 71 .045 X 33 LB	0.41	(lb/day) [b]	99.0	(lb/yr) [1]	--		141	(lb/yr) [e]
CARBONS 1/2X17 CTD DC JTD 100	19.2	(lb/day) [b]	4,600	(lb/yr) [1]	--		6,533	(lb/yr) [e]

Table 1
Input Process Rates and Parameters
Eagle Foundry Company

Source	Production or Throughput Rate									
	2021					PTE				
	Daily			Annual		Daily			Annual	
Pattern Production										
Urethane	0.25	(gal/day)	(b)	60.0	(gal/yr) (1)	0.36	(gal/day)	(b)	85.2	(gal/yr) (e)
Mar-Proof H/S Lacquer Sanding Sealer	0.021	(gal/day)	(b)	5.00	(gal/yr) (1)	0.030	(gal/day)	(b)	7.1	(gal/yr) (e)
Finishing										
Total Grinding (Metal Processed)	14.5	(tons/day)	(7)	3,482	(tons/yr) (7)	19.0	(tons/day)	(7)	4,945	(tons/yr) (7)
Grinding - Stainless Steel	--			--		2.5	(tons/day)	(1)	651	(tons/yr) (1)
Grinding - Non-stainless Steel	--			--		16.5	(tons/day)	(1)	4,294	(tons/yr) (1)
Abrasive Blasting										
Total Metal Finished by Abrasive Blasting	1.74	(tons/day)	(i)	418	(tons/yr) (i)	12.0	(tons/day)	(1)	593	(tons/yr) (i)
Mesh Blast (metal finished)	--		(8)	--	(8)	3.00	(tons/day)	(1)	59.3	(tons/yr) (1)
Shot Blast (metal finished)	1.74	(tons/day)	(1)	418	(tons/yr) (1)	9.00	(tons/day)	(1)	534	(tons/yr) (1)
Mold Production										
Total Sand Handled	--			1,354,448	(lb/yr) (10)	--			9,350	(tons/yr) (i)
Small Palmer Molding System										
Velvacoat St 803 - Mold Wash Z	49.2	(lb/day)	(b)	11,800	(lb/yr) (10)	41.7	(lb/day)	(b)	10,000	(lb/yr) (1)
Coated Cerabead	37.5	(lb/day)	(b)	9,000	(lb/yr) (10)	518	(lb/day)	(b)	124,257	(lb/yr) (j)
G-29 Sand	88.8	(lb/day)	(b)	21,312	(lb/yr) (10)	1,226	(lb/day)	(b)	294,241	(lb/yr) (j)
Naigai Cerabead	3,789	(lb/day)	(b)	820,964	(lb/yr) (10)	47,227	(lb/day)	(b)	11,334,527	(lb/yr) (j)
Unibond 1350 Core Paste	32.0	(lb/day)	(b)	6,925	(lb/yr) (1)	41.0	(lb/day)	(b)	9,835	(lb/yr) (e)
Small Palmer Molding Line (dust collected)	66.5	(lb/day)	(1)	10.4	(tons/yr) (n)	114	(lb/day)	(l)	14.8	(tons/yr) (e)
Big Palmer Molding System										
Velvacoat St 803 - Mold Wash Z	49.2	(lb/day)	(b)	11,800	(lb/yr) (1)	125	(lb/day)	(b)	30,000	(lb/yr) (1)
Isomol - Mold Wash M	15.0	(lb/day)	(b)	3,600	(lb/yr) (1)	21.3	(lb/day)	(b)	5,113	(lb/yr) (e)
Naigai Cerabead	2,097	(lb/day)	(b)	503,172	(lb/yr) (10)	28,946	(lb/day)	(b)	6,946,975	(lb/yr) (j)
Unibond 1350 Core Paste	17.7	(lb/day)	(b)	4,244	(lb/yr) (1)	25.1	(lb/day)	(b)	6,028	(lb/yr) (e)

Table 1
Input Process Rates and Parameters
Eagle Foundry Company

Source	Production or Throughput Rate								
	2021				PTE				
	Daily		Annual		Daily		Annual		
Silo Operation									
Silos Hours of Operation	20.0	(hrs/day) (11)	4,800	(hrs/yr) (11)	20.0	(hrs/day) (11)	8,760	(hrs/yr) (11)	
Slag Handling									
Slag Handling	0.50	(tons/day) (1)	156	(tons/yr) (1)	0.90	(tons/day) (b)	222	(tons/yr) (e)	
Emergency Generator									
Hours of Operation	2.00	(hrs/day) (1)	65.0	(hrs/yr) (1)	2.00	(hrs/day) (1)	100	(hrs/yr) (12)	
Diesel Usage	14.6	(gal/day) (m)	475	(gal/yr) (m)	14.6	(gal/day) (m)	730	(gal/yr) (m)	

Filter	Control Efficiency (%)	
Foundry Baghouse Control Efficiency for PM	90.0	(14)
Reclamation Baghouse Control Efficiency for PM	99.0	(1)
Baghouse Control Efficiency for $PM_{>10}$	100	(15)
Baghouse Control Efficiency for $PM_{2.5-10}$	99.5	(15)
Baghouse Control Efficiency for $PM_{2.5}$	99.0	(15)

Notes

gal = gallon; PM = particulate matter.

(a) 2021 Annual hours of operation (hrs/yr) = (daily hours of operation [hrs/day]) x (operational days per week [days/week]) x (operational weeks per year [weeks/yr])

Operational days per week (days/week) = 6.00 (1)

Operational weeks per year [weeks/yr]) = 52.0 (1)

(b) Daily usage (unit/day) = (annual usage [unit/yr]) / (operational days per week [days/week]) / (operational weeks per year [weeks/yr])
x (1 + [short-term variability factor {%}]/100)

Short-term variability factor (%) = 30.0 (3)

(c) Metal poured (tons/unit) = (annual usage [tons/yr]) / (percentage of total metal poured [%]/100)

White Iron percentage of total metal poured (%) = 80.0 (1)

Steel percentage of total metal poured (%) = 20.0 (1)

Table 1
Input Process Rates and Parameters
Eagle Foundry Company

(d) Total metal processed (tons metal processed) = (total metal poured [tons metal poured]) x (1 - [reject percentage {%}]/100) x (1 - [percentage of metal poured for riser {%}]/100)

Reject percentage (%) =	1.05	(1)
Percentage of metal poured for riser (%) =	38.0	(1)

(e) Annual parameter, PTE (units/yr) = (annual parameter, 2021 [units/yr]) x (total metal melt, PTE [tons melt/yr]) / (total metal melt, 2021 [tons melt/yr])

(f) Cutting torch hours of operation = (AirArc process hours of operation [hours/unit]) x (AirArc cutting time to total work time ratio)

AirArc cutting torch time to total work time ratio =	0.28	(g)

(g) AirArc cutting time to total work time ratio = (average minutes of cutting torch operation [minutes/unit]) / (average total minutes of operation [minutes/unit])

Average minutes of cutting torch operation (minutes) =	8.26	(6)
Average total minutes of operation (minutes) =	30.0	(6)

(h) Total welding wire - excluding waste (lb/unit) = (sum of welding wire usage [lb/unit]) x (1 - (percentage of welding wire waste [%] /100)

(i) Total metal finished by abrasive blasting (tons/unit) = (total metal processed [tons/unit]) x (percentage of metal processed finished by abrasive blasting [%]/100)

Percentage of metal processed finished by abrasive blasting (%) =	12.0	(1)

(i) Total sand handling (tons/yr) = (metal poured [tons/yr]) x (sand-to-metal ratio)

Sand-to-metal ratio (tons/ton) =	1.16	(9)

(j) Product usage (lb/yr) = (total sand handling [tons/yr]) x (2,000 lb/ton) x (2021 product purchase [lb/yr]) / (2021 total sand handling [lb/yr])

(l) Maximum daily parameter (lb/day) = (annual parameter [tons/yr]) x (2,000 lb/ton) / (operational days per week [days/week]) / (operational weeks per year [weeks/yr]) x (1 + [short-term variability factor {%}]/100)

Short-term variability factor (%) =	20.0	(3)

(m) Diesel usage (gal/unit) = (diesel usage [gal/hour]) x (hours of operation [hrs/unit])

Diesel usage (gal/hr) =	7.30	(13)

(n) Annual dust collected (tons/yr) = (daily dust collected [lb/day]) / (2,000 lb/ton) x (operational days per week [days/week]) x (operational weeks per year [weeks/yr])

References

(1) Information provided by Eagle Foundry.

(2) Assumes continuous operation.

(3) Based on a 20 percent increase for short-term variability.

(4) Information provided by facility. Maximum daily production for PTE is based on the daily capacity of foundry operations.

Table 1
Input Process Rates and Parameters
Eagle Foundry Company

(5) 100 percent of daily metal melted is allocated to HK steel alloy. Emissions from alloy HK results in the maximum predicted acute risk value.

(6) Based on an Eagle Foundry study of the time that cutting torches are in operation during AirArc process operations.

(7) Value represents the total metal processed. Total metal processed is equivalent to total metal melt minus reject percentage and metal poured for risers.

(8) The mesh blast unit was not used in 2021.

(9) Ratio of sand to total metal poured is based on facility operations. Value includes G-29 Sand, Naigai Cerabead, and Coated Cerabead.

(10) Information provided by Eagle Foundry. Values based on purchase records.

(11) Based on continuous operation for PTE estimates.

(12) See CFR 40 Ch. 1(C)(63). Emergency engines may only be operated for a maximum of 100 hours per calendar year.

(13) Based on a 100 kW emergency generator at 100 percent load.

(14) Assumed control efficiency provided by the Oregon DEQ by letter dated August 11, 2023.

(15) RTI International, 2012, Table F-1, Typical Collection Efficiencies of Various Particulate Control Devices. Assumes fabric filter—low temperature. RTI states that control efficiencies for PM larger that 10 micrometers in diameter are 100 percent.

Table 2
Foundry Emission Factors
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor											
		Steel						White Iron					
		Main Foundry Baghouse		Cooling Bunker Baghouse		Total		Main Foundry Baghouse		Cooling Bunker Baghouse		Total	
Aluminum and Compounds	7429-90-5	1.89E-03	(lb/ton melt) [1]	1.45E-03	(lb/ton melt) [1]	3.34E-03	(lb/ton melt)	1.94E-03	(lb/ton melt) [1]	1.72E-03	(lb/ton melt) [1]	3.66E-03	(lb/ton melt)
Antimony and Compounds	7440-36-0	< 1.60E-05	(lb/ton melt) [1]	< 1.48E-05	(lb/ton melt) [1]	< 3.08E-05	(lb/ton melt)	1.49E-05	(lb/ton melt) [1]	< 1.05E-05	(lb/ton melt) [1]	2.54E-05	(lb/ton melt)
Arsenic and Compounds	7440-38-2	< 6.01E-05	(lb/ton melt) [1]	< 5.43E-05	(lb/ton melt) [1]	< 1.14E-04	(lb/ton melt)	ND		< 4.42E-05	(lb/ton melt) [1]	< 4.42E-05	(lb/ton melt)
Barium and Compounds	7440-39-3	1.29E-04	(lb/ton melt) [1]	4.76E-05	(lb/ton melt) [1]	1.77E-04	(lb/ton melt)	7.42E-05	(lb/ton melt) [1]	3.70E-05	(lb/ton melt) [1]	1.11E-04	(lb/ton melt)
Beryllium and compounds	7440-41-7	ND		ND		ND		ND		ND		ND	
Cadmium and Compounds	7440-43-9	< 7.78E-06	(lb/ton melt) [1]	< 3.14E-06	(lb/ton melt) [1]	< 1.09E-05	(lb/ton melt)	< 3.71E-06	(lb/ton melt) [1]	ND		< 3.71E-06	(lb/ton melt)
Chromium	7440-47-3	3.43E-03	(lb/tons TAC in melt) [1]	9.38E-04	(lb/tons TAC in melt) [1]	4.37E-03	(lb/tons TAC in melt)	2.31E-04	(lb/tons TAC in melt) [1]	9.26E-05	(lb/tons TAC in melt) [1]	3.24E-04	(lb/tons TAC in melt)
Chromium VI	18540-29-9	1.32E-05	(lb/tons TAC in melt) [1]	1.87E-05	(lb/tons TAC in melt) [1]	3.19E-05	(lb/tons TAC in melt)	7.20E-07	(lb/tons TAC in melt) [1]	< 1.16E-06	(lb/tons TAC in melt) [1]	1.88E-06	(lb/tons TAC in melt)
Cobalt and Compounds	7440-48-4	< 2.43E-06	(lb/ton melt) [1]	< 1.98E-06	(lb/ton melt) [1]	< 4.41E-06	(lb/ton melt)	< 2.45E-06	(lb/ton melt) [1]	< 2.03E-06	(lb/ton melt) [1]	< 4.48E-06	(lb/ton melt)
Copper and Compounds	7440-50-8	< 7.96E-05	(lb/ton melt) [1]	< 7.42E-05	(lb/ton melt) [1]	< 1.54E-04	(lb/ton melt)	< 9.54E-05	(lb/ton melt) [1]	7.87E-05	(lb/ton melt) [1]	1.74E-04	(lb/ton melt)
Lead and Compounds	7439-92-1	ND		< 3.66E-05	(lb/ton melt) [1]	< 3.66E-05	(lb/ton melt)	< 5.49E-05	(lb/ton melt) [1]	< 4.43E-05	(lb/ton melt) [1]	< 9.92E-05	(lb/ton melt)
Manganese and Compounds	7439-96-5	4.11E-03	(lb/tons TAC in melt) [1]	2.20E-03	(lb/tons TAC in melt) [1]	6.31E-03	(lb/tons TAC in melt)	0.0345	(lb/tons TAC in melt) [1]	0.0122	(lb/tons TAC in melt) [1]	4.67E-02	(lb/tons TAC in melt)
Mercury	7439-97-6	< 4.16E-06	(lb/ton melt) [1]	< 2.92E-06	(lb/ton melt) [1]	< 7.08E-06	(lb/ton melt)	< 1.99E-06	(lb/ton melt) [1]	< 1.52E-06	(lb/ton melt) [1]	< 3.51E-06	(lb/ton melt)
Molybdenum Trioxide	1313-27-5	2.24E-06	(lb/ton melt) [a]	1.05E-05	(lb/ton melt) [a]	1.27E-05	(lb/ton melt)	2.24E-06	(lb/ton melt) [a]	1.05E-05	(lb/ton melt) [a]	1.27E-05	(lb/ton melt)
Nickel and Compounds	7440-02-0	< 0.0197	(lb/tons TAC in melt) [1]	5.98E-03	(lb/tons TAC in melt) [1]	0.0257	(lb/tons TAC in melt)	< 9.78E-05	(lb/ton melt) [1]	6.44E-05	(lb/ton melt) [1]	1.62E-04	(lb/ton melt)
Phosphorus and Compounds	504	< 2.14E-04	(lb/ton melt) [1]	< 1.74E-04	(lb/ton melt) [1]	< 3.88E-04	(lb/ton melt)	< 1.66E-04	(lb/ton melt) [1]	< 4.19E-05	(lb/ton melt) [1]	< 2.08E-04	(lb/ton melt)
Selenium and Compounds	7782-49-2	ND		ND		ND		ND		ND		ND	
Silver and Compounds	7440-22-4	< 1.49E-05	(lb/ton melt) [1]	ND		ND	1.49E-05	< 1.75E-05	(lb/ton melt) [1]	ND		< 1.75E-05	(lb/ton melt)
Thallium	7440-28-0	ND		ND		ND		ND		ND		ND	
Vanadium (fume or dust)	7440-62-2	ND		ND		ND		ND		ND		ND	
Zinc and Compounds	7440-66-6	2.17E-04	(lb/ton melt) [1]	2.17E-04	(lb/ton melt) [1]	4.34E-04	(lb/ton melt)	2.29E-04	(lb/ton melt) [1]	2.03E-04	(lb/ton melt) [1]	4.32E-04	(lb/ton melt)

Notes

< = Value calculated using the minimum detection limit for front half and/or back half results that were non-detect.

ND = Non-detect. Results were below the analytical detection limit for all sample train components in all source test runs; TAC = toxic air contaminant.

[a] Emission factor (lb/ton melt) = (PM emission factor [lb/ton]) x (1 - [control efficiency of the foundry baghouses {%}]/100) x (percent TAC in PM [%]) / 100

PM emission factor, melt (lb/ton) =	0.90	(2)
PM emission factor, pour/cool (lb/ton) =	4.20	(3)
Control efficiency of foundry baghouses (%) =	90.0	(4)
Molybdenum trioxide percentage of PM (%) =	2.49E-03	(b)

[b] Molybdenum trioxide emission factor (% of PM emitted) = (molybdenum emission factor [% of PM emitted]) x (molybdenum trioxide molecular weight [lb/lb-mole]) / (molybdenum molecular weight [lb/lb-mole]) (5)

Molybdenum and Compounds percentage of PM (%) =	1.66E-03	(6)
Molybdenum trioxide molecular weight (lb/lb-mole) =	143.94	
Molybdenum molecular weight (lb/lb-mole) =	95.95	

Table 2
Foundry Emission Factors
Eagle Foundry Company

References

(1) Values provided by the DEQ on November 20, 2023 in their source test review memorandum following review of the Main Foundry and Cooling Bunker Baghouses Emission Factor Determination and Main Foundry PTE Verification Source Test Report prepared by Bison Engineering, dated October 13, 2023.

(2) AP-42, Chapter 12.10, Table 12.10-3 "Particulate Emission Factors for Iron Furnaces". Uncontrolled particulate emission factor for melting in an electric induction furnace.

(3) AP-42, Chapter 12.10, Table 12.10-7 "Particulate Emission Factors for Ancillary Operations and Fugitive Sources at Gray Iron Foundries". Value for uncontrolled particulate emission factor for pouring and cooling in an electric induction furnace.

(4) See Table 1, Input Process Rates and Parameters. The foundry building has been approved as a permanent total enclosure. Fugitive emissions from the reclamation system are controlled by the main foundry baghouse.

(5) Conservatively assumes 100 percent of molybdenum is in the trioxide form.

(6) Based on baghouse dust analysis conducted by Apex Laboratories, March 2021.

Table 3
PTE Foundry White Iron TAC Emissions Estimate
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	White Iron Emission Factor [1]				Emissions Estimate				Total Emissions Estimate	
		Main Foundry		Cooling Bunker		Main Foundry		Cooling Bunker			
						Daily [2] (lb/day)	Annual (lb/yr)	Daily [2] (lb/day)	Annual (lb/yr)	Daily [2] (lb/day)	Annual [3] (lb/yr)
Aluminum and Compounds	7429-90-5	1.94E-03	(lb/ton melt)	1.72E-03	(lb/ton melt)	--	12.5 [a]	--	11.1 [a]	--	23.6
Antimony and Compounds	7440-36-0	1.49E-05	(lb/ton melt)	< 1.05E-05	(lb/ton melt)	--	0.096 [a]	--	0.068 [a]	--	0.16
Arsenic and Compounds	7440-38-2	ND		< 4.42E-05	(lb/ton melt)	--	--	--	0.29 [a]	--	0.29
Barium and Compounds	7440-39-3	7.42E-05	(lb/ton melt)	3.70E-05	(lb/ton melt)	--	0.48 [a]	--	0.24 [a]	--	0.72
Cadmium and Compounds	7440-43-9	< 3.71E-06	(lb/ton melt)	ND		--	0.024 [a]	--	--	--	0.024
Chromium	7440-47-3	2.31E-04	(lb/tons TAC in melt)	9.26E-05	(lb/tons TAC in melt)	--	0.39 [b]	--	0.16 [b]	--	0.54
Chromium VI	18540-29-9	7.20E-07	(lb/tons TAC in melt)	< 1.16E-06	(lb/tons TAC in melt)	--	1.2E-03 [b]	--	1.9E-03 [b]	--	3.2E-03
Cobalt and Compounds	7440-48-4	< 2.45E-06	(lb/ton melt)	< 2.03E-06	(lb/ton melt)	--	0.016 [a]	--	0.013 [a]	--	0.029
Copper and Compounds	7440-50-8	< 9.54E-05	(lb/ton melt)	7.87E-05	(lb/ton melt)	--	0.62 [a]	--	0.51 [a]	--	1.12
Lead and Compounds	7439-92-1	< 5.49E-05	(lb/ton melt)	< 4.43E-05	(lb/ton melt)	--	0.35 [a]	--	0.29 [a]	--	0.64
Mercury	7439-97-6	< 1.99E-06	(lb/ton melt)	< 1.52E-06	(lb/ton melt)	--	0.013 [a]	--	9.8E-03 [a]	--	0.023
Manganese and Compounds	7439-96-5	0.0345	(lb/tons TAC in melt)	0.0122	(lb/tons TAC in melt)	--	2.67 [b]	--	0.94 [b]	--	3.61
Molybdenum Trioxide	1313-27-5	2.24E-06	(lb/ton melt)	1.05E-05	(lb/ton melt)	--	0.014 [a]	--	0.067 [a]	--	0.082
Nickel and Compounds	7440-02-0	< 9.78E-05	(lb/ton melt)	6.44E-05	(lb/ton melt)	--	0.63 [a]	--	0.42 [a]	--	1.05
Phosphorus and Compounds	504	< 1.66E-04	(lb/ton melt)	< 4.19E-05	(lb/ton melt)	--	1.07 [a]	--	0.27 [a]	--	1.34
Silver and Compounds	7440-22-4	< 1.75E-05	(lb/ton melt)	ND		--	0.11 [a]	--	--	--	0.11
Zinc and Compounds	7440-66-6	2.29E-04	(lb/ton melt)	2.03E-04	(lb/ton melt)	--	1.48 [a]	--	1.31 [a]	--	2.79

Notes

ND = Non-detect. Results were below the analytical detection limit for all sample train components in all source test runs; TAC = toxic air contaminant.

[a] Annual emissions estimate (lb/yr) = (emission factor [lb/ton melt]) x (annual metal melted [tons/yr])

White Iron - total metal melted (tons/yr) = 6,448 (4)

[b] Annual emissions estimate (lb/yr) = (emission factor [lb/tons TAC in melt]) x (annual metal melt [tons/yr]) x (tons TAC/ton melt)

White Iron - Chromium in melt (ton TAC/ton melt) = 0.26 (5)

White Iron - Manganese in melt (ton TAC /ton melt) = 0.012 (5)

References

[1] See Table 2, Foundry Emission Factors.

[2] See Table 1, Input Process Rates and Parameters and Table D2, Alloy Toxicity Weighted Emission Rates . All daily production is attributed to HK steel alloy which will result in the maximum predicted acute hazard index. The daily emissions estimates for the main foundry and cooling bunker are shown in Table 4, PTE Foundry Steel TAC Emissions Estimate.

[3] Sum of main foundry and cooling bunker emission estimates.

[4] See Table 1, Input Process Rates and Parameters.

[5] See Table D1, Alloy Composition Data. Annual emissions estimate for the main foundry and cooling bunker are based on the maximum TAC content of all iron alloys.

Table 4
PTE Foundry Steel TAC Emissions Estimate
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Steel Emission Factor [1]		Emissions Estimate				Total Emissions Estimate [2]	
		Main Foundry	Cooling Bunker	Main Foundry		Cooling Bunker			
				Daily (lb/day)	Annual (lb/yr)	Daily (lb/day)	Annual (lb/yr)	Daily (lb/day)	Annual (lb/yr)
Aluminum and Compounds	7429-90-5	1.89E-03 (lb/ton melt)	1.45E-03 (lb/ton melt)	0.059 [a]	3.05 [b]	0.045 [a]	2.34 [b]	0.10	5.38
Antimony and Compounds	7440-36-0	< 1.60E-05 (lb/ton melt)	< 1.48E-05 (lb/ton melt)	5.0E-04 [a]	0.026 [b]	4.6E-04 [a]	0.024 [b]	9.5E-04	0.050
Arsenic and Compounds	7440-38-2	< 6.01E-05 (lb/ton melt)	< 5.43E-05 (lb/ton melt)	1.9E-03 [a]	0.097 [b]	1.7E-03 [a]	0.088 [b]	3.5E-03	0.18
Barium and Compounds	7440-39-3	1.29E-04 (lb/ton melt)	4.76E-05 (lb/ton melt)	4.0E-03 [a]	0.21 [b]	1.5E-03 [a]	0.077 [b]	5.5E-03	0.28
Cadmium and Compounds	7440-43-9	< 7.78E-06 (lb/ton melt)	< 3.14E-06 (lb/ton melt)	2.4E-04 [a]	0.013 [b]	9.7E-05 [a]	5.1E-03 [b]	3.4E-04	0.018
Chromium	7440-47-3	3.43E-03 (lb/tons TAC in melt)	9.38E-04 (lb/tons TAC in melt)	0.028 [c]	0.097 [d]	7.6E-03 [c]	0.027 [d]	0.035	0.12
Chromium VI	18540-29-9	1.32E-05 (lb/tons TAC in melt)	1.87E-05 (lb/tons TAC in melt)	1.1E-04 [c]	3.7E-04 [d]	1.5E-04 [c]	5.3E-04 [d]	2.6E-04	9.1E-04
Cobalt and Compounds	7440-48-4	< 2.43E-06 (lb/ton melt)	< 1.98E-06 (lb/ton melt)	7.5E-05 [a]	3.9E-03 [b]	6.1E-05 [a]	3.2E-03 [b]	1.4E-04	7.1E-03
Copper and Compounds	7440-50-8	< 7.96E-05 (lb/ton melt)	< 7.42E-05 (lb/ton melt)	2.5E-03 [a]	0.13 [b]	2.3E-03 [a]	0.12 [b]	4.8E-03	0.25
Lead and Compounds	7439-92-1	ND	< 3.66E-05 (lb/ton melt)	--	--	1.1E-03 [a]	0.059 [b]	1.1E-03	0.059
Mercury	7439-97-6	< 4.16E-06 (lb/ton melt)	< 2.92E-06 (lb/ton melt)	1.3E-04 [a]	6.7E-03 [b]	9.1E-05 [a]	4.7E-03 [b]	2.2E-04	0.011
Manganese and Compounds	7439-96-5	4.11E-03 (lb/tons TAC in melt)	2.20E-03 (lb/tons TAC in melt)	1.3E-03 [c]	0.35 [d]	6.8E-04 [c]	0.19 [d]	2.0E-03	0.54
Molybdenum Trioxide	1313-27-5	2.24E-06 (lb/ton melt)	1.05E-05 (lb/ton melt)	6.9E-05 [a]	3.6E-03 [b]	3.2E-04 [a]	0.017 [b]	3.9E-04	0.020
Nickel and Compounds	7440-02-0	< 0.020 (lb/tons TAC in melt)	5.98E-03 (lb/tons TAC in melt)	0.12 [c]	0.35 [d]	0.037 [c]	0.11 [d]	0.16	0.46
Phosphorus and Compounds	504	< 2.14E-04 (lb/ton melt)	< 1.74E-04 (lb/ton melt)	6.6E-03 [a]	0.34 [b]	5.4E-03 [a]	0.28 [b]	0.012	0.63
Silver and Compounds	7440-22-4	< 1.49E-05 (lb/ton melt)	ND	4.6E-04 [a]	0.024 [b]	--	--	4.6E-04	0.024
Zinc and Compounds	7440-66-6	2.17E-04 (lb/ton melt)	2.17E-04 (lb/ton melt)	6.7E-03 [a]	0.35 [b]	6.7E-03 [a]	0.35 [b]	0.013	0.70

Notes

ND = Non-detect. Results were below the analytical detection limit for all sample train components in all source test runs; TAC = toxic air contaminant.

[a] Daily emissions estimate (lb/day) = (emission factor [lb/ton melt]) x (daily metal melt [tons/day])

Steel - total metal melt (tons/day) = 31.0 (3)

[b] Annual emissions estimate (lb/yr) = (emission factor [lb/ton melt]) x (annual metal melt [tons/yr])

Steel - total metal melt (tons/yr) = 1,612 (3)

[c] Daily emissions estimate (lb/day) = (emission factor [lb/tons TAC in melt]) x (daily metal melt [tons/day]) x (tons TAC/ton melt)

Steel - Chromium in melt (tons TAC/ton melt) = 0.26 (4)

Steel - Manganese in melt (tons TAC/ton melt) = 0.010 (4)

Steel - Nickel in melt (tons TAC/ton melt) = 0.20 (4)

[d] Annual emissions estimate (lb/yr) = (emission factor [lb/tons TAC in melt]) x (annual metal melt [tons/yr]) x (tons TAC/ton melt)

Steel - Chromium in melt (tons TAC/ton melt) = 0.018 (5)

Steel - Manganese in melt (tons TAC/ton melt) = 0.053 (5)

Steel - Nickel in melt (tons TAC/ton melt) = 0.011 (5)

Table 4
PTE Foundry Steel TAC Emissions Estimate
Eagle Foundry Company

References

(1) See Table 2, Foundry Emission Factors.

(2) Sum of main foundry and cooling bunker emission estimates.

(3) See Table 1, Input Process Rates and Parameters.

(4) See Table D1, Alloy Composition Data and Table D2, Alloy Toxicity Weighted Emission Rates. Daily emissions estimate for the main foundry and cooling bunker are based on alloy HK, which has the highest toxicity weighted emission rate of any melt and results in the maximum predicted acute hazard index.

(5) See Table D1, Alloy Composition Data. Annual emissions estimate for the main foundry and cooling bunker are based on the weighted average TAC content of all Steel alloys produced in 2022.

Table 5
PTE Hot Top TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant [1]	CAS	Emission Factor [a] (lb/lb hot top)	Emissions Estimate	
			Daily [b] (lb/day)	Annual [c] (lb/yr)
Silica, crystalline	7631-86-9 [4]	3.0E-04	4.3E-03	1.02

Notes

[a] Emission factor (lb/lb hot top used) = (percentage of TAC [%]/100) x (percentage airborne [%]/100)

Percentage of quartz (%) = 3.00 (1)

Percentage of product airborne (%) = 1.00 (2)

[b] Maximum daily emissions estimate (lb/day) = (emission factor [lb/lb hot top used])
x (maximum daily hot top usage [lb hot top used/day]) x (1 - control efficiency of baghouse [%]/100)

Maximum daily hot top usage (lb hot top used/day) = 142 (3)

Control efficiency of baghouse (%) = 90.0 (3)

[c] Annual emissions estimate (lb/yr) = (emission factor [lb/lb hot top used])
x (annual hot top usage [lb hot top used/yr]) x (1 - control efficiency of baghouse [%]/100)

Annual hot top usage (lb hot top used/yr) = 34,093 (3)

Control efficiency of baghouse (%) = 90.0 (3)

References

[1] Information from product SDS. Aluminum content of Hot Top is accounted for in foundry emissions.

[2] Hot top is the molten metal insulation applied after casting. Based on similar operations at other facilities, it is conservatively estimated that up to 1 percent of the total mass of the hot top used becomes airborne.

[3] See Table 1, Input Process Rates and Parameters.

[4] CAS 7631-86-9 (Silica, crystalline,-respirable) was substituted for CAS 14808-60-7 (crystalline silica—Quartz). Conservatively assumes all crystalline silica emitted is of respirable size.

Table 6
PTE Reclamation TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor		Emissions Estimate					
				To Main Foundry BH [1]		To Reclamation BH		Total	
				Daily (lb/day)	Annual (lb/yr)	Daily (lb/day)	Annual (lb/yr)	Daily (lb/day)	Annual (lb/yr)
PM	--	3.20	(lb/ton metal poured) [2]	0.99 [a]	258 [b]	0.89 [c]	232 [d]	1.88	490
Aluminum and Compounds	7429-90-5	1.52	(% of PM emitted) [6]	0.015 [e]	3.92 [f]	0.014 [e]	3.53 [f]	0.029	7.45
Antimony and Compounds	7440-36-0	3.7E-04	(% of PM emitted) [6]	3.7E-06 [e]	9.6E-04 [f]	3.3E-06 [e]	8.6E-04 [f]	7.0E-06	1.8E-03
Arsenic and Compounds	7440-38-2	2.4E-04	(% of PM emitted) [6]	2.4E-06 [e]	6.2E-04 [f]	2.2E-06 [e]	5.6E-04 [f]	4.6E-06	1.2E-03
Barium and Compounds	7440-39-3	9.5E-03	(% of PM emitted) [6]	9.4E-05 [e]	0.024 [f]	8.4E-05 [e]	0.022 [f]	1.8E-04	0.046
Beryllium and compounds	7440-41-7	2.6E-05	(% of PM emitted) [6]	2.6E-07 [e]	6.8E-05 [f]	2.3E-07 [e]	6.1E-05 [f]	4.9E-07	1.3E-04
Cadmium and Compounds	7440-43-9	1.4E-04	(% of PM emitted) [6]	1.4E-06 [e]	3.7E-04 [f]	1.3E-06 [e]	3.3E-04 [f]	2.7E-06	7.0E-04
Chromium	7440-47-3	0.0454	(% of PM emitted) [6]	4.5E-04 [e]	0.12 [f]	4.1E-04 [e]	0.11 [f]	8.6E-04	0.22
Chromium VI	18540-29-9	1.4E-03	(% of PM emitted) [7]	1.4E-05 [e]	3.5E-03 [f]	1.2E-05 [e]	3.2E-03 [f]	2.6E-05	6.7E-03
Cobalt and Compounds	7440-48-4	3.6E-04	(% of PM emitted) [6]	3.6E-06 [e]	9.4E-04 [f]	3.2E-06 [e]	8.4E-04 [f]	6.8E-06	1.8E-03
Copper and Compounds	7440-50-8	0.031	(% of PM emitted) [6]	3.0E-04 [e]	0.079 [f]	2.7E-04 [e]	0.071 [f]	5.8E-04	0.15
Lead and Compounds	7439-92-1	0.011	(% of PM emitted) [6]	1.1E-04 [e]	0.029 [f]	1.0E-04 [e]	0.026 [f]	2.1E-04	0.056
Manganese and Compounds	7439-96-5	0.27	(% of PM emitted) [6]	2.6E-03 [e]	0.69 [f]	2.4E-03 [e]	0.62 [f]	5.0E-03	1.31
Molybdenum trioxide	1313-27-5	1.7E-03	(% of PM emitted) [g]	1.6E-05 [e]	4.3E-03 [f]	1.5E-05 [e]	3.8E-03 [f]	3.1E-05	8.1E-03
Nickel and Compounds	7440-02-0	5.8E-03	(% of PM emitted) [6]	5.7E-05 [e]	0.015 [f]	5.1E-05 [e]	0.013 [f]	1.1E-04	0.028
Selenium and Compounds	7782-49-2	2.3E-04	(% of PM emitted) [6]	2.3E-06 [e]	6.0E-04 [f]	2.1E-06 [e]	5.4E-04 [f]	4.4E-06	1.1E-03
Silica, crystalline	7631-86-9	36.1	(% of PM emitted) [9]	0.36 [e]	93.1 [f]	0.32 [e]	83.8 [f]	0.68	177
Silver and Compounds	7440-22-4	2.5E-04	(% of PM emitted) [6]	2.5E-06 [e]	6.5E-04 [f]	2.3E-06 [e]	5.9E-04 [f]	4.8E-06	1.2E-03
Thallium	7440-28-0	1.5E-05	(% of PM emitted) [6]	1.5E-07 [e]	3.9E-05 [f]	1.4E-07 [e]	3.5E-05 [f]	2.9E-07	7.4E-05
Vanadium (fume or dust)	7440-62-2	1.5E-03	(% of PM emitted) [6]	1.4E-05 [e]	3.7E-03 [f]	1.3E-05 [e]	3.4E-03 [f]	2.7E-05	7.1E-03
Zinc and Compounds	7440-66-6	5.9E-03	(% of PM emitted) [6]	5.9E-05 [e]	0.015 [f]	5.3E-05 [e]	0.014 [f]	1.1E-04	0.029

Notes

BH = baghouse; PM = particulate matter.

[a] Daily emissions estimate to Main Foundry Baghouse (lb/day) = (emission factor [lb/ton metal poured]) x (daily metal poured [tons/day]) x (1 - [capture efficiency of reclamation system {%}]/100) x (1 - [control efficiency of the main foundry baghouse {%}]/100)

Daily metal poured (tons/day) =	31.0	(3)
Capture efficiency of reclamation system (%) =	90.0	(4)
Control efficiency of main foundry baghouse (%) =	90.0	(5)

[b] Annual emissions estimate to Main Foundry Baghouse (lb/yr) = (emission factor [lb/ton metal poured]) x (annual metal poured [tons/yr]) x (1 - [capture efficiency of reclamation system {%}]/100) x (1 - [control efficiency of the main foundry baghouse {%}]/100)

Annual metal poured (tons/yr) =	8,060	(3)

Table 6
PTE Reclamation TAC Emission Estimates
Eagle Foundry Company

(c) Daily emissions estimate to Reclamation Baghouse (lb/day) = (emission factor [lb/ton metal poured]) x (daily metal poured [tons/day]) x (capture efficiency of reclamation system [%]/100) x (1 - [control efficiency of the reclamation baghouse {%}]/100)

Daily metal poured (tons/day) =	31.0	(3)
Control efficiency of the reclamation baghouse (%) =	99.0	(3)

(d) Annual emissions estimate to Reclamation Baghouse (lb/yr) = (emission factor [lb/ton metal poured]) x (annual metal poured [tons/yr]) x (capture efficiency of reclamation system [%]/100) x (1 - [control efficiency of the reclamation baghouse {%}]/100)

Annual metal poured (ton/yr) =	8,060	(3)

(e) Daily emissions estimate (lb/day) = (daily PM emissions [lb/day]) x (emission factor [% of PM emitted]/100)

(f) Annual emissions estimate (lb/yr) = (annual PM emissions [lb/yr]) x (emission factor [% of PM emitted]/100)

(g) Molybdenum trioxide emission factor (% of PM emitted) = (molybdenum emission factor [% of PM emitted]) x (molybdenum trioxide molecular weight [lb/lb-mole]) / (molybdenum molecular weight [lb/lb-mole])

		(8)
Molybdenum and Compounds percentage of PM (%) =	1.1E-03	(6)
Molybdenum trioxide molecular weight (lb/lb-mole) =	143.94	
Molybdenum molecular weight (lb/lb-mole) =	95.95	

References

(1) Fugitive emissions from the reclamation system are captured by the foundry permanent total enclosure and are controlled by the main foundry baghouse.

(2) AP-42, Chapter 12.10, Table 12.10-7 "Particulate Emission Factors for Ancillary Operations and Fugitive Sources at Gray Iron Foundries". Uncontrolled particulate emission factor for shakeout.

(3) See Table 1, Input Process Rates and Parameters.

(4) Capture efficiency provided by the DEQ based on equipment configuration of enclosed, rotary shakeout.

(5) See Table 1, Input Process Rates and Parameters. The foundry building has been approved as a permanent total enclosure. Fugitive emissions from the reclamation system are controlled by the main foundry baghouse.

(6) Based on baghouse dust analysis conducted by Apex Laboratories, March 2021.

(7) As a conservative estimate, Chromium VI is assumed to be 3 percent of total chromium. Eagle Foundry reserves the right to revise this assumption if site specific data becomes available.

(8) Conservatively assumes 100 percent of molybdenum is in the trioxide form.

(9) Value is the weighted average silica content of mold making materials.

Table 7
PTE Air Arc Cutting TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor				Emissions Estimate	
		Daily		Annual		Daily (lb/day)	Annual (lb/yr)
PM	--	0.060	(lb/hr) [1]	0.060	(lb/hr) [1]	4.0E-03 [a]	0.73 [b]
Chromium	7440-47-3	0.50	(% TAC in alloy) [3]	1.26	(% TAC in alloy) [4]	2.0E-05 [c]	9.3E-03 [d]
Chromium VI	18540-29-9	0.015	(% TAC in alloy) [5]	0.038	(% TAC in alloy) [5]	5.9E-07 [c]	2.8E-04 [d]
Copper and Compounds	7440-50-8	0	[3]	0.083	(% TAC in alloy) [4]	0	6.1E-04 [d]
Manganese and Compounds	7439-96-5	12.75	(% TAC in alloy) [3]	5.36	(% TAC in alloy) [4]	5.0E-04 [c]	0.039 [d]
Molybdenum trioxide	1313-27-5	0.75	(% TAC in alloy) [e]	0.66	(% TAC in alloy) [e]	3.0E-05 [c]	4.8E-03 [d]
Nickel and Compounds	7440-02-0	0.80	(% TAC in alloy) [3]	0.81	(% TAC in alloy) [4]	3.2E-05 [c]	5.9E-03 [d]
Phosphorus and Compounds	504	0.070	(% TAC in alloy) [3]	0.055	(% TAC in alloy) [4]	2.8E-06 [c]	4.0E-04 [d]

Notes

PM = particulate matter; TAC = toxic air contaminant.

[a] Daily emissions estimate (lb/day) = (emission factor [lb/hr]) x (torch hours of operation [hrs/day]) x (1 - [baghouse control efficiency {%}]/100)

Daily cutting torch hours of operation (hrs/day) =	6.60	(2)
Baghouse control efficiency (%) =	99.0	(2)

[b] Annual emissions estimate (lb/yr) = (emission factor [lb/hr]) x (annual hours of operation [hrs/yr]) x (1-[baghouse control efficiency {%}]/100)

Annual cutting torch hours of operation (hrs/yr) =	1,220	(2)
Baghouse control efficiency (%) =	99.0	(2)

[c] Daily emissions estimate (lb/day) = (daily PM emissions [lb/day]) x (emission factor [% TAC in alloy]/100)

[d] Annual emissions estimate (lb/yr) = (annual PM emissions [lb/yr]) x (emission factor [% TAC in alloy]/100)

[e] Molybdenum trioxide emission factor (% of PM emitted) = (molybdenum emission factor [% of PM emitted]) x (molybdenum trioxide molecular weight [lb/lb-mole]) / (molybdenum molecular weight [lb/lb-mole])

Daily Molybdenum and Compounds percentage of PM (%) =	0.50	(3)
Annual Molybdenum and Compounds percentage of PM (%) =	0.44	(4)
Molybdenum trioxide molecular weight (lb/lb-mole) =	143.94	
Molybdenum molecular weight (lb/lb-mole) =	95.95	

References

[1] Versar, Inc. Title V Applicability Workbook, prepared for the Institute of Scrap Recycling Industries, 1996, Table D-5, Torch Cutting Emission Factors.

[2] See Table 1, Input Process Rates and Parameters.

[3] See Table D1, Alloy Composition Data and Table D2, Alloy Toxicity Weighted Emission Rates. Daily emissions estimates for AirArc are based on alloy MNB2, which has the highest toxicity weighted emission rate for AirArc cut alloys and results in the maximum predicted acute risk value. MNB2 does not contain copper.

[4] See Table D1, Alloy Composition Data. Based on alloy composition data for manganese and low alloy steel. Value represents the weighted average TAC content for AirArc cut metals based on 2022 production.

[5] As a conservative estimate, Chromium VI is assumed to be 3 percent of total chromium. Eagle Foundry reserves the right to revise this assumption if site specific data becomes available.

Table 8
PTE Welding TAC Emission Estimates
Eagle Foundry Company

Product	Toxic Air Contaminant	CAS/DEQ ID	Weight Percentage (%)	Usage		Total Emissions Estimate	
				Daily (lb/day)	Annual (lb/yr)	Daily (lb/day)	Annual (lb/yr)
Total By Toxic Air Contaminant							
Total	Aluminum	7429-90-5	--	--	--	-- (2)	7.8E-03 (3)
	Arsenic	7440-38-2				-- (2)	1.9E-04 (3)
	Chromium and Compounds	7440-47-3				0.040 (2)	1.32 (3)
	Chromium VI	18540-29-9				2.0E-03 (2)	0.33 (3)
	Cobalt	7440-48-4				-- (2)	7.3E-03 (3)
	Copper	7440-50-8				4.6E-03 (2)	7.51 (3)
	Manganese	7439-96-5				0.013 (2)	1.06 (3)
	Molybdenum trioxide	1313-27-5				0.019 (2)	0.096 (3)
	Nickel	7440-02-0				0.042 (2)	0.32 (3)
	Phosphorus	504				-- (2)	5.6E-04 (3)
	Vanadium	7440-62-2				-- (2)	1.9E-04 (3)
Individual Products							
Sandvik WIRE 309LSI .035 X 33 LB	Chromium and Compounds	7440-47-3	17.5 (4)	42.3 (5)	46.9 (6)	0.040 (a)	0.045 (a)
	Chromium VI	18540-29-9	-- (4)			2.0E-03 (b)	2.2E-03 (b)
	Copper	7440-50-8	2.00 (4)			4.6E-03 (a)	5.1E-03 (a)
	Manganese	7439-96-5	5.50 (4)			0.013 (a)	0.014 (a)
	Molybdenum and Compounds	7439-98-7	5.50 (4)			0.013 (a)	0.014 (a)
	Molybdenum trioxide	1313-27-5	--			0.019 (d)	0.021 (d)
	Nickel	7440-02-0	18.0 (4)			0.042 (a)	0.046 (a)
Lincore M WIRE HF LCM 1/16 25# SP	Manganese	7439-96-5	13.0 (4)	(2)	1,136 (6)	(2)	0.81 (a)
	Chromium and Compounds	7440-47-3	4.90 (4)			(2)	0.30 (a)
	Chromium VI	18540-29-9	-- (4)			(2)	0.032 (e)
	Nickel	7440-02-0	0.50 (4)			(2)	0.031 (a)
Avesta 2205 ELECTR SS E2209 1/8 10#	Manganese	7439-96-5	1.70 (4)	(2)	426 (6)	(2)	0.042 (c)
	Molybdenum and Compounds	7439-98-7	0.30 (4)			(2)	7.3E-03 (c)
	Molybdenum trioxide	1313-27-5	--			(2)	0.011 (d)
	Chromium and Compounds	7440-47-3	20.0 (4)			(2)	0.49 (c)
	Chromium VI	18540-29-9	-- (4)			(2)	0.27 (e)
	Copper	7440-50-8	0.30 (4)			(2)	7.3E-03 (c)
	Nickel	7440-02-0	10.0 (4)			(2)	0.24 (c)
	Cobalt	7440-48-4	0.30 (4)			(2)	7.3E-03 (c)
CARBONS 1/2X17 CTD DC JTD 100	Copper	7440-50-8	20.0 (4)	(2)	6,533 (6)	(2)	7.49 (c)
Stoody WIRE HF 965-G 045 33# SP	Manganese	7439-96-5	1.10 (4)	(2)	1,265 (6)	(2)	0.076 (a)
	Molybdenum and Compounds	7439-98-7	0.55 (4)			(2)	0.038 (a)
	Molybdenum trioxide	1313-27-5	--			(2)	0.057 (d)
	Chromium and Compounds	7440-47-3	7.00 (4)			(2)	0.48 (a)
	Chromium VI	18540-29-9	-- (4)			(2)	0.024 (b)
Hobart WIRE EXCELARC 71 .045 X 33 LB	Aluminum	7429-90-5	1.00 (4)	(2)	141 (6)	(2)	7.7E-03 (a)
	Manganese	7439-96-5	2.50 (4)			(2)	0.019 (a)
	Molybdenum and Compounds	7439-98-7	0.50 (4)			(2)	3.8E-03 (a)
	Molybdenum trioxide	1313-27-5	--			(2)	5.8E-03 (d)
Prostar S-6 WIRE MS 70S6 035 33# SP PRS	Phosphorus	504	9.0E-03 (4)	(2)	1,140 (6)	(2)	5.6E-04 (a)
	Aluminum	7429-90-5	2.0E-03 (4)			(2)	1.2E-04 (a)
	Chromium and Compounds	7440-47-3	0.027 (4)			(2)	1.7E-03 (a)
	Chromium VI	18540-29-9	-- (4)			(2)	8.4E-05 (b)
	Copper	7440-50-8	0.14 (4)			(2)	8.9E-03 (a)
	Manganese	7439-96-5	1.63 (4)			(2)	0.10 (a)
	Molybdenum and Compounds	7439-98-7	8.0E-03 (4)			(2)	5.0E-04 (a)
	Molybdenum trioxide	1313-27-5	--			(2)	7.5E-04 (d)
	Nickel	7440-02-0	0.031 (4)			(2)	1.9E-03 (a)
	Vanadium	7440-62-2	3.0E-03 (4)			(2)	1.9E-04 (a)
	Arsenic	7440-38-2	3.0E-03 (4)			(2)	1.9E-04 (a)

Table 8
PTE Welding TAC Emission Estimates
Eagle Foundry Company

Notes

(a) Emissions estimate (lb/unit) = (fume generation rate—GMAW [lb fume/lb wire]) x (fume correction factor—GMAW) x (weight percentage [%]/100) x (usage [lb/unit])

Fume generation rate—GMAW (lb fume/lb wire) =	0.010	(7)
Fume correction factor—GMAW =	0.5464	(7)

(b) Emissions estimate (lb/unit) = (fume generation rate [lb fume/lb wire]) x (fume correction factor) x (chromium and compounds weight percentage [%]/100) x (usage [lb/unit]) x (chromium VI conversion rate [%]/100)

Fume generation rate—GMAW (lb fume/lb wire) =	0.010	(7)
Fume correction factor—GMAW =	0.5464	(7)
Chromium VI conversion rate—GMAW (%) =	5.00	(7)

(c) Emissions estimate (lb/unit) = (fume generation rate—SMAW [lb fume/lb wire]) x (fume correction factor—SMAW) x (weight percentage [%]/100) x (usage [lb/unit])

Fume generation rate—SMAW (lb fume/lb wire) =	0.020	(8)
Fume correction factor—SMAW =	0.2865	(8)

(d) Molybdenum trioxide emission estimate (lb/unit) = molybdenum emission estimate [lb/unit]) x (molybdenum trioxide molecular weight [lb/lb-mole]) / (molybdenum molecular weight [lb/lb-mole]) (9)

Molybdenum trioxide molecular weight (lb/lb-mole) =	143.94
Molybdenum molecular weight (lb/lb-mole) =	95.95

(e) Emissions estimate (lb/unit) = (fume generation rate [lb fume/lb wire]) x (fume correction factor) x (chromium and compounds weight percentage [%]/100) x (usage [lb/unit]) x (chromium VI conversion rate [%]/100)

Fume generation rate—SMAW/FCAW (lb fume/lb wire) =	0.020	(8)
Fume correction factor—SMAW/FCAW =	0.2865	(8)
Chromium VI conversion rate—SMAW (%) =	55.0	(8)
Chromium VI conversion rate—FCAW (%) =	10.0	(8)

References

(1) Information from product safety data sheets. Value represents maximum percentage in all wires/rods used at Eagle Foundry.

(2) Daily emissions calculated based on total daily product usage attributed to the welding wire that results in the highest predicted acute risk.

(3) Total annual emission estimates are the sum of individual product annual emission estimates (see below).

(4) Information from product safety data sheets.

(5) See Table 1, Input Process Rates and Parameters. Value represents total product usage excluding waste.

(6) See Table 1, Input Process Rates and Parameters.

(7) San Diego County Air Pollution Control District, Welding Operations, dated October 16, 1998. Based on American Welding Society information and the National Steel Shipbuilding Company (NASSCO) research. Assumes GMAW fume generation rate and correction factor. Hexavalent chromium accounts for 5 percent of total chromium emissions for GMAW welding.

(8) San Diego County Air Pollution Control District, Welding Operations, dated October 16, 1998 (revised July 11, 2022). Based on American Welding Society information and the NASSCO research. Assumes SMAW fume generation rate and correction factor. Hexavalent chromium accounts for 55 percent of total chromium emissions for SMAW welding.

(9) Conservatively assume 100 percent of molybdenum is in the trioxide form.

Table 9
PTE Grinding - Stainless Steel Controlled TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor				Controlled Emissions Estimate	
		Daily		Annual		Daily (lb/day)	Annual (lb/yr)
$PM_{>10}$	--	8.00	(lb/ton metal processed) [(a)]	8.00	(lb/ton metal processed) [(a)]	0 [(b)]	0 [(c)]
$PM_{2.5-10}$	--	4.80	(lb/ton metal processed) [(a)]	4.80	(lb/ton metal processed) [(a)]	0.057 [(b)]	14.8 [(c)]
$PM_{2.5}$	--	3.20	(lb/ton metal processed) [(a)]	3.20	(lb/ton metal processed) [(a)]	0.076 [(b)]	19.8 [(c)]
Total PM	--	*16.0*	*(lb/ton metal processed)* [(1)]	*16.0*	*(lb/ton metal processed)* [(1)]	*0.13*	*34.6*
Aluminum and Compounds	7429-90-5	0.48	(% of PM emitted) [(5)]	0.48	(% of PM emitted) [(5)]	6.4E-04 [(d)]	0.17 [(e)]
Antimony and Compounds	7440-36-0	2.6E-04	(% of PM emitted) [(5)]	2.6E-04	(% of PM emitted) [(5)]	3.5E-07 [(d)]	9.0E-05 [(e)]
Arsenic and Compounds	7440-38-2	1.6E-03	(% of PM emitted) [(5)]	1.6E-03	(% of PM emitted) [(5)]	2.1E-06 [(d)]	5.4E-04 [(e)]
Barium and Compounds	7440-39-3	0.014	(% of PM emitted) [(5)]	0.014	(% of PM emitted) [(5)]	1.9E-05 [(d)]	4.8E-03 [(e)]
Beryllium and Compounds	7440-41-7	5.2E-05	(% of PM emitted) [(5)]	5.2E-05	(% of PM emitted) [(5)]	6.9E-08 [(d)]	1.8E-05 [(e)]
Cadmium and Compounds	7440-43-9	4.1E-04	(% of PM emitted) [(5)]	4.1E-04	(% of PM emitted) [(5)]	5.4E-07 [(d)]	1.4E-04 [(e)]
Chromium and Compounds	7440-47-3	26.0	(% TAC in alloy) [(6)]	26.0	(% TAC in alloy) [(7)]	0.035 [(d)]	9.00 [(e)]
Chromium VI	18540-29-9	0.78	(% TAC in alloy) [(8)]	0.78	(% TAC in alloy) [(8)]	1.0E-03 [(d)]	0.27 [(e)]
Cobalt and Compounds	7440-48-4	7.6E-03	(% of PM emitted) [(5)]	7.6E-03	(% of PM emitted) [(5)]	1.0E-05 [(d)]	2.6E-03 [(e)]
Copper and Compounds	7440-50-8	0.075	(% of PM emitted) [(5)]	0.075	(% of PM emitted) [(5)]	1.0E-04 [(d)]	0.026 [(e)]
Lead and Compounds	7439-92-1	4.5E-04	(% of PM emitted) [(5)]	4.5E-04	(% of PM emitted) [(5)]	6.0E-07 [(d)]	1.6E-04 [(e)]
Manganese and Compounds	7439-96-5	1.00	(% TAC in alloy) [(6)]	1.00	(% TAC in alloy) [(7)]	1.3E-03 [(d)]	0.35 [(e)]
Molybdenum trioxide	1313-27-5	0.75	(% TAC in alloy) [(f)]	0.75	(% TAC in alloy) [(f)]	1.0E-03 [(d)]	0.26 [(e)]
Nickel and Compounds	7440-02-0	20.0	(% TAC in alloy) [(6)]	15.5	(% TAC in alloy) [(7)]	0.027 [(d)]	5.37 [(e)]
Phosphorus and Compounds	504	0.040	(% TAC in alloy) [(6)]	0.040	(% TAC in alloy) [(7)]	5.3E-05 [(d)]	0.014 [(e)]
Selenium and Compounds	7782-49-2	2.6E-04	(% of PM emitted) [(5)]	2.6E-04	(% of PM emitted) [(5)]	3.5E-07 [(d)]	9.0E-05 [(e)]
Silver and Compounds	7440-22-4	5.2E-05	(% of PM emitted) [(5)]	5.2E-05	(% of PM emitted) [(5)]	6.9E-08 [(d)]	1.8E-05 [(e)]
Thallium	7440-28-0	5.2E-05	(% of PM emitted) [(5)]	5.2E-05	(% of PM emitted) [(5)]	6.9E-08 [(d)]	1.8E-05 [(e)]
Vanadium (fume or dust)	7440-62-2	6.0E-03	(% of PM emitted) [(5)]	6.0E-03	(% of PM emitted) [(5)]	8.0E-06 [(d)]	2.1E-03 [(e)]
Zinc and Compounds	7440-66-6	3.4E-03	(% of PM emitted) [(5)]	3.4E-03	(% of PM emitted) [(5)]	4.5E-06 [(d)]	1.2E-03 [(e)]

Notes

PM = particulate matter; TAC = toxic air contaminant.

[(a)] PM emission factor (lb/ton metal processed) = (total PM emission factor [lb/ton metal processed]) x (percentage of total PM [%]/100)

$PM_{>10}$ percentage of total PM (%) =	50.0	(1)
$PM_{2.5-10}$ percentage of total PM (%) =	30.0	(1)
$PM_{2.5}$ percentage of total PM (%) =	20.0	(1)

Table 9
PTE Grinding - Stainless Steel Controlled TAC Emission Estimates
Eagle Foundry Company

[b] Daily controlled emissions estimate (lb/day) = (emission factor [lb/ton metal processed]) x (daily stainless steel processed for grinding [tons/day]) x (capture efficiency of building enclosure [%]/100) x (1 - [control efficiency of baghouse {%}]/100)

Daily stainless steel processed for grinding (tons/day) =	2.50	(2)
Capture efficiency of building enclosure (%) =	95.0	(3)
Control efficiency of baghouse for $PM_{>10}$ (%) =	100	(4)
Control efficiency of baghouse for $PM_{2.5-10}$ (%) =	99.5	(4)
Control efficiency of baghouse for $PM_{2.5}$ (%) =	99.0	(4)

[c] Annual controlled emissions estimate (lb/yr) = (emission factor [lb/ton metal processed]) x (annual stainless steel processed for grinding [tons/yr]) x (capture efficiency of building enclosure [%]/100) x (1 - [control efficiency of baghouse {%}]/100)

Annual stainless steel processed for grinding (tons/yr) =	651	(2)

[d] Daily emissions estimate (lb/day) = (daily PM emissions [lb/day]) x (emission factor [% TAC in alloy]/100)

[e] Annual emissions estimate (lb/yr) = (annual PM emissions [lb/yr]) x (emission factor [% TAC in alloy]/100)

[f] Molybdenum trioxide emission factor (% of PM emitted) = (molybdenum emission factor [% of PM emitted]) x (molybdenum trioxide molecular weight [lb/lb-mole]) / (molybdenum molecular weight [lb/lb-mole])

Daily Molybdenum and Compounds percentage of PM (%) =	0.50	(6)
Annual Molybdenum and Compounds percentage of PM (%) =	0.50	(7)
Molybdenum trioxide molecular weight (lb/lb-mole) =	143.94	
Molybdenum molecular weight (lb/lb-mole) =	95.95	

References

[1] RTI International, Emission Estimation Protocol for Iron and Steel Foundries (December, 2012), Table 6-2, PM Emission Factors for Finishing Operations. Value represents grinding, captured and uncontrolled.

[2] See Table 1, Input Process Rates and Parameters.

[3] Based on EPA methodology enclosure testing conducted on April 18, 2023.

[4] RTI International, Emission Estimation Protocol for Iron and Steel Foundries (December, 2012), Table 3-4, Typical Collection Efficiencies of Various Particulate Control Devices. Section 3.1.4.1 notes that it can be assumed that PM collection efficiencies for PM greater than 10 µm are 100 percent.

[5] Based on baghouse dust analysis for the finishing baghouse conducted by Apex Laboratories, March 2021.

[6] See Table D1, Alloy Composition Data and Table D2, Alloy Toxicity Weighted Emission Rates. Daily emissions estimates for stainless steel grinding are based on alloy HK, which has the highest toxicity weighted emission rate for stainless steel alloys and results in the maximum predicted acute risk value.

[7] Information provided by facility. Value represents the weighted average TAC content for stainless steel alloys produced in 2022.

[8] As a conservative estimate, Chromium VI is assumed to be 3 percent of total chromium. Eagle Foundry reserves the right to revise this assumption if site specific data becomes available.

Table 10
PTE Grinding - Stainless Steel Fugitive TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor				Fugitive Emissions Estimate	
		Daily		Annual		Daily (lb/day)	Annual (lb/yr)
$PM_{>10}$	--	0.016	(lb/ton metal processed) (a)	0.016	(lb/ton metal processed) (a)	2.0E-03 (b)	0.52 (c)
$PM_{2.5-10}$	--	0.016	(lb/ton metal processed) (a)	0.016	(lb/ton metal processed) (a)	2.0E-03 (b)	0.52 (c)
$PM_{2.5}$	--	0.13	(lb/ton metal processed) (a)	0.13	(lb/ton metal processed) (a)	0.016 (b)	4.17 (c)
Total PM	--	*0.16*	*(lb/ton metal processed)* (1)	*0.16*	*(lb/ton metal processed)* (1)	*0.020*	*5.21*
Aluminum and Compounds	7429-90-5	0.48	(% of PM emitted) (4)	0.48	(% of PM emitted) (4)	9.6E-05 (d)	0.025 (e)
Antimony and Compounds	7440-36-0	2.6E-04	(% of PM emitted) (4)	2.6E-04	(% of PM emitted) (4)	5.2E-08 (d)	1.4E-05 (e)
Arsenic and Compounds	7440-38-2	1.6E-03	(% of PM emitted) (4)	1.6E-03	(% of PM emitted) (4)	3.1E-07 (d)	8.2E-05 (e)
Barium and Compounds	7440-39-3	0.014	(% of PM emitted) (4)	0.014	(% of PM emitted) (4)	2.8E-06 (d)	7.3E-04 (e)
Beryllium and Compounds	7440-41-7	5.2E-05	(% of PM emitted) (4)	5.2E-05	(% of PM emitted) (4)	1.0E-08 (d)	2.7E-06 (e)
Cadmium and Compounds	7440-43-9	4.1E-04	(% of PM emitted) (4)	4.1E-04	(% of PM emitted) (4)	8.1E-08 (d)	2.1E-05 (e)
Chromium and Compounds	7440-47-3	26.0	(% TAC in alloy) (5)	26.0	(% TAC in alloy) (6)	5.2E-03 (d)	1.35 (e)
Chromium VI	18540-29-9	0.78	(% TAC in alloy) (7)	0.78	(% TAC in alloy) (7)	1.6E-04 (d)	0.041 (e)
Cobalt and Compounds	7440-48-4	7.6E-03	(% of PM emitted) (4)	7.6E-03	(% of PM emitted) (4)	1.5E-06 (d)	4.0E-04 (e)
Copper and Compounds	7440-50-8	0.075	(% of PM emitted) (4)	0.075	(% of PM emitted) (4)	1.5E-05 (d)	3.9E-03 (e)
Lead and Compounds	7439-92-1	4.5E-04	(% of PM emitted) (4)	4.5E-04	(% of PM emitted) (4)	9.0E-08 (d)	2.3E-05 (e)
Manganese and Compounds	7439-96-5	1.00	(% TAC in alloy) (5)	1.00	(% TAC in alloy) (6)	2.0E-04 (d)	0.052 (e)
Molybdenum trioxide	1313-27-5	0.75	(% TAC in alloy) (f)	0.75	(% TAC in alloy) (f)	1.5E-04 (d)	0.039 (e)
Nickel and Compounds	7440-02-0	20.0	(% TAC in alloy) (5)	15.5	(% TAC in alloy) (6)	4.0E-03 (d)	0.81 (e)
Phosphorus and Compounds	504	0.040	(% TAC in alloy) (5)	0.040	(% TAC in alloy) (6)	8.0E-06 (d)	2.1E-03 (e)
Selenium and Compounds	7782-49-2	2.6E-04	(% of PM emitted) (4)	2.6E-04	(% of PM emitted) (4)	5.2E-08 (d)	1.4E-05 (e)
Silver and Compounds	7440-22-4	5.2E-05	(% of PM emitted) (4)	5.2E-05	(% of PM emitted) (4)	1.0E-08 (d)	2.7E-06 (e)
Thallium	7440-28-0	5.2E-05	(% of PM emitted) (4)	5.2E-05	(% of PM emitted) (4)	1.0E-08 (d)	2.7E-06 (e)
Vanadium (fume or dust)	7440-62-2	6.0E-03	(% of PM emitted) (4)	6.0E-03	(% of PM emitted) (4)	1.2E-06 (d)	3.1E-04 (e)
Zinc and Compounds	7440-66-6	3.4E-03	(% of PM emitted) (4)	3.4E-03	(% of PM emitted) (4)	6.7E-07 (d)	1.7E-04 (e)

Notes

PM = particulate matter; TAC = toxic air contaminant.

(a) PM emission factor (lb/ton metal processed) = (total PM emission factor [lb/ton metal processed]) x (percentage of total PM [%]/100)

$PM_{>10}$ percentage of total PM (%) = 10.0 (1)

$PM_{2.5-10}$ percentage of total PM (%) = 10.0 (1)

$PM_{2.5}$ percentage of total PM (%) = 80.0 (1)

(b) Daily fugitive emissions estimate (lb/day) = (emission factor [lb/ton metal processed]) x (daily stainless steel processed for grinding [tons/day]) x (1 - [capture efficiency of building enclosure {%}]/100)

Daily stainless steel processed for grinding (tons/day) = 2.50 (2)

Capture efficiency of building enclosure (%) = 95.0 (3)

Table 10
PTE Grinding - Stainless Steel Fugitive TAC Emission Estimates
Eagle Foundry Company

[c] Annual fugitive emissions estimate (lb/yr) = (emission factor [lb/ton metal processed]) x (annual stainless steel processed for grinding [tons/yr]) x (1 - [capture efficiency of building enclosure {%}]/100)

Annual stainless steel processed for grinding (tons/yr) =	651	(2)

[d] Daily emissions estimate (lb/day) = (daily PM emissions [lb/day]) x (emission factor [% TAC in alloy]/100)

[e] Annual emissions estimate (lb/yr) = (annual PM emissions [lb/yr]) x (emission factor [% TAC in alloy]/100)

[f] Molybdenum trioxide emission factor (% of PM emitted) = (molybdenum emission factor [% of PM emitted]) x (molybdenum trioxide molecular weight [lb/lb-mole]) / (molybdenum molecular weight [lb/lb-mole])

Daily Molybdenum and Compounds percentage of PM (%) =	0.50	(5)
Annual Molybdenum and Compounds percentage of PM (%) =	0.50	(6)
Molybdenum trioxide molecular weight (lb/lb-mole) =	143.94	
Molybdenum molecular weight (lb/lb-mole) =	95.95	

References

[1] RTI International, Emission Estimation Protocol for Iron and Steel Foundries (December, 2012), Table 6-2, PM Emission Factors for Finishing Operations. Value represents grinding, uncaptured and uncontrolled.

[2] See Table 1, Input Process Rates and Parameters.

[3] Based on EPA methodology enclosure testing conducted on April 18, 2023.

[4] Based on baghouse dust analysis for the finishing baghouse conducted by Apex Laboratories, March 2021.

[5] See Table D1, Alloy Composition Data and Table D2, Alloy Toxicity Weighted Emission Rates. Daily emissions estimates for stainless steel grinding are based on alloy HK, which has the highest toxicity weighted emission rate for stainless steel alloys and results in the maximum predicted acute risk value.

[6] Information provided by facility. Value represents the weighted average TAC content for stainless steel alloys produced in 2022.

[7] As a conservative estimate, Chromium VI is assumed to be 3 percent of total chromium. Eagle Foundry reserves the right to revise this assumption if site specific data becomes available.

Table 11
PTE Grinding - Non-stainless Steel Controlled TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor				Controlled Emissions Estimate	
		Daily		Annual		Daily (lb/day)	Annual (lb/yr)
$PM_{>10}$	--	8.00	(lb/ton metal processed) [a]	8.00	(lb/ton metal processed) [a]	0 [b]	0 [c]
$PM_{2.5-10}$	--	4.80	(lb/ton metal processed) [a]	4.80	(lb/ton metal processed) [a]	0.38 [b]	97.9 [c]
$PM_{2.5}$	--	3.20	(lb/ton metal processed) [a]	3.20	(lb/ton metal processed) [a]	0.50 [b]	131 [c]
Total PM	--	*16.0*	*(lb/ton metal processed)* [1]	*16.0*	*(lb/ton metal processed)* [1]	*0.88*	*228*
Aluminum and Compounds	7429-90-5	0.48	(% of PM emitted) [5]	0.48	(% of PM emitted) [5]	4.2E-03 [d]	1.09 [e]
Antimony and Compounds	7440-36-0	2.6E-04	(% of PM emitted) [5]	2.6E-04	(% of PM emitted) [5]	2.3E-06 [d]	6.0E-04 [e]
Arsenic and Compounds	7440-38-2	1.6E-03	(% of PM emitted) [5]	1.6E-03	(% of PM emitted) [5]	1.4E-05 [d]	3.6E-03 [e]
Barium and Compounds	7440-39-3	0.014	(% of PM emitted) [5]	0.014	(% of PM emitted) [5]	1.2E-04 [d]	0.032 [e]
Beryllium and Compounds	7440-41-7	5.2E-05	(% of PM emitted) [5]	5.2E-05	(% of PM emitted) [5]	4.6E-07 [d]	1.2E-04 [e]
Cadmium and Compounds	7440-43-9	4.1E-04	(% of PM emitted) [5]	4.1E-04	(% of PM emitted) [5]	3.6E-06 [d]	9.3E-04 [e]
Chromium and Compounds	7440-47-3	0.50	(% TAC in alloy) [6]	19.7	(% TAC in alloy) [7]	4.4E-03 [d]	45.0 [e]
Chromium VI	18540-29-9	0.015	(% TAC in alloy) [8]	0.59	(% TAC in alloy) [8]	1.3E-04 [d]	1.35 [e]
Cobalt and Compounds	7440-48-4	7.6E-03	(% of PM emitted) [5]	7.6E-03	(% of PM emitted) [5]	6.7E-05 [d]	0.017 [e]
Copper and Compounds	7440-50-8		-- [6]	0.045	(% TAC in alloy) [7]	--	0.10 [e]
Lead and Compounds	7439-92-1	4.5E-04	(% of PM emitted) [5]	4.5E-04	(% of PM emitted) [5]	4.0E-06 [d]	1.0E-03 [e]
Manganese and Compounds	7439-96-5	12.8	(% TAC in alloy) [6]	1.90	(% TAC in alloy) [7]	0.11 [d]	4.35 [e]
Molybdenum trioxide	1313-27-5	0.75	(% TAC in alloy) [f]	0.70	(% TAC in alloy) [f]	6.6E-03 [d]	1.60 [e]
Nickel and Compounds	7440-02-0	0.80	(% TAC in alloy) [6]	0.16	(% TAC in alloy) [7]	7.0E-03 [d]	0.36 [e]
Phosphorus and Compounds	504	0.070	(% TAC in alloy) [6]	0.069	(% TAC in alloy) [7]	6.1E-04 [d]	0.16 [e]
Selenium and Compounds	7782-49-2	2.6E-04	(% of PM emitted) [5]	2.6E-04	(% of PM emitted) [5]	2.3E-06 [d]	6.0E-04 [e]
Silver and Compounds	7440-22-4	5.2E-05	(% of PM emitted) [5]	5.2E-05	(% of PM emitted) [5]	4.6E-07 [d]	1.2E-04 [e]
Thallium	7440-28-0	5.2E-05	(% of PM emitted) [5]	5.2E-05	(% of PM emitted) [5]	4.6E-07 [d]	1.2E-04 [e]
Vanadium (fume or dust)	7440-62-2	6.0E-03	(% of PM emitted) [5]	6.0E-03	(% of PM emitted) [5]	5.3E-05 [d]	0.014 [e]
Zinc and Compounds	7440-66-6	3.4E-03	(% of PM emitted) [5]	3.4E-03	(% of PM emitted) [5]	2.9E-05 [d]	7.7E-03 [e]

Notes

PM = particulate matter; TAC = toxic air contaminant.

[a] PM emission factor (lb/ton metal processed) = (total PM emission factor [lb/ton metal processed]) x (percentage of total PM [%]/100)

$PM_{>10}$ percentage of total PM (%) =	50.0	(1)
$PM_{2.5-10}$ percentage of total PM (%) =	30.0	(1)
$PM_{2.5}$ percentage of total PM (%) =	20.0	(1)

Table 11
PTE Grinding - Non-stainless Steel Controlled TAC Emission Estimates
Eagle Foundry Company

[b] Daily controlled emissions estimate (lb/day) = (emission factor [lb/ton metal processed]) x (daily non-stainless steel processed for grinding [tons/day]) x (capture efficiency of building enclosure [%]/100) x (1 - [control efficiency of baghouse {%}]/100)

Daily non-stainless steel processed for grinding (tons/day) =	16.5	(2)
Capture efficiency of building enclosure (%) =	95.0	(3)
Control efficiency of baghouse for $PM_{>10}$ (%) =	100	(4)
Control efficiency of baghouse for $PM_{2.5-10}$ (%) =	99.5	(4)
Control efficiency of baghouse for $PM_{2.5}$ (%) =	99.0	(4)

[c] Annual controlled emissions estimate (lb/yr) = (emission factor [lb/ton metal processed]) x (annual non-stainless steel processed for grinding [tons/yr]) x (capture efficiency of building enclosure [%]/100) x (1 - [control efficiency of baghouse {%}]/100)

Annual non-stainless steel processed for grinding (tons/yr) =	4,294	(2)

[d] Daily emissions estimate (lb/day) = (daily PM emissions [lb/day]) x (emission factor [% TAC in alloy]/100)

[e] Annual emissions estimate (lb/yr) = (annual PM emissions [lb/yr]) x (emission factor [% TAC in alloy]/100)

[f] Molybdenum trioxide emission factor (% of PM emitted) = (molybdenum emission factor [% of PM emitted]) x (molybdenum trioxide molecular weight [lb/lb-mole]) / (molybdenum molecular weight [lb/lb-mole])

Daily Molybdenum and Compounds percentage of PM (%) =	0.50	(6)
Annual Molybdenum and Compounds percentage of PM (%) =	0.47	(7)
Molybdenum trioxide molecular weight (lb/lb-mole) =	143.94	
Molybdenum molecular weight (lb/lb-mole) =	95.95	

References

[1] RTI International, Emission Estimation Protocol for Iron and Steel Foundries (December, 2012), Table 6-2, PM Emission Factors for Finishing Operations. Value represents grinding, captured and uncontrolled.

[2] See Table 1, Input Process Rates and Parameters.

[3] Based on EPA methodology enclosure testing conducted on April 18, 2023.

[4] RTI International, Emission Estimation Protocol for Iron and Steel Foundries (December, 2012), Table 3-4, Typical Collection Efficiencies of Various Particulate Control Devices. Section 3.1.4.1 notes that it can be assumed that PM collection efficiencies for PM greater than 10 µm are 100 percent.

[5] Based on baghouse dust analysis for the finishing baghouse conducted by Apex Laboratories, March 2021.

[6] See Table D1, Alloy Composition Data and Table D2, Alloy Toxicity Weighted Emission Rates. Daily emissions estimates for non-stainless steel grinding are based on alloy MNB2, which has the highest toxicity weighted emission rate for non-stainless steel alloys and results in the maximum predicted acute risk value.

[7] Information provided by facility. Value represents the weighted average TAC content for non-stainless steel alloys produced in 2022.

[8] As a conservative estimate, Chromium VI is assumed to be 3 percent of total chromium. Eagle Foundry reserves the right to revise this assumption if site specific data becomes available.

Table 12
PTE Grinding - Non-stainless Steel Fugitive TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor				Fugitive Emissions Estimate	
		Daily		Annual		Daily (lb/day)	Annual (lb/yr)
$PM_{>10}$	--	0.016	(lb/ton metal processed) [a]	0.016	(lb/ton metal processed) [a]	0.013 [b]	3.44 [c]
$PM_{2.5-10}$	--	0.016	(lb/ton metal processed) [a]	0.016	(lb/ton metal processed) [a]	0.013 [b]	3.44 [c]
$PM_{2.5}$	--	0.13	(lb/ton metal processed) [a]	0.13	(lb/ton metal processed) [a]	0.11 [b]	27.5 [c]
Total PM	--	*0.16*	*(lb/ton metal processed)* [1]	*0.16*	*(lb/ton metal processed)* [1]	*0.13*	*34.4*
Aluminum and Compounds	7429-90-5	0.48	(% of PM emitted) [5]	0.48	(% of PM emitted) [5]	6.3E-04 [d]	0.16 [e]
Antimony and Compounds	7440-36-0	2.6E-04	(% of PM emitted) [5]	2.6E-04	(% of PM emitted) [5]	3.4E-07 [d]	8.9E-05 [e]
Arsenic and Compounds	7440-38-2	1.6E-03	(% of PM emitted) [5]	1.6E-03	(% of PM emitted) [5]	2.1E-06 [d]	5.4E-04 [e]
Barium and Compounds	7440-39-3	0.014	(% of PM emitted) [5]	0.014	(% of PM emitted) [5]	1.8E-05 [d]	4.8E-03 [e]
Beryllium and Compounds	7440-41-7	5.2E-05	(% of PM emitted) [5]	5.2E-05	(% of PM emitted) [5]	6.9E-08 [d]	1.8E-05 [e]
Cadmium and Compounds	7440-43-9	4.1E-04	(% of PM emitted) [5]	4.1E-04	(% of PM emitted) [5]	5.3E-07 [d]	1.4E-04 [e]
Chromium and Compounds	7440-47-3	0.50	(% TAC in alloy) [6]	19.7	(% TAC in alloy) [7]	6.6E-04 [d]	6.77 [e]
Chromium VI	18540-29-9	0.015	(% TAC in alloy) [8]	0.59	(% TAC in alloy) [8]	2.0E-05 [d]	0.20 [e]
Cobalt and Compounds	7440-48-4	7.6E-03	(% of PM emitted) [5]	7.6E-03	(% of PM emitted) [5]	1.0E-05 [d]	2.6E-03 [e]
Copper and Compounds	7440-50-8		-- [6]	0.045	(% TAC in alloy) [7]	--	0.016 [e]
Lead and Compounds	7439-92-1	4.5E-04	(% of PM emitted) [5]	4.5E-04	(% of PM emitted) [5]	6.0E-07 [d]	1.5E-04 [e]
Manganese and Compounds	7439-96-5	12.8	(% TAC in alloy) [6]	1.90	(% TAC in alloy) [7]	0.017 [d]	0.65 [e]
Molybdenum trioxide	1313-27-5	0.75	(% TAC in alloy) [f]	0.70	(% TAC in alloy) [f]	9.9E-04 [d]	0.24 [e]
Nickel and Compounds	7440-02-0	0.80	(% TAC in alloy) [6]	0.16	(% TAC in alloy) [7]	1.1E-03 [d]	0.054 [e]
Phosphorus and Compounds	504	0.070	(% TAC in alloy) [6]	0.069	(% TAC in alloy) [7]	9.2E-05 [d]	0.024 [e]
Selenium and Compounds	7782-49-2	2.6E-04	(% of PM emitted) [5]	2.6E-04	(% of PM emitted) [5]	3.4E-07 [d]	8.9E-05 [e]
Silver and Compounds	7440-22-4	5.2E-05	(% of PM emitted) [5]	5.2E-05	(% of PM emitted) [5]	6.9E-08 [d]	1.8E-05 [e]
Thallium	7440-28-0	5.2E-05	(% of PM emitted) [5]	5.2E-05	(% of PM emitted) [5]	6.9E-08 [d]	1.8E-05 [e]
Vanadium (fume or dust)	7440-62-2	6.0E-03	(% of PM emitted) [5]	6.0E-03	(% of PM emitted) [5]	7.9E-06 [d]	2.1E-03 [e]
Zinc and Compounds	7440-66-6	3.4E-03	(% of PM emitted) [5]	3.4E-03	(% of PM emitted) [5]	4.4E-06 [d]	1.2E-03 [e]

Notes

PM = particulate matter; TAC = toxic air contaminant.

[a] PM emission factor (lb/ton metal processed) = (total PM emission factor [lb/ton metal processed]) x (percentage of total PM [%]/100)

$PM_{>10}$ percentage of total PM (%) =	10.0	(1)
$PM_{2.5-10}$ percentage of total PM (%) =	10.0	(1)
$PM_{2.5}$ percentage of total PM (%) =	80.0	(1)

[b] Daily fugitive emissions estimate (lb/day) = (emission factor [lb/ton metal processed]) x (daily non-stainless steel processed for grinding [tons/day]) x (1 - [capture efficiency of building enclosure {%}]/100)

Daily non-stainless steel processed for grinding (tons/day) =	16.5	(2)
Capture efficiency of building enclosure (%) =	95.0	(3)

Table 12
PTE Grinding - Non-stainless Steel Fugitive TAC Emission Estimates
Eagle Foundry Company

[c] Annual fugitive emissions estimate (lb/yr) = (emission factor [lb/ton metal processed]) x (annual non-stainless steel processed for grinding [tons/yr]) x (1 - [capture efficiency of building enclosure {%}]/100)

Annual non-stainless steel processed for grinding (tons/yr) =	4,294	(2)

[d] Daily emissions estimate (lb/day) = (daily PM emissions [lb/day]) x (emission factor [% TAC in alloy]/100)

[e] Annual emissions estimate (lb/yr) = (annual PM emissions [lb/yr]) x (emission factor [% TAC in alloy]/100)

[f] Molybdenum trioxide emission factor (% of PM emitted) = (molybdenum emission factor [% of PM emitted]) x (molybdenum trioxide molecular weight [lb/lb-mole]) / (molybdenum molecular weight [lb/lb-mole])

Daily Molybdenum and Compounds percentage of PM (%) =	0.50	(6)
Annual Molybdenum and Compounds percentage of PM (%) =	0.47	(7)
Molybdenum trioxide molecular weight (lb/lb-mole) =	143.94	
Molybdenum molecular weight (lb/lb-mole) =	95.95	

References

[1] RTI International, Emission Estimation Protocol for Iron and Steel Foundries (December, 2012), Table 6-2, PM Emission Factors for Finishing Operations. Value represents grinding, uncaptured and uncontrolled.

[2] See Table 1, Input Process Rates and Parameters.

[3] Based on EPA methodology enclosure testing conducted on April 18, 2023.

[4] RTI International, Emission Estimation Protocol for Iron and Steel Foundries (December, 2012), Table 3-4, Typical Collection Efficiencies of Various Particulate Control Devices. Section 3.1.4.1 notes that it can be assumed that PM collection efficiencies for PM greater than 10 µm are 100 percent.

[5] Based on baghouse dust analysis for the finishing baghouse conducted by Apex Laboratories, March 2021.

[6] See Table D1, Alloy Composition Data and Table D2, Alloy Toxicity Weighted Emission Rates. Daily emissions estimates for non-stainless steel grinding are based on alloy MNB2, which has the highest toxicity weighted emission rate for non-stainless steel alloys and results in the maximum predicted acute risk value.

[7] Information provided by facility. Value represents the weighted average TAC content for non-stainless steel alloys produced in 2022.

[8] As a conservative estimate, Chromium VI is assumed to be 3 percent of total chromium. Eagle Foundry reserves the right to revise this assumption if site specific data becomes available.

Table 13
PTE Mesh Blast TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor		Total Emissions Estimate	
				Daily (lb/day)	Annual (lb/yr)
$PM_{>10}$	--	8.00	(lb/ton metal processed) [a]	0 [b]	0 [c]
$PM_{2.5-10}$	--	4.80	(lb/ton metal processed) [a]	0.29 [b]	5.69 [c]
$PM_{2.5}$	--	3.20	(lb/ton metal processed) [a]	0.19 [b]	3.80 [c]
Total PM	--	*16.0*	*(lb/ton metal processed)* [1]	*0.48*	*9.49*
Aluminum and Compounds	7429-90-5	0.064	(% of PM emitted) [5]	3.1E-04 [d]	6.1E-03 [e]
Antimony and Compounds	7440-36-0	1.6E-03	(% of PM emitted) [5]	7.7E-06 [d]	1.5E-04 [e]
Arsenic and Compounds	7440-38-2	4.9E-03	(% of PM emitted) [5]	2.3E-05 [d]	4.6E-04 [e]
Barium and Compounds	7440-39-3	5.1E-04	(% of PM emitted) [5]	2.4E-06 [d]	4.8E-05 [e]
Beryllium and compounds	7440-41-7	1.0E-04	(% of PM emitted) [5]	4.9E-07 [d]	9.7E-06 [e]
Cadmium and Compounds	7440-43-9	1.0E-04	(% of PM emitted) [5]	4.9E-07 [d]	9.7E-06 [e]
Chromium	7440-47-3	0.24	(% of PM emitted) [5]	1.2E-03 [d]	0.023 [e]
Chromium VI	18540-29-9	7.3E-03	(% of PM emitted) [6]	3.5E-05 [d]	6.9E-04 [e]
Cobalt and Compounds	7440-48-4	7.0E-03	(% of PM emitted) [5]	3.4E-05 [d]	6.7E-04 [e]
Copper and Compounds	7440-50-8	0.27	(% of PM emitted) [5]	1.3E-03 [d]	0.025 [e]
Lead and Compounds	7439-92-1	7.9E-04	(% of PM emitted) [5]	3.8E-06 [d]	7.5E-05 [e]
Manganese and Compounds	7439-96-5	0.65	(% of PM emitted) [5]	3.1E-03 [d]	0.062 [e]
Molybdenum trioxide	1313-27-5	0.056	(% of PM emitted) [f]	2.7E-04 [d]	5.3E-03 [e]
Nickel and Compounds	7440-02-0	0.10	(% of PM emitted) [5]	4.9E-04 [d]	9.7E-03 [e]
Selenium and Compounds	7782-49-2	5.1E-05	(% of PM emitted) [5]	2.4E-07 [d]	4.8E-06 [e]
Silver and Compounds	7440-22-4	1.0E-04	(% of PM emitted) [5]	4.9E-07 [d]	9.7E-06 [e]
Thallium	7440-28-0	1.0E-04	(% of PM emitted) [5]	4.9E-07 [d]	9.7E-06 [e]
Vanadium (fume or dust)	7440-62-2	9.1E-03	(% of PM emitted) [5]	4.4E-05 [d]	8.6E-04 [e]
Zinc and Compounds	7440-66-6	8.9E-03	(% of PM emitted) [5]	4.3E-05 [d]	8.5E-04 [e]

Notes

PM = particulate matter.

[a] Emission factor (lb/ton metal produced) = (total PM emission factor [lb/ton metal processed])
x (percentage of total PM [%]/100)

$PM_{>10}$ percentage of total PM (%) =	50.0	(1)
$PM_{2.5-10}$ percentage of total PM (%) =	30.0	(1)
$PM_{2.5}$ percentage of total PM (%) =	20.0	(1)

[b] Daily emissions estimate (lb/day) = (emission factor [lb/ton metal processed])
x (daily metal finished by mesh blasting [tons/day]) x (1 - [control efficiency of filters {%}]/100)

Daily metal finished by mesh blasting (tons/day) =	3.00	(2)
Control efficiency of filters for $PM_{>10}$ (%) =	100	(3)
Control efficiency of filters for $PM_{2.5-10}$ (%) =	98.0	(4)
Control efficiency of filters for $PM_{2.5}$ (%) =	98.0	(4)

[c] Annual emissions estimate (lb/yr) = (emission factor [lb/ton metal processed])
x (annual metal finished by mesh blasting [tons/yr]) x (1 - [control efficiency of filters {%}]/100)

Annual metal finished by mesh blasting (tons/yr) =	59.3	(2)

[d] Daily emissions estimate (lb/day) = (daily PM emissions [lb/day]) x (emission factor [% of PM emitted]/100)

[e] Annual emissions estimate (lb/yr) = (annual PM emissions [lb/yr]) x (emission factor [% of PM emitted]/100)

[f] Molybdenum trioxide percentage of PM (% of PM emitted) = (molybdenum percentage of PM [%])
x (molybdenum trioxide molecular weight [lb/lb-mole]) / (molybdenum molecular weight [lb/lb-mole]) (7)

Molybdenum percentage of PM (%) =	0.037	(5)
Molybdenum trioxide molecular weight (lb/lb-mole) =	143.94	
Molybdenum molecular weight (lb/lb-mole) =	95.95	

References

[1] RTI International, Emission Estimation Protocol for Iron and Steel Foundries (December, 2012), Table 6-2. Value for shot blasting, captured and uncontrolled.

[2] See Table 1, Input Process Rates and Parameters.

[3] RTI International, Emission Estimation Protocol for Iron and Steel Foundries (December, 2012), Table 3-4, Typical Collection Efficiencies of Various Particulate Control Devices. Section 3.1.4.1 notes that it can be assumed that PM collection efficiencies for PM greater than 10 µm are 100 percent.

[4] Based on filter specifications.

[5] Based on dust analysis conducted by Apex Laboratories, March 2021.

[6] As a conservative estimate, Chromium VI is assumed to be 3 percent of total chromium. Eagle Foundry reserves the right to revise this assumption if site specific data becomes available.

[7] Conservatively assume 100 percent of molybdenum is in the trioxide form.

Table 14
PTE Shot Blast TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor		Total Emissions Estimate	
				Daily (lb/day)	Annual (lb/yr)
$PM_{>10}$	--	8.00	(lb/ton metal processed) [a]	0 [b]	0 [c]
$PM_{2.5-10}$	--	4.80	(lb/ton metal processed) [a]	0.22 [b]	12.8 [c]
$PM_{2.5}$	--	3.20	(lb/ton metal processed) [a]	0.29 [b]	17.1 [c]
Total PM	--	*16.0*	*(lb/ton metal processed)* [1]	*0.50*	*29.9*
Aluminum and Compounds	7429-90-5	0.064	(% of PM emitted) [4]	3.2E-04 [d]	0.019 [e]
Antimony and Compounds	7440-36-0	1.6E-03	(% of PM emitted) [4]	8.1E-06 [d]	4.8E-04 [e]
Arsenic and Compounds	7440-38-2	4.9E-03	(% of PM emitted) [4]	2.5E-05 [d]	1.5E-03 [e]
Barium and Compounds	7440-39-3	5.1E-04	(% of PM emitted) [4]	2.6E-06 [d]	1.5E-04 [e]
Beryllium and compounds	7440-41-7	1.0E-04	(% of PM emitted) [4]	5.2E-07 [d]	3.1E-05 [e]
Cadmium and Compounds	7440-43-9	1.0E-04	(% of PM emitted) [4]	5.2E-07 [d]	3.1E-05 [e]
Chromium	7440-47-3	0.24	(% of PM emitted) [4]	1.2E-03 [d]	0.073 [e]
Chromium VI	18540-29-9	7.3E-03	(% of PM emitted) [5]	3.7E-05 [d]	2.2E-03 [e]
Cobalt and Compounds	7440-48-4	7.0E-03	(% of PM emitted) [4]	3.5E-05 [d]	2.1E-03 [e]
Copper and Compounds	7440-50-8	0.27	(% of PM emitted) [4]	1.3E-03 [d]	0.079 [e]
Lead and Compounds	7439-92-1	7.9E-04	(% of PM emitted) [4]	4.0E-06 [d]	2.3E-04 [e]
Manganese and Compounds	7439-96-5	0.65	(% of PM emitted) [4]	3.3E-03 [d]	0.19 [e]
Molybdenum trioxide	1313-27-5	0.056	(% of PM emitted) [f]	2.8E-04 [d]	0.017 [e]
Nickel and Compounds	7440-02-0	0.10	(% of PM emitted) [4]	5.1E-04 [d]	0.030 [e]
Selenium and Compounds	7782-49-2	5.1E-05	(% of PM emitted) [4]	2.6E-07 [d]	1.5E-05 [e]
Silver and Compounds	7440-22-4	1.0E-04	(% of PM emitted) [4]	5.2E-07 [d]	3.1E-05 [e]
Thallium	7440-28-0	1.0E-04	(% of PM emitted) [4]	5.2E-07 [d]	3.1E-05 [e]
Vanadium (fume or dust)	7440-62-2	9.1E-03	(% of PM emitted) [4]	4.6E-05 [d]	2.7E-03 [e]
Zinc and Compounds	7440-66-6	8.9E-03	(% of PM emitted) [4]	4.5E-05 [d]	2.7E-03 [e]

Notes

PM = particulate matter.

[a] Emission factor (lb/ton metal produced) = (total PM emission factor [lb/ton metal processed])
x (percentage of total PM [%]/100)

$PM_{>10}$ percentage of total PM (%) =	50.0	(1)
$PM_{2.5-10}$ percentage of total PM (%) =	30.0	(1)
$PM_{2.5}$ percentage of total PM (%) =	20.0	(1)

[b] Daily emissions estimate (lb/day) = (emission factor [lb/ton metal produced]) x (daily metal finished by abrasive blasting [tons/day])
x (percentage of total PM [%]/100) x (1 - [control efficiency of baghouse {%}]/100)

Daily metal finished by abrasive blasting (tons/day) =	9.00	(2)
Control efficiency of filters for $PM_{>10}$ (%) =	100	(3)
Control efficiency of filters for $PM_{2.5-10}$ (%) =	99.5	(3)
Control efficiency of filters for $PM_{2.5}$ (%) =	99.0	(3)

[c] Annual emissions estimate (lb/yr) = (emission factor [lb/ton metal produced]) x (annual metal finished by abrasive blasting [tons/yr])
x (percentage of total PM [%]/100) x (1 - [control efficiency of baghouse {%}]/100)

Annual metal finished by abrasive blasting (tons/yr) =	534	(2)

[d] Daily emissions estimate (lb/day) = (daily PM emissions [lb/day]) x (emission factor [% of PM emitted]/100)

[e] Annual emissions estimate (lb/yr) = (annual PM emissions [lb/yr]) x (emission factor [% of PM emitted]/100)

[f] Molybdenum trioxide percentage of PM (% of PM emitted) = (molybdenum percentage of PM [%])
x (molybdenum trioxide molecular weight [lb/lb-mole]) / (molybdenum molecular weight [lb/lb-mole]) (6)

Molybdenum percentage of PM (%) =	0.037	(4)
Molybdenum trioxide molecular weight (lb/lb-mole) =	143.94	
Molybdenum molecular weight (lb/lb-mole) =	95.95	

References

[1] RTI International, Emission Estimation Protocol for Iron and Steel Foundries (December, 2012), Table 6-2. Value for shot blasting, captured and uncontrolled.

[2] See Table 1, Input Process Rates and Parameters.

[3] RTI International, Emission Estimation Protocol for Iron and Steel Foundries (December, 2012), Table 3-4, Typical Collection Efficiencies of Various Particulate Control Devices. Section 3.1.4.1 notes that it can be assumed that PM collection efficiencies for PM greater than 10 µm are 100 percent.

[4] Based on a dust analysis conducted by Apex Laboratories, March 2021. Dust speciation for the mesh blast hopper is assumed to be representative of shotblast speciation.

[5] As a conservative estimate, Chromium VI is assumed to be 3 percent of total chromium. Eagle Foundry reserves the right to revise this assumption if site specific data becomes available.

[6] Conservatively assume 100 percent of molybdenum is in the trioxide form.

Table 15
PTE Small Palmer TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor (lb/ton PM generated)		Total Emissions Estimate	
				Daily [a] (lb/day)	Annual [b] (lb/yr)
Aluminum and Compounds	7429-90-5	10.3	(1)	5.9E-03	1.55
Antimony and Compounds	7440-36-0	1.5E-03	(1)	8.4E-07	2.2E-04
Arsenic and Compounds	7440-38-2	1.2E-03	(1)	6.9E-07	1.8E-04
Barium and Compounds	7440-39-3	0.060	(1)	3.5E-05	9.0E-03
Beryllium and compounds	7440-41-7	9.9E-05	(1)	5.7E-08	1.5E-05
Cadmium and Compounds	7440-43-9	2.3E-04	(1)	1.3E-07	3.4E-05
Chromium	7440-47-3	0.098	(1)	5.6E-05	0.015
Chromium VI	18540-29-9	2.9E-03	(3)	1.7E-06	4.4E-04
Cobalt and Compounds	7440-48-4	1.7E-03	(1)	9.5E-07	2.5E-04
Copper and Compounds	7440-50-8	0.26	(1)	1.5E-04	0.039
Lead and Compounds	7439-92-1	0.031	(1)	1.8E-05	4.7E-03
Manganese and Compounds	7439-96-5	0.78	(1)	4.5E-04	0.12
Molybdenum trioxide	1313-27-5	0.024	(c)	1.4E-05	3.5E-03
Nickel and Compounds	7440-02-0	0.037	(1)	2.1E-05	5.6E-03
Selenium and Compounds	7782-49-2	4.9E-04	(1)	2.8E-07	7.4E-05
Silver and Compounds	7440-22-4	6.2E-04	(1)	3.6E-07	9.2E-05
Thallium	7440-28-0	9.9E-05	(1)	5.7E-08	1.5E-05
Vanadium (fume or dust)	7440-62-2	6.7E-03	(1)	3.9E-06	1.0E-03
Zinc and Compounds	7440-66-6	0.17	(1)	9.6E-05	0.025

Notes

PM = particulate matter.

[a] Daily emissions estimate (lb/day) = (daily PM generated [lb/day])
x (emission factor [lb/ton PM generated]) x (ton/2,000 lb) x (1 - [baghouse control efficiency {%}]/100)

Daily PM generated (lb PM generated/day) =	115	(1)
Baghouse control efficiency (%) =	99.0	(2)

[b] Annual emissions estimate (lb/yr) = (annual PM generated [ton/yr]) x (emission factor [lb/ton PM generated])
x (1 - [baghouse control efficiency {%}]/100)

Annual PM generated (tons PM generated/yr) =	14.9	(1)
Baghouse control efficiency (%) =	99.0	(2)

[c] Molybdenum trioxide emission factor (lb/ton PM generated) = (molybdenum emission factor [lb/ton PM generated])
x (molybdenum trioxide molecular weight [lb/lb-mole]) / (molybdenum molecular weight [lb/lb-mole])

Molybdenum emission factor (lb/ton PM generated) =	0.016	(1)
Molybdenum trioxide molecular weight (lb/lb-mole) =	143.94	
Molybdenum molecular weight (lb/lb-mole) =	95.95	

References

[1] See Table D4, Baghouse Emission Factors - PTE. Based on facility dust collection records and the dust analysis conducted by Apex Laboratories, March 2021.

[2] See Table 1, Input Process Rates and Parameters.

[3] As a conservative estimate, Chromium VI is assumed to be 3 percent of total chromium. Eagle Foundry reserves the right to revise this assumption if site specific data becomes available.

[4] Conservatively assume 100 percent of molybdenum is in the trioxide form.

Table 16
PTE Small Palmer Material Handling TAC Emission Estimates
Eagle Foundry Company

Product	Toxic Air Contaminant	CAS	Weight Percentage (%)	Product Usage [1]		Total Emissions Estimate	
				Daily (lb/day)	Annual (lb/yr)	Daily (lb/day)	Annual (lb/yr)
Velvacoat ST 803 (Mold Wash Z)	Isopropanol	67-63-0	25.0 [2]	41.7	10,000	10.4 [a]	2,500 [b]
	Silica, crystalline	7631-86-9 [3]	0.55 [2]			2.3E-05 [c]	5.5E-03 [d]
	Silica, crystalline	7631-86-9 [3]	0.55 [2]			2.3E-05 [c]	5.5E-03 [d]
Coated Cerabead	Phenol	108-95-2	0.010 [2]	517.7	124,257	0.052 [a]	12.4 [b]
	Silica, crystalline	7631-86-9	25.4 [5]			0.013 [c]	3.15 [d]
	Aluminum and Compounds	7429-90-5	34.2 [5]			0.018 [c]	4.25 [d]
G-29 Sand	Silica, crystalline	7631-86-9 [3]	95.0 [2]	1,226.0	294,241	0.12 [c]	28.0 [d]
Unibond 1350 Core Paste	Silica, crystalline	7631-86-9 [3]	27.1 [5]	41.0	9,835	1.1E-03 [c]	0.27 [d]
Naigai Cerabead	Silica, crystalline	7631-86-9	25.4 [5]	47,227	11,334,527	1.20 [c]	288 [d]
	Aluminum and Compounds	7429-90-5	34.2 [5]			1.62 [c]	388 [d]

Notes

PM = particulate matter.

[a] Daily emissions estimate (lb/day) = (weight percentage [%]/100) x (daily product usage [lb/day])

[b] Annual emissions estimate (lb/yr) =(weight percentage [%]/100) x (annual product usage [lb/yr])

[c] Daily emissions estimate (lb/day) = (PM emission factor [lb/ton]) x (daily product usage [lb/day]) x (ton/2,000 lb) x (weight percent [%])/100

PM emission factor (lb/ton sand handled) = 0.20 (4)

[d] Annual emissions estimate (lb/yr) = (PM emission factor [lb/ton]) x (annual product usage [lb/yr]) x (ton/2,000 lb) x (weight percent [%])/100

PM emission factor (lb/ton sand handled) = 0.20 (4)

References

[1] See Table 1, Input Process Rates and Parameters.

[2] Information from product SDS. Value is midpoint of the range.

[3] CAS numbers have been updated to the CAS for silica, crystalline- respirable. Not all crystalline silica in the product is of a respirable size.

[4] AP-42 Chapter 12.10, Table 12.10-7, Particulate Emission factors for Ancillary Operations and Fugitive Sources at Gray Iron Foundries. Value for sand handling, baghouse controlled.

[5] See Table D3, Silica Data.

Table 17
PTE Big Palmer Material Handling TAC Emission Estimates
Eagle Foundry Company

Product	Toxic Air Contaminant	CAS	Weight Percentage [1] (%)	Product Usage [2]		Total Emissions Estimate	
				Daily (lb/day)	Annual (lb/yr)	Daily (lb/day)	Annual (lb/yr)
Velvacoat ST 803 (Mold Wash Z)	Isopropanol	67-63-0	25.0	125	30,000	31.3 [a]	7,500 [b]
	Silica, crystalline	7631-86-9 [3]	0.55			1.2E-04 [c]	0.030 [d]
	Silica, crystalline	7631-86-9 [3]	0.55			1.2E-04 [c]	0.030 [d]
Isomol 780 (Mold Wash M)	Isopropanol	67-63-0	27.5	21.3	5,113	5.86 [a]	1,406 [b]
	Silica, crystalline	7631-86-9 [3]	0.55			2.1E-05 [c]	5.1E-03 [d]
Unibond 1350 Core Paste	Silica, crystalline	7631-86-9 [3]	27.1 [5]	25.1	6,028	1.2E-03 [c]	0.29 [d]
Naigai Cerabead	Silica, crystalline	7631-86-9 [3]	25.4 [5]	28,946	6,946,975	1.32 [c]	317 [d]
	Aluminum and Compounds	7429-90-5	34.2			1.78 [c]	428 [d]

Notes

PM = particulate matter.

[a] Daily emissions estimate (lb/day) = (weight percentage [%]/100) x (daily product usage [lb/day])

[b] Annual emissions estimate (lb/yr) =(weight percentage [%]/100) x (annual product usage [lb/yr])

[c] Daily emissions estimate (lb/day) = (PM emission factor [lb/ton]) x (daily product usage [lb/day]) x (ton/2,000 lb) x (weight percent [%])/100 x (1 - [baghouse control efficiency {%}]/100)

PM emission factor (lb/ton sand handled) =	3.60	(4)
Main Foundry baghouse control efficiency (%) =	90.0	(2)

[d] Annual emissions estimate (lb/yr) = (PM emission factor [lb/ton]) x (annual product usage [lb/yr]) x (ton/2,000 lb) x (weight percent [%])/100 x (1 - [baghouse control efficiency {%}]/100)

PM emission factor (lb/ton sand handled) =	3.60	(4)
Main Foundry baghouse control efficiency (%) =	90.0	(2)

References

[1] Information from product SDS. Value is midpoint of the range.

[2] See Table 1, Input Process Rates and Parameters.

[3] CAS numbers have been updated to the CAS for silica, crystalline- respirable. Not all crystalline silica in the product is of a respirable size.

[4] AP-42 Chapter 12.10, Table 12.10-7, Particulate Emission factors for Ancillary Operations and Fugitive Sources at Gray Iron Foundries. Value for sand handling, uncontrolled.

[5] See Table D3, Silica Data.

Table 18
PTE Screening Station TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor		Total Emissions Estimate	
				Daily (lb/day)	Annual (lb/yr)
PM	--	0.20	(lb PM/ton sand handled) (1)	7.19 (a)	1,870 (c)
Aluminum and Compounds	7429-90-5	0.50	(% of PM emitted) (4)	0.036 (d)	9.31 (e)
Antimony and Compounds	7440-36-0	7.0E-05	(% of PM emitted) (4)	5.0E-06 (d)	1.3E-03 (e)
Arsenic and Compounds	7440-38-2	2.7E-05	(% of PM emitted) (4)	1.9E-06 (d)	5.0E-04 (e)
Barium and Compounds	7440-39-3	2.4E-03	(% of PM emitted) (4)	1.8E-04 (d)	0.046 (e)
Beryllium and compounds	7440-41-7	5.3E-06	(% of PM emitted) (4)	3.8E-07 (d)	9.9E-05 (e)
Cadmium and Compounds	7440-43-9	5.3E-06	(% of PM emitted) (4)	3.8E-07 (d)	9.9E-05 (e)
Chromium	7440-47-3	5.8E-03	(% of PM emitted) (4)	4.2E-04 (d)	0.11 (e)
Chromium VI	18540-29-9	1.7E-04	(% of PM emitted) (5)	1.3E-05 (d)	3.3E-03 (e)
Cobalt and Compounds	7440-48-4	9.2E-05	(% of PM emitted) (4)	6.6E-06 (d)	1.7E-03 (e)
Copper and Compounds	7440-50-8	0.017	(% of PM emitted) (4)	1.3E-03 (d)	0.33 (e)
Lead and Compounds	7439-92-1	1.2E-03	(% of PM emitted) (4)	8.6E-05 (d)	0.022 (e)
Manganese and Compounds	7439-96-5	0.046	(% of PM emitted) (4)	3.3E-03 (d)	0.87 (e)
Molybdenum trioxide	1313-27-5	1.7E-03	(% of PM emitted) (f)	1.2E-04 (d)	0.031 (e)
Nickel and Compounds	7440-02-0	3.0E-03	(% of PM emitted) (4)	2.1E-04 (d)	0.056 (e)
Selenium and Compounds	7782-49-2	2.7E-05	(% of PM emitted) (4)	1.9E-06 (d)	5.0E-04 (e)
Silica, crystalline	7631-86-9	36.1	(% of PM emitted) (7)	2.60 (d)	675 (e)
Silver and Compounds	7440-22-4	3.1E-05	(% of PM emitted) (4)	2.2E-06 (d)	5.7E-04 (e)
Thallium	7440-28-0	5.3E-06	(% of PM emitted) (4)	3.8E-07 (d)	9.9E-05 (e)
Vanadium (fume or dust)	7440-62-2	2.8E-04	(% of PM emitted) (4)	2.0E-05 (d)	5.2E-03 (e)
Zinc and Compounds	7440-66-6	5.7E-03	(% of PM emitted) (4)	4.1E-04 (d)	0.11 (e)

Notes

PM = particulate matter.

(a) Daily emissions estimate (lb/day) = (emission factor [lb/ton sand handled]) x (daily sand handled [tons/day])

Daily sand handled (tons/day) = 36.0 (b)

(b) Total sand handling (lb/unit) = (metal poured [tons/unit]) x (sand-to-metal ratio)

Daily total metal poured (tons/day) = 31.0 (2)

Annual total metal poured (tons/yr) = 8,060 (2)

Sand-to-metal ratio (tons/ton) = 1.16 (3)

(c) Annual emissions estimate (lb/yr) = (emission factor [lb/ton sand handled]) x (annual sand used [tons/yr])

Annual sand handled (tons/yr) = 9,350 (b)

(d) Daily emissions estimate (lb/day) = (daily PM emissions [lb/day]) x (emission factor [% of PM emitted]/100)

(e) Annual emissions estimate (lb/yr) = (annual PM emissions [lb/yr]) x (emission factor [% of PM emitted]/100)

(f) Molybdenum trioxide emission factor (% of PM emitted) = (molybdenum emission factor [% of PM emitted]) x (molybdenum trioxide molecular weight [lb/lb-mole]) / (molybdenum molecular weight [lb/lb-mole]) (6)

Molybdenum percentage of PM (%) = 1.1E-03 (4)

Molybdenum trioxide molecular weight (lb/lb-mole) = 143.94

Molybdenum molecular weight (lb/lb-mole) = 95.95

References

(1) AP-42 Chapter 12.10, Table 12.10-7. Assumes value for baghouse-controlled sand handling.

(2) See Table 1, Input Process Rates and Parameters.

(3) Ratio of sand to total metal poured is based on facility operations. Value includes G-29 Sand, Naigai Cerabead, and Coated Cerabead.

(4) Based on a dust analysis conducted by Apex Laboratories, March 2021.

(5) As a conservative estimate, Chromium VI is assumed to be 3 percent of total chromium. Eagle Foundry reserves the right to revise this assumption if site specific data becomes available.

(6) Conservatively assume 100 percent of molybdenum is in the trioxide form.

(7) Value is the weighted average silica content of mold making materials.

Table 19
PTE Slag Handling TAC Emission Estimates
Eagle Foundry Company

Pollutant	CAS/DEQ ID	Emission Factor		Total Emissions Estimate	
				Daily (lb/day)	Annual (lb/yr)
PM_{10}	--	0.018	(lb PM/ton slag) [a]	0.016 [b]	4.06 [c]
Aluminum and Compounds	7429-90-5	0.46	(% of PM emitted) [5]	7.6E-05 [d]	0.019 [e]
Antimony and Compounds	7440-36-0	5.4E-05	(% of PM emitted) [5]	8.8E-09 [d]	2.2E-06 [e]
Arsenic and Compounds	7440-38-2	5.4E-05	(% of PM emitted) [5]	8.8E-09 [d]	2.2E-06 [e]
Barium and Compounds	7440-39-3	1.0E-03	(% of PM emitted) [5]	1.7E-07 [d]	4.2E-05 [e]
Beryllium and compounds	7440-41-7	1.1E-05	(% of PM emitted) [5]	1.8E-09 [d]	4.3E-07 [e]
Cadmium and Compounds	7440-43-9	1.1E-05	(% of PM emitted) [5]	1.8E-09 [d]	4.3E-07 [e]
Chromium	7440-47-3	0.26	(% of PM emitted) [5]	4.3E-05 [d]	0.010 [e]
Chromium VI	18540-29-9	1.5E-03	(% of PM emitted) [5]	2.5E-07 [d]	6.2E-05 [e]
Cobalt and Compounds	7440-48-4	3.6E-04	(% of PM emitted) [5]	5.9E-08 [d]	1.4E-05 [e]
Copper and Compounds	7440-50-8	2.4E-03	(% of PM emitted) [5]	4.0E-07 [d]	9.8E-05 [e]
Lead and Compounds	7439-92-1	4.1E-05	(% of PM emitted) [5]	6.7E-09 [d]	1.6E-06 [e]
Manganese and Compounds	7439-96-5	0.77	(% of PM emitted) [5]	1.3E-04 [d]	0.031 [e]
Mercury	7439-97-6	4.3E-06	(% of PM emitted) [5]	7.1E-10 [d]	1.7E-07 [e]
Molybdenum trioxide	1313-27-5	0.012	(% of PM emitted) [5]	2.0E-06 [d]	4.9E-04 [e]
Nickel and Compounds	7440-02-0	5.4E-05	(% of PM emitted) [5]	8.8E-09 [d]	2.2E-06 [e]
Phosphorus and Compounds	504	5.4E-03	(% of PM emitted) [5]	8.8E-07 [d]	2.2E-04 [e]
Selenium and Compounds	7782-49-2	5.4E-05	(% of PM emitted) [5]	8.8E-09 [d]	2.2E-06 [e]
Silver and Compounds	7440-22-4	1.1E-05	(% of PM emitted) [5]	1.8E-09 [d]	4.3E-07 [e]
Thallium	7440-28-0	1.1E-05	(% of PM emitted) [5]	1.8E-09 [d]	4.3E-07 [e]
Vanadium (fume or dust)	7440-62-2	5.7E-04	(% of PM emitted) [5]	9.4E-08 [d]	2.3E-05 [e]
Zinc and Compounds	7440-66-6	2.1E-04	(% of PM emitted) [5]	3.5E-08 [d]	8.7E-06 [e]

Notes

PM = particulate matter.

[a] Emission factor (lb/ton) = (0.0032) x (particulate size multiplier) x ([wind speed {mph}] / 5)$^{1.3}$ / ([material moisture content {%}] / 2)$^{1.4}$

Particulate size multiplier for PM_{10} =	0.35	(1)
Wind speed (mph) =	18.6	(2)
Moisture content of slag (%) =	0.92	(3)

[b] Daily emissions estimate (lb/day) = (emission factor [lb/ton slag]) x (daily slag handled [tons/day])

Daily slag handled (tons/day) =	0.90	(4)

[c] Annual emissions estimate (lb/yr) = (emission factor [lb/ton slag]) x (annual slag handled [tons/yr])

Annual slag handled (tons/yr) =	222	(4)

[d] Daily emissions estimate (lb/day) = (daily PM emissions [lb/day]) x (emission factor [% of PM emitted]/100)

[e] Annual emissions estimate (lb/yr) = (annual PM emissions [lb/yr]) x (emission factor [% of PM emitted]/100)

[e] Molybdenum trioxide emission factor (lb/ton PM generated) = (molybdenum emission factor [lb/ton PM generated]) x (molybdenum trioxide molecular weight [lb/lb-mole]) / (molybdenum molecular weight [lb/lb-mole]) (6)

Molybdenum emission factor (lb/ton PM generated) =	8.0E-03	(5)
Molybdenum trioxide molecular weight (lb/lb-mole) =	143.94	
Molybdenum molecular weight (lb/lb-mole) =	95.95	

References

[1] AP-42, Chapter 13.2.4 "Aggregate Handling and Storage Piles" (November 2006). Equation for quantity of particulate emissions generated by drop operations.

[2] Value represents the highest average daily wind speed, 2018 - 2022, from the Carus-Spangler monitoring station (DEQ).

[3] Based on operations at similar facility.

[4] See Table 1, Input Process Rates and Parameters.

[5] Based on facility dust collection records and the dust analysis conducted by Apex Laboratories, September 2023.

[6] Conservatively assume 100 percent of molybdenum is in the trioxide form.

Table 20
PTE Pattern Making TAC Emission Estimates
Eagle Foundry Company

Product	Toxic Air Contaminant	CAS	Weight Percentage (%)	Specific Gravity	Product Density (lb/gal)	Product Usage [1]		Total Emissions Estimate	
						Maximum Daily (gal/day)	Annual (gal/yr)	Daily [a] (lb/day)	Annual [b] (lb/yr)
Urethane	Toluene	108-88-3	5.50 [2]	0.907 [3]	7.56 [c]	0.36	85.2	0.15	35.4
	1,2,4-Trimethylbenzene	95-63-6	5.50 [5]					0.15	35.4
Mar-Proof H/S Lacquer Sanding Sealer	Methyl Ethyl Ketone	78-93-3	17.5 [2]	--	7.56 [3]	0.030	7.10	0.039	9.40
	Toluene	108-88-3	17.5 [2]					0.039	9.40
	Isopropanol	67-63-0	5.00 [2]					0.011	2.68
	n-Butyl Alcohol	71-36-3	5.00 [2]					0.011	2.68

Notes

gal = gallon; lb = pound.

[a] Daily emissions estimate (lb/day) = (weight percentage [%]/100) x (product density [lb/gal]) x (daily product usage [gal/day])

[b] Annual emissions estimate (lb/yr) =(weight percentage [%]/100) x (product density [lb/gal]) x (maximum annual product usage [gal/yr])

[c] Product density (lb/gal) = (specific gravity) x (density of water [lb/gal])

Density of water (lb/gal) = 8.331 (4)

References

[1] See Table 1, Input Process Rates and Parameters.

[2] Information from product SDS. Value is midpoint of the range.

[3] Information from product SDS.

[4] Density of water at 20 degrees Celsius.

[5] Information from product SDS. CAS 95-63-6 (1,2,4-trimethylbenzene) was substituted for CAS 25551-13-7 (trimethylbenzene).

Table 21
PTE Heat Treat—Propane Combustion TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant	CAS	Emission Factor [1] (lb/Mgal)	Total Emissions Estimate	
			Daily [a] (lb/day)	Annual [b] (lb/yr)
Benzene	71-43-2	7.1E-04	6.4E-04	0.15
Formaldehyde	50-00-0	1.5E-03	1.4E-03	0.33
PAHs (excluding Naphthalene)	401	1.0E-05	9.0E-06	2.2E-03
Naphthalene	91-20-3	3.0E-05	2.7E-05	6.5E-03
Acetaldehyde	75-07-0	3.8E-04	3.4E-04	0.082
Acrolein	107-02-8	2.4E-04	2.2E-04	0.052
Ammonia	7664-41-7	0.30	0.27	64.7
Ethylbenzene	100-41-4	8.4E-04	7.5E-04	0.18
Hexane	110-54-3	5.6E-04	5.0E-04	0.12
Toluene	108-88-3	3.3E-03	2.9E-03	0.70
Xylene (mixed isomers)	1330-20-7	2.4E-03	2.2E-03	0.52

Notes

Mgal = thousand gallons.

[a] Daily emissions estimate (lb/day) = (emission factor [lb/Mgal]) x (daily propane usage [gal/day]) x (Mgal/1,000 gal)

Daily propane usage (gal/day) = 898 (2)

[b] Annual emissions estimate (lb/yr) = (emission factor [lb/Mgal]) x (annual propane usage [gal/yr]) x (Mgal/1,000 gal)

Annual propane usage (gal/yr) = 215,639 (2)

References

[1] Emission factors provided by Oregon Department of Environmental Quality for Propane External Combustion Sources. Emission factors for sources <10 MMBtu/hr were used.

[2] See Table 1, Input Process Rates and Parameters.

Table 22
PTE Diesel Emergency Generator TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant	CAS	Emission Factor (lb/Mgal)		Emissions Estimates	
				Daily [a] (lb/day)	Annual [b] (lb/yr)
Arsenic	7440-38-2	1.6E-03	[2]	2.3E-05	1.2E-03
Cadmium	7440-43-9	1.5E-03	[2]	2.2E-05	1.1E-03
Chromium VI	18540-29-9	1.0E-04	[2]	1.5E-06	7.3E-05
Copper	7440-50-8	4.1E-03	[2]	6.0E-05	3.0E-03
Lead	7439-92-1	8.3E-03	[2]	1.2E-04	6.1E-03
Manganese	7439-96-5	3.1E-03	[2]	4.5E-05	2.3E-03
Mercury	7439-97-6	2.0E-03	[2]	2.9E-05	1.5E-03
Nickel	7440-02-0	3.9E-03	[2]	5.7E-05	2.8E-03
Selenium	7782-49-2	2.2E-03	[2]	3.2E-05	1.6E-03
Acetaldehyde	75-07-0	0.78	[2]	0.011	0.57
Acrolein	107-02-8	0.034	[2]	4.9E-04	0.025
Benzene	71-43-2	0.19	[2]	2.7E-03	0.14
1,3-Butadiene	106-99-0	0.217	[2]	3.2E-03	0.16
Ethylbenzene	100-41-4	0.011	[2]	1.6E-04	8.0E-03
Formaldehyde	50-00-0	1.73	[2]	0.025	1.26
Hexane	110-54-3	0.027	[2]	3.9E-04	0.020
Toluene	108-88-3	0.11	[2]	1.5E-03	0.077
Xylenes (mixed isomers)	1330-20-7	0.042	[2]	6.2E-04	0.031
Ammonia	7664-41-7	0.80	[4]	0.012	0.58
Hydrochloric Acid	7647-01-0	0.19	[2]	2.7E-03	0.14
PAHs	401	0.036	[2]	5.3E-04	0.026
Benzo(a)pyrene	50-32-8	3.52E-05	[3]	5.1E-07	2.6E-05
Naphthalene	91-20-3	0.020	[2]	2.9E-04	0.014
DPM	200	33.5	[2]	0.49	24.5

Notes

DPM = Diesel particulate matter; Mgal = thousand gallons.

[a] Daily emissions estimate (lb/day) = (emission factor [lb/Mgal]) x (Mgal/1,000 gal) x (daily fuel consumption [gal/day])

Daily fuel consumption (gal/day) = 14.6 (1)

[b] Annual emissions estimate (lb/yr) = (emission factor [lb/Mgal]) x (Mgal/1,000 gal) x (annual fuel consumption [gal/yr])

Annual fuel consumption (gal/yr) = 730 (1)

References

[1] See Table 1, Input Process Rates and Parameters.

[2] DEQ approved diesel combustion emission factors for stationary and portable internal combustion engines.

[3] AP-42 Section 3.4, Table 3.4-4, converted to lb/Mgal using a heating value of 137,000 Btu/gal (Appendix A)

[4] Reporting Procedures for AB2588 Facilities for Reporting their Quadrennial Air Toxics Emissions Inventory published by the South Coast Air Quality Management District (SCAQMD) in December 2016. See Appendix B, Table B-2 "Default EF for Diesel/Distillate Oil Fuel Combustion (lb/1,000 gal)" for stationary and portable internal combustion engines (ICE). Assumes no control.

Table 23
PTE Reclaimed Bead Silo TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor			Total Emissions Estimate		Annual (lb/yr)	
					Daily (lb/day)			
PM	--	2.1E-04	(lb/hr)	(a)	4.2E-03	(b)	1.84	(c)
Aluminum and Compounds	7429-90-5	0.50	(% of PM emitted)	(3)	2.1E-05	(d)	9.2E-03	(e)
Antimony and Compounds	7440-36-0	7.0E-05	(% of PM emitted)	(3)	2.9E-09	(d)	1.3E-06	(e)
Arsenic and Compounds	7440-38-2	2.7E-05	(% of PM emitted)	(3)	1.1E-09	(d)	4.9E-07	(e)
Barium and Compounds	7440-39-3	2.4E-03	(% of PM emitted)	(3)	1.0E-07	(d)	4.5E-05	(e)
Beryllium and compounds	7440-41-7	5.3E-06	(% of PM emitted)	(3)	2.2E-10	(d)	9.7E-08	(e)
Cadmium and Compounds	7440-43-9	5.3E-06	(% of PM emitted)	(3)	2.2E-10	(d)	9.7E-08	(e)
Chromium	7440-47-3	5.8E-03	(% of PM emitted)	(3)	2.4E-07	(d)	1.1E-04	(e)
Chromium VI	18540-29-9	1.7E-04	(% of PM emitted)	(4)	7.3E-09	(d)	3.2E-06	(e)
Cobalt and Compounds	7440-48-4	9.2E-05	(% of PM emitted)	(3)	3.9E-09	(d)	1.7E-06	(e)
Copper and Compounds	7440-50-8	0.017	(% of PM emitted)	(3)	7.3E-07	(d)	3.2E-04	(e)
Lead and Compounds	7439-92-1	1.2E-03	(% of PM emitted)	(3)	5.0E-08	(d)	2.2E-05	(e)
Manganese and Compounds	7439-96-5	0.046	(% of PM emitted)	(3)	1.9E-06	(d)	8.5E-04	(e)
Nickel and Compounds	7440-02-0	3.0E-03	(% of PM emitted)	(3)	1.2E-07	(d)	5.5E-05	(e)
Silica, crystalline	7631-86-9	36.1	(% of PM emitted)	(5)	1.5E-03	(d)	0.66	(e)
Selenium and Compounds	7782-49-2	2.7E-05	(% of PM emitted)	(3)	1.1E-09	(d)	4.9E-07	(e)
Silver and Compounds	7440-22-4	3.1E-05	(% of PM emitted)	(3)	1.3E-09	(d)	5.6E-07	(e)
Thallium	7440-28-0	5.3E-06	(% of PM emitted)	(3)	2.2E-10	(d)	9.7E-08	(e)
Vanadium (fume or dust)	7440-62-2	2.8E-04	(% of PM emitted)	(3)	1.2E-08	(d)	5.1E-06	(e)
Zinc and Compounds	7440-66-6	5.7E-03	(% of PM emitted)	(3)	2.4E-07	(d)	1.0E-04	(e)

Notes

PM = particulate matter.

(a) Emission factor (lb/hr) = (PM discharge rate [lb/10^6 ft^3]) x (bin vent airflow rate [ft^3/hr]) x (10^6) x (1 - [baghouse control efficiency {%}]/100)

Bin vent airflow rate (ft^3/hr) =	30,000	(1)
PM discharge rate (lb/10^6 ft^3) =	0.70	(1)
Baghouse control efficiency (%) =	99.0	(2)

(b) Daily emissions estimate (lb/day) = (emission factor [lb/hr]) x (daily hours of operation [hrs/day])

Daily hours of operation (hrs/day) =	20.0	(2)

(c) Annual emissions estimate (lb/yr) = (emission factor [lb/hr]) x (annual hours of operation [hrs/yr])

Annual hours of operation (hrs/yr) =	8,760	(2)

(d) Daily emissions estimate (lb/day) = (daily PM emissions [lb/day]) x (emission factor [% of PM emitted]/100)

(e) Annual emissions estimate (lb/yr) = (annual PM emissions [lb/yr]) x (emission factor [% of PM emitted]/100)

References

(1) Draft Review Report 03-2631, Application no. 016656, October 29, 1998.

(2) See Table 1, Input Process Rates and Parameters.

(3) Based on a dust analysis conducted by Apex Laboratories, March 2021.

(4) As a conservative estimate, Chromium VI is assumed to be 3 percent of total chromium. Eagle Foundry reserves the right to revise this assumption if site-specific data becomes available.

(5) Value is the weighted average silica content of mold making materials.

Table 24
PTE Reclaimed Bead Overflow Silo TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor			Total Emissions Estimate			
					Daily (lb/day)		Annual (lb/yr)	
PM	--	2.1E-04	(lb/hr)	(a)	4.2E-03	(b)	1.84	(c)
Aluminum and Compounds	7429-90-5	0.50	(% of PM emitted)	(3)	2.1E-05	(d)	9.2E-03	(e)
Antimony and Compounds	7440-36-0	7.0E-05	(% of PM emitted)	(3)	2.9E-09	(d)	1.3E-06	(e)
Arsenic and Compounds	7440-38-2	2.7E-05	(% of PM emitted)	(3)	1.1E-09	(d)	4.9E-07	(e)
Barium and Compounds	7440-39-3	2.4E-03	(% of PM emitted)	(3)	1.0E-07	(d)	4.5E-05	(e)
Beryllium and compounds	7440-41-7	5.3E-06	(% of PM emitted)	(3)	2.2E-10	(d)	9.7E-08	(e)
Cadmium and Compounds	7440-43-9	5.3E-06	(% of PM emitted)	(3)	2.2E-10	(d)	9.7E-08	(e)
Chromium	7440-47-3	5.8E-03	(% of PM emitted)	(3)	2.4E-07	(d)	1.1E-04	(e)
Chromium VI	18540-29-9	1.7E-04	(% of PM emitted)	(4)	7.3E-09	(d)	3.2E-06	(e)
Cobalt and Compounds	7440-48-4	9.2E-05	(% of PM emitted)	(3)	3.9E-09	(d)	1.7E-06	(e)
Copper and Compounds	7440-50-8	0.017	(% of PM emitted)	(3)	7.3E-07	(d)	3.2E-04	(e)
Lead and Compounds	7439-92-1	1.2E-03	(% of PM emitted)	(3)	5.0E-08	(d)	2.2E-05	(e)
Manganese and Compounds	7439-96-5	0.046	(% of PM emitted)	(3)	1.9E-06	(d)	8.5E-04	(e)
Nickel and Compounds	7440-02-0	3.0E-03	(% of PM emitted)	(3)	1.2E-07	(d)	5.5E-05	(e)
Silica, crystalline	7631-86-9	36.1	(% of PM emitted)	(5)	1.5E-03	(d)	0.66	(e)
Selenium and Compounds	7782-49-2	2.7E-05	(% of PM emitted)	(3)	1.1E-09	(d)	4.9E-07	(e)
Silver and Compounds	7440-22-4	3.1E-05	(% of PM emitted)	(3)	1.3E-09	(d)	5.6E-07	(e)
Thallium	7440-28-0	5.3E-06	(% of PM emitted)	(3)	2.2E-10	(d)	9.7E-08	(e)
Vanadium (fume or dust)	7440-62-2	2.8E-04	(% of PM emitted)	(3)	1.2E-08	(d)	5.1E-06	(e)
Zinc and Compounds	7440-66-6	5.7E-03	(% of PM emitted)	(3)	2.4E-07	(d)	1.0E-04	(e)

Notes

PM = particulate matter.

(a) Emission factor (lb/hr) = (PM discharge rate [lb/10^6 ft^3]) x (bin vent airflow rate [ft^3/hr]) x (10^6) x (1 - [baghouse control efficiency {%}]/100)

Bin vent airflow rate (ft^3/hr) =	30,000	(1)
PM discharge rate (lb/10^6 ft^3) =	0.70	(1)
Baghouse control efficiency (%) =	99.0	(2)

(b) Daily emissions estimate (lb/day) = (emission factor [lb/hr]) x (daily hours of operation [hrs/day])

Daily hours of operation (hrs/day) =	20.0	(2)

(c) Annual emissions estimate (lb/yr) = (emission factor [lb/hr]) x (annual hours of operation [hrs/yr])

Annual hours of operation (hrs/yr) =	8,760	(2)

(d) Daily emissions estimate (lb/day) = (daily PM emissions [lb/day]) x (emission factor [% of PM emitted]/100)

(e) Annual emissions estimate (lb/yr) = (annual PM emissions [lb/yr]) x (emission factor [% of PM emitted]/100)

References

(1) Draft Review Report 03-2631, Application no. 016656, October 29, 1998.

(2) See Table 1, Input Process Rates and Parameters.

(3) Based on a dust analysis conducted by Apex Laboratories, March 2021.

(4) As a conservative estimate, Chromium VI is assumed to be 3 percent of total chromium. Eagle Foundry reserves the right to revise this assumption if site-specific data becomes available.

(5) Value is the weighted average silica content of mold making materials.

Table 25
PTE Small Palmer Silo TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor			Total Emissions Estimate			
					Daily (lb/day)		Annual (lb/yr)	
PM	--	2.1E-04	(lb/hr)	(a)	4.2E-03	(b)	1.84	(c)
Aluminum and Compounds	7429-90-5	0.50	(% of PM emitted)	(3)	2.1E-05	(d)	9.2E-03	(e)
Antimony and Compounds	7440-36-0	7.0E-05	(% of PM emitted)	(3)	2.9E-09	(d)	1.3E-06	(e)
Arsenic and Compounds	7440-38-2	2.7E-05	(% of PM emitted)	(3)	1.1E-09	(d)	4.9E-07	(e)
Barium and Compounds	7440-39-3	2.4E-03	(% of PM emitted)	(3)	1.0E-07	(d)	4.5E-05	(e)
Beryllium and compounds	7440-41-7	5.3E-06	(% of PM emitted)	(3)	2.2E-10	(d)	9.7E-08	(e)
Cadmium and Compounds	7440-43-9	5.3E-06	(% of PM emitted)	(3)	2.2E-10	(d)	9.7E-08	(e)
Chromium	7440-47-3	5.8E-03	(% of PM emitted)	(3)	2.4E-07	(d)	1.1E-04	(e)
Chromium VI	18540-29-9	1.7E-04	(% of PM emitted)	(4)	7.3E-09	(d)	3.2E-06	(e)
Cobalt and Compounds	7440-48-4	9.2E-05	(% of PM emitted)	(3)	3.9E-09	(d)	1.7E-06	(e)
Copper and Compounds	7440-50-8	0.017	(% of PM emitted)	(3)	7.3E-07	(d)	3.2E-04	(e)
Lead and Compounds	7439-92-1	1.2E-03	(% of PM emitted)	(3)	5.0E-08	(d)	2.2E-05	(e)
Manganese and Compounds	7439-96-5	0.046	(% of PM emitted)	(3)	1.9E-06	(d)	8.5E-04	(e)
Nickel and Compounds	7440-02-0	3.0E-03	(% of PM emitted)	(3)	1.2E-07	(d)	5.5E-05	(e)
Silica, crystalline	7631-86-9	36.1	(% of PM emitted)	(5)	1.5E-03	(d)	0.66	(e)
Selenium and Compounds	7782-49-2	2.7E-05	(% of PM emitted)	(3)	1.1E-09	(d)	4.9E-07	(e)
Silver and Compounds	7440-22-4	3.1E-05	(% of PM emitted)	(3)	1.3E-09	(d)	5.6E-07	(e)
Thallium	7440-28-0	5.3E-06	(% of PM emitted)	(3)	2.2E-10	(d)	9.7E-08	(e)
Vanadium (fume or dust)	7440-62-2	2.8E-04	(% of PM emitted)	(3)	1.2E-08	(d)	5.1E-06	(e)
Zinc and Compounds	7440-66-6	5.7E-03	(% of PM emitted)	(3)	2.4E-07	(d)	1.0E-04	(e)

Notes

PM = particulate matter.

(a) Emission factor (lb/hr) = (PM discharge rate [lb/10^6 ft^3]) x (bin vent airflow rate [ft^3/hr]) x (10^6) x (1 - [baghouse control efficiency {%}]/100)

Bin vent airflow rate (ft^3/hr) =	30,000	(1)
PM discharge rate (lb/10^6 ft^3) =	0.70	(1)
Baghouse control efficiency (%) =	99.0	(2)

(b) Daily emissions estimate (lb/day) = (emission factor [lb/hr]) x (daily hours of operation [hrs/day])

Daily hours of operation (hrs/day) =	20.0	(2)

(c) Annual emissions estimate (lb/yr) = (emission factor [lb/hr]) x (annual hours of operation [hrs/yr])

Annual hours of operation (hrs/yr) =	8,760	(2)

(d) Daily emissions estimate (lb/day) = (daily PM emissions [lb/day]) x (emission factor [% of PM emitted]/100)

(e) Annual emissions estimate (lb/yr) = (annual PM emissions [lb/yr]) x (emission factor [% of PM emitted]/100)

References

(1) Draft Review Report 03-2631, Application no. 016656, October 29, 1998.

(2) See Table 1, Input Process Rates and Parameters.

(3) Based on a dust analysis conducted by Apex Laboratories, March 2021.

(4) As a conservative estimate, Chromium VI is assumed to be 3 percent of total chromium. Eagle Foundry reserves the right to revise this assumption if site-specific data becomes available.

(5) Value is the weighted average silica content of mold making materials.

Table 26
PTE New Bead Silo TAC Emission Estimates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor			Total Emissions Estimate			
					Daily (lb/day)		Annual (lb/yr)	
PM	--	2.1E-04	(lb/hr)	(a)	4.2E-03	(b)	1.84	(c)
Aluminum and Compounds	7429-90-5	34.21	(% of PM emitted)	(2)	1.4E-03	(d)	0.63	(e)
Silica, crystalline	7631-86-9	25.38	(% of PM emitted)	(2)	1.1E-03	(d)	0.47	(e)

Notes

PM = particulate matter.

(a) Emission factor (lb/hr) = (PM discharge rate [lb/10^6 ft^3]) x (bin vent airflow rate [ft^3/hr]) x (10^6) x (1 - [baghouse control efficiency {%}]/100)

Bin vent airflow rate (ft^3/hr) = 30,000 (1)

PM discharge rate (lb/10^6 ft^3) = 0.70 (1)

Baghouse control efficiency (%) = 99.0 (3)

(b) Daily emissions estimate (lb/day) = (emission factor [lb/hr]) x (daily hours of operation [hrs/day])

Daily hours of operation (hrs/day) = 20.0 (3)

(c) Annual emissions estimate (lb/yr) = (emission factor [lb/hr]) x (annual hours of operation [hrs/yr])

Annual hours of operation (hrs/yr) = 8,760 (3)

(d) Daily emissions estimate (lb/day) = (daily PM emissions [lb/day]) x (emission factor [% of PM emitted]/100)

(e) Annual emissions estimate (lb/yr) = (annual PM emissions [lb/yr]) x (emission factor [% of PM emitted]/100)

References

(1) Draft Review Report 03-2631, Application no. 016656, October 29, 1998.

(2) See Table D3, Silica Data.

(3) See Table 1, Input Process Rates and Parameters.

Table 27
PTE TAC Emissions Summary
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	HAP? (Yes/No)	RBC? (Yes/No)	Emissions Estimate			
				Foundry White Iron		Foundry Steel	
				(lb/day)	(lb/yr)	(lb/day)	(lb/yr)
ORGANIC COMPOUNDS							
Acetaldehyde	75-07-0	Yes	Yes	--	--	--	--
Acrolein	107-02-8	Yes	Yes	--	--	--	--
Benzene	71-43-2	Yes	Yes	--	--	--	--
1,3-Butadiene	106-99-0	Yes	Yes	--	--	--	--
Ethylbenzene	100-41-4	Yes	Yes	--	--	--	--
Formaldehyde	50-00-0	Yes	Yes	--	--	--	--
Hexane	110-54-3	Yes	Yes	--	--	--	--
Isopropanol	67-63-0	No	Yes	--	--	--	--
Methyl Ethyl Ketone	78-93-3	No	Yes	--	--	--	--
n-Butyl Alcohol	71-36-3	No	No	--	--	--	--
Phenol	108-95-2	Yes	Yes	--	--	--	--
Toluene	108-88-3	Yes	Yes	--	--	--	--
1,2,4-Trimethylbenzene	95-63-6	No	Yes	--	--	--	--
Xylene (mixed)	1330-20-7	Yes	Yes	--	--	--	--
INORGANIC COMPOUNDS							
Ammonia	7664-41-7	No	Yes	--	--	--	--
Hydrochloric Acid	7647-01-0	Yes	Yes	--	--	--	--
Molybdenum trioxide	1313-27-5	No	No	--	0.082	3.9E-04	0.020
Silicon dioxide (respirable)	7631-86-9	No	Yes	--	--	--	--
POLYCYCLIC AROMATIC HYDROCARBONS (PAH)							
Benzo(a)pyrene	50-32-8	Yes	Yes	--	--	--	--
Naphthalene	91-20-3	Yes	Yes	--	--	--	--
PAHs (excluding Naphthalene)*	401	Yes	Yes	--	--	--	--
METALS							
Aluminum and Compounds	7429-90-5	No	Yes	--	23.6	0.10	5.38
Antimony and Compounds	7440-36-0	Yes	Yes	--	0.16	9.5E-04	0.050
Arsenic and Compounds	7440-38-2	Yes	Yes	--	0.29	3.5E-03	0.18
Barium and Compounds	7440-39-3	No	No	--	0.72	5.5E-03	0.28
Beryllium and compounds	7440-41-7	Yes	Yes	--	--	--	--
Cadmium and Compounds	7440-43-9	Yes	Yes	--	0.024	3.4E-04	0.018
Chromium	7440-47-3	Yes	No	--	0.54	0.035	0.12
Chromium VI	18540-29-9	Yes	Yes	--	3.2E-03	2.6E-04	9.1E-04
Cobalt and Compounds	7440-48-4	Yes	Yes	--	0.029	1.4E-04	7.1E-03
Copper and Compounds	7440-50-8	No	Yes	--	1.12	4.8E-03	0.25
Lead and Compounds	7439-92-1	Yes	Yes	--	0.64	1.1E-03	0.059
Manganese and Compounds	7439-96-5	Yes	Yes	--	3.61	2.0E-03	0.54
Mercury	7439-97-6	Yes	Yes	--	0.023	2.2E-04	0.011
Nickel and Compounds	7440-02-0	Yes	Yes	--	1.05	0.16	0.46
Phosphorus and Compounds	504	Yes	No	--	1.34	0.012	0.63
Selenium and Compounds	7782-49-2	Yes	Yes	--	--	--	--
Silver and Compounds	7440-22-4	No	No	--	0.11	4.6E-04	0.024
Thallium	7440-28-0	No	No	--	--	--	--
Vanadium (fume or dust)	7440-62-2	No	Yes	--	--	--	--
Zinc and Compounds	7440-66-6	No	No	--	2.79	0.013	0.70
DIESEL PARTICULATE MATTER (DPM)							
DPM	200	No	Yes	--	--	--	--
Total TAC Emissions Estimate				**0**	**36.1**	**0.34**	**8.73**
Total HAP Emissions Estimate				**0**	**7.71**	**0.21**	**2.07**

Table 27
PTE TAC Emissions Summary
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emissions Estimate					
		Hot Top		Reclamation		Air Arc	
		(lb/day)	(lb/yr)	(lb/day)	(lb/yr)	(lb/day)	(lb/yr)
ORGANIC COMPOUNDS							
Acetaldehyde	75-07-0	--	--	--	--	--	--
Acrolein	107-02-8	--	--	--	--	--	--
Benzene	71-43-2	--	--	--	--	--	--
1,3-Butadiene	106-99-0	--	--	--	--	--	--
Ethylbenzene	100-41-4	--	--	--	--	--	--
Formaldehyde	50-00-0	--	--	--	--	--	--
Hexane	110-54-3	--	--	--	--	--	--
Isopropanol	67-63-0	--	--	--	--	--	--
Methyl Ethyl Ketone	78-93-3	--	--	--	--	--	--
n-Butyl Alcohol	71-36-3	--	--	--	--	--	--
Phenol	108-95-2	--	--	--	--	--	--
Toluene	108-88-3	--	--	--	--	--	--
1,2,4-Trimethylbenzene	95-63-6	--	--	--	--	--	--
Xylene (mixed)	1330-20-7	--	--	--	--	--	--
INORGANIC COMPOUNDS							
Ammonia	7664-41-7	--	--	--	--	--	--
Hydrochloric Acid	7647-01-0	--	--	--	--	--	--
Molybdenum trioxide	1313-27-5	--	--	3.1E-05	8.1E-03	3.0E-05	4.8E-03
Silicon dioxide (respirable)	7631-86-9	4.3E-03	1.02	0.68	177	--	--
POLYCYCLIC AROMATIC HYDROCARBONS (PAI							
Benzo(a)pyrene	50-32-8	--	--	--	--	--	--
Naphthalene	91-20-3	--	--	--	--	--	--
PAHs (excluding Naphthalene)*	401	--	--	--	--	--	--
METALS							
Aluminum and Compounds	7429-90-5	--	--	0.029	7.45	--	--
Antimony and Compounds	7440-36-0	--	--	7.0E-06	1.8E-03	--	--
Arsenic and Compounds	7440-38-2	--	--	4.6E-06	1.2E-03	--	--
Barium and Compounds	7440-39-3	--	--	1.8E-04	0.046	--	--
Beryllium and compounds	7440-41-7	--	--	4.9E-07	1.3E-04	--	--
Cadmium and Compounds	7440-43-9	--	--	2.7E-06	7.0E-04	--	--
Chromium	7440-47-3	--	--	8.6E-04	0.22	2.0E-05	9.3E-03
Chromium VI	18540-29-9	--	--	2.6E-05	6.7E-03	5.9E-07	2.8E-04
Cobalt and Compounds	7440-48-4	--	--	6.8E-06	1.8E-03	--	--
Copper and Compounds	7440-50-8	--	--	5.8E-04	0.15	0	6.1E-04
Lead and Compounds	7439-92-1	--	--	2.1E-04	0.056	--	--
Manganese and Compounds	7439-96-5	--	--	5.0E-03	1.31	5.0E-04	0.039
Mercury	7439-97-6	--	--	--	--	--	--
Nickel and Compounds	7440-02-0	--	--	1.1E-04	0.028	3.2E-05	5.9E-03
Phosphorus and Compounds	504	--	--	--	--	2.8E-06	4.0E-04
Selenium and Compounds	7782-49-2	--	--	4.4E-06	1.1E-03	--	--
Silver and Compounds	7440-22-4	--	--	4.8E-06	1.2E-03	--	--
Thallium	7440-28-0	--	--	2.9E-07	7.4E-05	--	--
Vanadium (fume or dust)	7440-62-2	--	--	2.7E-05	7.1E-03	--	--
Zinc and Compounds	7440-66-6	--	--	1.1E-04	0.029	--	--
DIESEL PARTICULATE MATTER (DPM)							
DPM	200	--	--	--	--	--	--
Total TAC Emissions Estimate		**4.3E-03**	**1.02**	**0.72**	**186**	**5.9E-04**	**0.060**
Total HAP Emissions Estimate		**0**	**0**	**6.3E-03**	**1.63**	**5.6E-04**	**0.055**

Table 27
PTE TAC Emissions Summary
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emissions Estimate					
		Welding		Grinding SS (Controlled)		Grinding SS (Fugitive)	
		(lb/day)	(lb/yr)	(lb/day)	(lb/yr)	(lb/day)	(lb/yr)
ORGANIC COMPOUNDS							
Acetaldehyde	75-07-0	--	--	--	--	--	--
Acrolein	107-02-8	--	--	--	--	--	--
Benzene	71-43-2	--	--	--	--	--	--
1,3-Butadiene	106-99-0	--	--	--	--	--	--
Ethylbenzene	100-41-4	--	--	--	--	--	--
Formaldehyde	50-00-0	--	--	--	--	--	--
Hexane	110-54-3	--	--	--	--	--	--
Isopropanol	67-63-0	--	--	--	--	--	--
Methyl Ethyl Ketone	78-93-3	--	--	--	--	--	--
n-Butyl Alcohol	71-36-3	--	--	--	--	--	--
Phenol	108-95-2	--	--	--	--	--	--
Toluene	108-88-3	--	--	--	--	--	--
1,2,4-Trimethylbenzene	95-63-6	--	--	--	--	--	--
Xylene (mixed)	1330-20-7	--	--	--	--	--	--
INORGANIC COMPOUNDS							
Ammonia	7664-41-7	--	--	--	--	--	--
Hydrochloric Acid	7647-01-0	--	--	--	--	--	--
Molybdenum trioxide	1313-27-5	0.019	0.096	1.0E-03	0.26	1.5E-04	0.039
Silicon dioxide (respirable)	7631-86-9	--	--	--	--	--	--
POLYCYCLIC AROMATIC HYDROCARBONS (PAI							
Benzo(a)pyrene	50-32-8	--	--	--	--	--	--
Naphthalene	91-20-3	--	--	--	--	--	--
PAHs (excluding Naphthalene)*	401	--	--	--	--	--	--
METALS							
Aluminum and Compounds	7429-90-5	--	7.8E-03	6.4E-04	0.17	9.6E-05	0.025
Antimony and Compounds	7440-36-0	--	--	3.5E-07	9.0E-05	5.2E-08	1.4E-05
Arsenic and Compounds	7440-38-2	--	1.9E-04	2.1E-06	5.4E-04	3.1E-07	8.2E-05
Barium and Compounds	7440-39-3	--	--	1.9E-05	4.8E-03	2.8E-06	7.3E-04
Beryllium and compounds	7440-41-7	--	--	6.9E-08	1.8E-05	1.0E-08	2.7E-06
Cadmium and Compounds	7440-43-9	--	--	5.4E-07	1.4E-04	8.1E-08	2.1E-05
Chromium	7440-47-3	0.040	1.32	0.035	9.00	5.2E-03	1.35
Chromium VI	18540-29-9	2.0E-03	0.33	1.0E-03	0.27	1.6E-04	0.041
Cobalt and Compounds	7440-48-4	--	7.3E-03	1.0E-05	2.6E-03	1.5E-06	4.0E-04
Copper and Compounds	7440-50-8	4.6E-03	7.51	1.0E-04	0.026	1.5E-05	3.9E-03
Lead and Compounds	7439-92-1	--	--	6.0E-07	1.6E-04	9.0E-08	2.3E-05
Manganese and Compounds	7439-96-5	0.013	1.06	1.3E-03	0.35	2.0E-04	0.052
Mercury	7439-97-6	--	--	--	--	--	--
Nickel and Compounds	7440-02-0	0.042	0.32	0.027	5.37	4.0E-03	0.81
Phosphorus and Compounds	504	--	5.6E-04	5.3E-05	0.014	8.0E-06	2.1E-03
Selenium and Compounds	7782-49-2	--	--	3.5E-07	9.0E-05	5.2E-08	1.4E-05
Silver and Compounds	7440-22-4	--	--	6.9E-08	1.8E-05	1.0E-08	2.7E-06
Thallium	7440-28-0	--	--	6.9E-08	1.8E-05	1.0E-08	2.7E-06
Vanadium (fume or dust)	7440-62-2	--	1.9E-04	8.0E-06	2.1E-03	1.2E-06	3.1E-04
Zinc and Compounds	7440-66-6	--	--	4.5E-06	1.2E-03	6.7E-07	1.7E-04
DIESEL PARTICULATE MATTER (DPM)							
DPM	200	--	--	--	--	--	--
Total TAC Emissions Estimate		**0.12**	**10.7**	**0.065**	**15.5**	**9.8E-03**	**2.33**
Total HAP Emissions Estimate		**0.097**	**3.04**	**0.064**	**15.0**	**9.6E-03**	**2.26**

Table 27
PTE TAC Emissions Summary
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emissions Estimate					
		Grinding NSS (Controlled)		Grinding NSS (Fugitive)		Mesh Blast	
		(lb/day)	(lb/yr)	(lb/day)	(lb/yr)	(lb/day)	(lb/yr)
ORGANIC COMPOUNDS							
Acetaldehyde	75-07-0	--	--	--	--	--	--
Acrolein	107-02-8	--	--	--	--	--	--
Benzene	71-43-2	--	--	--	--	--	--
1,3-Butadiene	106-99-0	--	--	--	--	--	--
Ethylbenzene	100-41-4	--	--	--	--	--	--
Formaldehyde	50-00-0	--	--	--	--	--	--
Hexane	110-54-3	--	--	--	--	--	--
Isopropanol	67-63-0	--	--	--	--	--	--
Methyl Ethyl Ketone	78-93-3	--	--	--	--	--	--
n-Butyl Alcohol	71-36-3	--	--	--	--	--	--
Phenol	108-95-2	--	--	--	--	--	--
Toluene	108-88-3	--	--	--	--	--	--
1,2,4-Trimethylbenzene	95-63-6	--	--	--	--	--	--
Xylene (mixed)	1330-20-7	--	--	--	--	--	--
INORGANIC COMPOUNDS							
Ammonia	7664-41-7	--	--	--	--	--	--
Hydrochloric Acid	7647-01-0	--	--	--	--	--	--
Molybdenum trioxide	1313-27-5	6.6E-03	1.60	9.9E-04	0.24	2.7E-04	5.3E-03
Silicon dioxide (respirable)	7631-86-9	--	--	--	--	--	--
POLYCYCLIC AROMATIC HYDROCARBONS (PAI							
Benzo(a)pyrene	50-32-8	--	--	--	--	--	--
Naphthalene	91-20-3	--	--	--	--	--	--
PAHs (excluding Naphthalene)*	401	--	--	--	--	--	--
METALS							
Aluminum and Compounds	7429-90-5	4.2E-03	1.09	6.3E-04	0.16	3.1E-04	6.1E-03
Antimony and Compounds	7440-36-0	2.3E-06	6.0E-04	3.4E-07	8.9E-05	7.7E-06	1.5E-04
Arsenic and Compounds	7440-38-2	1.4E-05	3.6E-03	2.1E-06	5.4E-04	2.3E-05	4.6E-04
Barium and Compounds	7440-39-3	1.2E-04	0.032	1.8E-05	4.8E-03	2.4E-06	4.8E-05
Beryllium and compounds	7440-41-7	4.6E-07	1.2E-04	6.9E-08	1.8E-05	4.9E-07	9.7E-06
Cadmium and Compounds	7440-43-9	3.6E-06	9.3E-04	5.3E-07	1.4E-04	4.9E-07	9.7E-06
Chromium	7440-47-3	4.4E-03	45.0	6.6E-04	6.77	1.2E-03	0.023
Chromium VI	18540-29-9	1.3E-04	1.35	2.0E-05	0.20	3.5E-05	6.9E-04
Cobalt and Compounds	7440-48-4	6.7E-05	0.017	1.0E-05	2.6E-03	3.4E-05	6.7E-04
Copper and Compounds	7440-50-8	--	0.10	--	0.016	1.3E-03	0.025
Lead and Compounds	7439-92-1	4.0E-06	1.0E-03	6.0E-07	1.5E-04	3.8E-06	7.5E-05
Manganese and Compounds	7439-96-5	0.11	4.35	0.017	0.65	3.1E-03	0.062
Mercury	7439-97-6	--	--	--	--	--	--
Nickel and Compounds	7440-02-0	7.0E-03	0.36	1.1E-03	0.054	4.9E-04	9.7E-03
Phosphorus and Compounds	504	6.1E-04	0.16	9.2E-05	0.024	--	--
Selenium and Compounds	7782-49-2	2.3E-06	6.0E-04	3.4E-07	8.9E-05	2.4E-07	4.8E-06
Silver and Compounds	7440-22-4	4.6E-07	1.2E-04	6.9E-08	1.8E-05	4.9E-07	9.7E-06
Thallium	7440-28-0	4.6E-07	1.2E-04	6.9E-08	1.8E-05	4.9E-07	9.7E-06
Vanadium (fume or dust)	7440-62-2	5.3E-05	0.014	7.9E-06	2.1E-03	4.4E-05	8.6E-04
Zinc and Compounds	7440-66-6	2.9E-05	7.7E-03	4.4E-06	1.2E-03	4.3E-05	8.5E-04
DIESEL PARTICULATE MATTER (DPM)							
DPM	200	--	--	--	--	--	--
Total TAC Emissions Estimate		**0.14**	**54.1**	**0.020**	**8.14**	**6.8E-03**	**0.14**
Total HAP Emissions Estimate		**0.12**	**51.2**	**0.019**	**7.71**	**4.9E-03**	**0.097**

Table 27
PTE TAC Emissions Summary
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emissions Estimate					
		Shotblast		Small Palmer		Small Palmer Material Handling	
		(lb/day)	(lb/yr)	(lb/day)	(lb/yr)	(lb/day)	(lb/yr)
ORGANIC COMPOUNDS							
Acetaldehyde	75-07-0	--	--	--	--	--	--
Acrolein	107-02-8	--	--	--	--	--	--
Benzene	71-43-2	--	--	--	--	--	--
1,3-Butadiene	106-99-0	--	--	--	--	--	--
Ethylbenzene	100-41-4	--	--	--	--	--	--
Formaldehyde	50-00-0	--	--	--	--	--	--
Hexane	110-54-3	--	--	--	--	--	--
Isopropanol	67-63-0	--	--	--	--	10.4	2,500
Methyl Ethyl Ketone	78-93-3	--	--	--	--	--	--
n-Butyl Alcohol	71-36-3	--	--	--	--	--	--
Phenol	108-95-2	--	--	--	--	0.052	12.4
Toluene	108-88-3	--	--	--	--	--	--
1,2,4-Trimethylbenzene	95-63-6	--	--	--	--	--	--
Xylene (mixed)	1330-20-7	--	--	--	--	--	--
INORGANIC COMPOUNDS							
Ammonia	7664-41-7	--	--	--	--	--	--
Hydrochloric Acid	7647-01-0	--	--	--	--	--	--
Molybdenum trioxide	1313-27-5	2.8E-04	0.017	1.4E-05	3.5E-03	--	--
Silicon dioxide (respirable)	7631-86-9	--	--	--	--	1.33	319
POLYCYCLIC AROMATIC HYDROCARBONS (PAI							
Benzo(a)pyrene	50-32-8	--	--	--	--	--	--
Naphthalene	91-20-3	--	--	--	--	--	--
PAHs (excluding Naphthalene)*	401	--	--	--	--	--	--
METALS							
Aluminum and Compounds	7429-90-5	3.2E-04	0.019	5.9E-03	1.55	1.63	392
Antimony and Compounds	7440-36-0	8.1E-06	4.8E-04	8.4E-07	2.2E-04	--	--
Arsenic and Compounds	7440-38-2	2.5E-05	1.5E-03	6.9E-07	1.8E-04	--	--
Barium and Compounds	7440-39-3	2.6E-06	1.5E-04	3.5E-05	9.0E-03	--	--
Beryllium and compounds	7440-41-7	5.2E-07	3.1E-05	5.7E-08	1.5E-05	--	--
Cadmium and Compounds	7440-43-9	5.2E-07	3.1E-05	1.3E-07	3.4E-05	--	--
Chromium	7440-47-3	1.2E-03	0.073	5.6E-05	0.015	--	--
Chromium VI	18540-29-9	3.7E-05	2.2E-03	1.7E-06	4.4E-04	--	--
Cobalt and Compounds	7440-48-4	3.5E-05	2.1E-03	9.5E-07	2.5E-04	--	--
Copper and Compounds	7440-50-8	1.3E-03	0.079	1.5E-04	0.039	--	--
Lead and Compounds	7439-92-1	4.0E-06	2.3E-04	1.8E-05	4.7E-03	--	--
Manganese and Compounds	7439-96-5	3.3E-03	0.19	4.5E-04	0.12	--	--
Mercury	7439-97-6	--	--	--	--	--	--
Nickel and Compounds	7440-02-0	5.1E-04	0.030	2.1E-05	5.6E-03	--	--
Phosphorus and Compounds	504	--	--	--	--	--	--
Selenium and Compounds	7782-49-2	2.6E-07	1.5E-05	2.8E-07	7.4E-05	--	--
Silver and Compounds	7440-22-4	5.2E-07	3.1E-05	3.6E-07	9.2E-05	--	--
Thallium	7440-28-0	5.2E-07	3.1E-05	5.7E-08	1.5E-05	--	--
Vanadium (fume or dust)	7440-62-2	4.6E-05	2.7E-03	3.9E-06	1.0E-03	--	--
Zinc and Compounds	7440-66-6	4.5E-05	2.7E-03	9.6E-05	0.025	--	--
DIESEL PARTICULATE MATTER (DPM)							
DPM	200	--	--	--	--	--	--
Total TAC Emissions Estimate		**7.2E-03**	**0.43**	**6.8E-03**	**1.77**	**13.4**	**3,224**
Total HAP Emissions Estimate		**5.1E-03**	**0.30**	**5.5E-04**	**0.14**	**0.052**	**12.4**

Table 27
PTE TAC Emissions Summary
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emissions Estimate					
		Big Palmer Material Handling		Screening Station		Slag Handling	
		(lb/day)	(lb/yr)	(lb/day)	(lb/yr)	(lb/day)	(lb/yr)
ORGANIC COMPOUNDS							
Acetaldehyde	75-07-0	--	--	--	--	--	--
Acrolein	107-02-8	--	--	--	--	--	--
Benzene	71-43-2	--	--	--	--	--	--
1,3-Butadiene	106-99-0	--	--	--	--	--	--
Ethylbenzene	100-41-4	--	--	--	--	--	--
Formaldehyde	50-00-0	--	--	--	--	--	--
Hexane	110-54-3	--	--	--	--	--	--
Isopropanol	67-63-0	37.1	8,906	--	--	--	--
Methyl Ethyl Ketone	78-93-3	--	--	--	--	--	--
n-Butyl Alcohol	71-36-3	--	--	--	--	--	--
Phenol	108-95-2	--	--	--	--	--	--
Toluene	108-88-3	--	--	--	--	--	--
1,2,4-Trimethylbenzene	95-63-6	--	--	--	--	--	--
Xylene (mixed)	1330-20-7	--	--	--	--	--	--
INORGANIC COMPOUNDS							
Ammonia	7664-41-7	--	--	--	--	--	--
Hydrochloric Acid	7647-01-0	--	--	--	--	--	--
Molybdenum trioxide	1313-27-5	--	--	1.2E-04	0.031	2.0E-06	4.9E-04
Silicon dioxide (respirable)	7631-86-9	1.32	318	2.60	675	--	--
POLYCYCLIC AROMATIC HYDROCARBONS (PAI							
Benzo(a)pyrene	50-32-8	--	--	--	--	--	--
Naphthalene	91-20-3	--	--	--	--	--	--
PAHs (excluding Naphthalene)*	401	--	--	--	--	--	--
METALS							
Aluminum and Compounds	7429-90-5	1.78	428	0.036	9.31	7.6E-05	0.019
Antimony and Compounds	7440-36-0	--	--	5.0E-06	1.3E-03	8.8E-09	2.2E-06
Arsenic and Compounds	7440-38-2	--	--	1.9E-06	5.0E-04	8.8E-09	2.2E-06
Barium and Compounds	7440-39-3	--	--	1.8E-04	0.046	1.7E-07	4.2E-05
Beryllium and compounds	7440-41-7	--	--	3.8E-07	9.9E-05	1.8E-09	4.3E-07
Cadmium and Compounds	7440-43-9	--	--	3.8E-07	9.9E-05	1.8E-09	4.3E-07
Chromium	7440-47-3	--	--	4.2E-04	0.11	4.3E-05	0.010
Chromium VI	18540-29-9	--	--	1.3E-05	3.3E-03	2.5E-07	6.2E-05
Cobalt and Compounds	7440-48-4	--	--	6.6E-06	1.7E-03	5.9E-08	1.4E-05
Copper and Compounds	7440-50-8	--	--	1.3E-03	0.33	4.0E-07	9.8E-05
Lead and Compounds	7439-92-1	--	--	8.6E-05	0.022	6.7E-09	1.6E-06
Manganese and Compounds	7439-96-5	--	--	3.3E-03	0.87	1.3E-04	0.031
Mercury	7439-97-6	--	--	--	--	7.1E-10	1.7E-07
Nickel and Compounds	7440-02-0	--	--	2.1E-04	0.056	8.8E-09	2.2E-06
Phosphorus and Compounds	504	--	--	--	--	8.8E-07	2.2E-04
Selenium and Compounds	7782-49-2	--	--	1.9E-06	5.0E-04	8.8E-09	2.2E-06
Silver and Compounds	7440-22-4	--	--	2.2E-06	5.7E-04	1.8E-09	4.3E-07
Thallium	7440-28-0	--	--	3.8E-07	9.9E-05	1.8E-09	4.3E-07
Vanadium (fume or dust)	7440-62-2	--	--	2.0E-05	5.2E-03	9.4E-08	2.3E-05
Zinc and Compounds	7440-66-6	--	--	4.1E-04	0.11	3.5E-08	8.7E-06
DIESEL PARTICULATE MATTER (DPM)							
DPM	200	--	--	--	--	--	--
Total TAC Emissions Estimate		**40.2**	**9,652**	**2.64**	**686**	**2.5E-04**	**0.061**
Total HAP Emissions Estimate		**0**	**0**	**4.1E-03**	**1.06**	**1.7E-04**	**0.042**

Table 27
PTE TAC Emissions Summary
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emissions Estimate				
		Pattern Making		Reclaimed Bead Silo		Reclai Ove
		(lb/day)	(lb/yr)	(lb/day)	(lb/yr)	(lb/day)
ORGANIC COMPOUNDS						
Acetaldehyde	75-07-0	--	--	--	--	--
Acrolein	107-02-8	--	--	--	--	--
Benzene	71-43-2	--	--	--	--	--
1,3-Butadiene	106-99-0	--	--	--	--	--
Ethylbenzene	100-41-4	--	--	--	--	--
Formaldehyde	50-00-0	--	--	--	--	--
Hexane	110-54-3	--	--	--	--	--
Isopropanol	67-63-0	0.011	2.68	--	--	--
Methyl Ethyl Ketone	78-93-3	0.039	9.40	--	--	--
n-Butyl Alcohol	71-36-3	0.011	2.68	--	--	--
Phenol	108-95-2	--	--	--	--	--
Toluene	108-88-3	0.19	44.8	--	--	--
1,2,4-Trimethylbenzene	95-63-6	0.15	35.4	--	--	--
Xylene (mixed)	1330-20-7	--	--	--	--	--
INORGANIC COMPOUNDS						
Ammonia	7664-41-7	--	--	--	--	--
Hydrochloric Acid	7647-01-0	--	--	--	--	--
Molybdenum trioxide	1313-27-5	--	--	--	--	--
Silicon dioxide (respirable)	7631-86-9	--	--	1.5E-03	0.66	1.5E-03
POLYCYCLIC AROMATIC HYDROCARBONS (PAI						
Benzo(a)pyrene	50-32-8	--	--	--	--	--
Naphthalene	91-20-3	--	--	--	--	--
PAHs (excluding Naphthalene)*	401	--	--	--	--	--
METALS						
Aluminum and Compounds	7429-90-5	--	--	2.1E-05	9.2E-03	2.1E-05
Antimony and Compounds	7440-36-0	--	--	2.9E-09	1.3E-06	2.9E-09
Arsenic and Compounds	7440-38-2	--	--	1.1E-09	4.9E-07	1.1E-09
Barium and Compounds	7440-39-3	--	--	1.0E-07	4.5E-05	1.0E-07
Beryllium and compounds	7440-41-7	--	--	2.2E-10	9.7E-08	2.2E-10
Cadmium and Compounds	7440-43-9	--	--	2.2E-10	9.7E-08	2.2E-10
Chromium	7440-47-3	--	--	2.4E-07	1.1E-04	2.4E-07
Chromium VI	18540-29-9	--	--	7.3E-09	3.2E-06	7.3E-09
Cobalt and Compounds	7440-48-4	--	--	3.9E-09	1.7E-06	3.9E-09
Copper and Compounds	7440-50-8	--	--	7.3E-07	3.2E-04	7.3E-07
Lead and Compounds	7439-92-1	--	--	5.0E-08	2.2E-05	5.0E-08
Manganese and Compounds	7439-96-5	--	--	1.9E-06	8.5E-04	1.9E-06
Mercury	7439-97-6	--	--	--	--	--
Nickel and Compounds	7440-02-0	--	--	1.2E-07	5.5E-05	1.2E-07
Phosphorus and Compounds	504	--	--	--	--	--
Selenium and Compounds	7782-49-2	--	--	1.1E-09	4.9E-07	1.1E-09
Silver and Compounds	7440-22-4	--	--	1.3E-09	5.6E-07	1.3E-09
Thallium	7440-28-0	--	--	2.2E-10	9.7E-08	2.2E-10
Vanadium (fume or dust)	7440-62-2	--	--	1.2E-08	5.1E-06	1.2E-08
Zinc and Compounds	7440-66-6	--	--	2.4E-07	1.0E-04	2.4E-07
DIESEL PARTICULATE MATTER (DPM)						
DPM	200	--	--	--	--	--
Total TAC Emissions Estimate		**0.40**	**95.0**	**1.5E-03**	**0.67**	**1.5E-03**
Total HAP Emissions Estimate		**0.19**	**44.8**	**2.4E-06**	**1.0E-03**	**2.4E-06**

Table 27
PTE TAC Emissions Summary
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID		Emissions Estimate			
		med Bead rflow Silo	Small Palmer Silo		New Bead Silo	
		(lb/yr)	(lb/day)	(lb/yr)	(lb/day)	(lb/yr)
ORGANIC COMPOUNDS						
Acetaldehyde	75-07-0	--	--	--	--	--
Acrolein	107-02-8	--	--	--	--	--
Benzene	71-43-2	--	--	--	--	--
1,3-Butadiene	106-99-0	--	--	--	--	--
Ethylbenzene	100-41-4	--	--	--	--	--
Formaldehyde	50-00-0	--	--	--	--	--
Hexane	110-54-3	--	--	--	--	--
Isopropanol	67-63-0	--	--	--	--	--
Methyl Ethyl Ketone	78-93-3	--	--	--	--	--
n-Butyl Alcohol	71-36-3	--	--	--	--	--
Phenol	108-95-2	--	--	--	--	--
Toluene	108-88-3	--	--	--	--	--
1,2,4-Trimethylbenzene	95-63-6	--	--	--	--	--
Xylene (mixed)	1330-20-7	--	--	--	--	--
INORGANIC COMPOUNDS						
Ammonia	7664-41-7	--	--	--	--	--
Hydrochloric Acid	7647-01-0	--	--	--	--	--
Molybdenum trioxide	1313-27-5	--	--	--	--	--
Silicon dioxide (respirable)	7631-86-9	0.66	1.5E-03	0.66	1.1E-03	0.47
POLYCYCLIC AROMATIC HYDROCARBONS (PAI						
Benzo(a)pyrene	50-32-8	--	--	--	--	--
Naphthalene	91-20-3	--	--	--	--	--
PAHs (excluding Naphthalene)*	401	--	--	--	--	--
METALS						
Aluminum and Compounds	7429-90-5	9.2E-03	2.1E-05	9.2E-03	--	--
Antimony and Compounds	7440-36-0	1.3E-06	2.9E-09	1.3E-06	--	--
Arsenic and Compounds	7440-38-2	4.9E-07	1.1E-09	4.9E-07	--	--
Barium and Compounds	7440-39-3	4.5E-05	1.0E-07	4.5E-05	--	--
Beryllium and compounds	7440-41-7	9.7E-08	2.2E-10	9.7E-08	--	--
Cadmium and Compounds	7440-43-9	9.7E-08	2.2E-10	9.7E-08	--	--
Chromium	7440-47-3	1.1E-04	2.4E-07	1.1E-04	--	--
Chromium VI	18540-29-9	3.2E-06	7.3E-09	3.2E-06	--	--
Cobalt and Compounds	7440-48-4	1.7E-06	3.9E-09	1.7E-06	--	--
Copper and Compounds	7440-50-8	3.2E-04	7.3E-07	3.2E-04	--	--
Lead and Compounds	7439-92-1	2.2E-05	5.0E-08	2.2E-05	--	--
Manganese and Compounds	7439-96-5	8.5E-04	1.9E-06	8.5E-04	--	--
Mercury	7439-97-6	--	--	--	--	--
Nickel and Compounds	7440-02-0	5.5E-05	1.2E-07	5.5E-05	--	--
Phosphorus and Compounds	504	--	--	--	--	--
Selenium and Compounds	7782-49-2	4.9E-07	1.1E-09	4.9E-07	--	--
Silver and Compounds	7440-22-4	5.6E-07	1.3E-09	5.6E-07	--	--
Thallium	7440-28-0	9.7E-08	2.2E-10	9.7E-08	--	--
Vanadium (fume or dust)	7440-62-2	5.1E-06	1.2E-08	5.1E-06	--	--
Zinc and Compounds	7440-66-6	1.0E-04	2.4E-07	1.0E-04	--	--
DIESEL PARTICULATE MATTER (DPM)						
DPM	200	--	--	--	--	--
Total TAC Emissions Estimate		**0.67**	**1.5E-03**	**0.67**	**1.1E-03**	**0.47**
Total HAP Emissions Estimate		**1.0E-03**	**2.4E-06**	**1.0E-03**	**0**	**0**

Table 27
PTE TAC Emissions Summary
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emissions Estimate					
		Emergency Generator		Heat Treat Propane Combustion		Facility Total	
		(lb/day)	(lb/yr)	(lb/day)	(lb/yr)	(lb/day)	(lb/yr)
ORGANIC COMPOUNDS							
Acetaldehyde	75-07-0	0.011	0.57	3.4E-04	0.082	0.012	0.65
Acrolein	107-02-8	4.9E-04	0.025	2.2E-04	0.052	7.1E-04	0.077
Benzene	71-43-2	2.7E-03	0.14	6.4E-04	0.15	3.4E-03	0.29
1,3-Butadiene	106-99-0	3.2E-03	0.16	--	--	3.2E-03	0.16
Ethylbenzene	100-41-4	1.6E-04	8.0E-03	7.5E-04	0.18	9.1E-04	0.19
Formaldehyde	50-00-0	0.025	1.26	1.4E-03	0.33	0.027	1.59
Hexane	110-54-3	3.9E-04	0.020	5.0E-04	0.12	9.0E-04	0.14
Isopropanol	67-63-0	--	--	--	--	47.5	11,409
Methyl Ethyl Ketone	78-93-3	--	--	--	--	0.039	9.40
n-Butyl Alcohol	71-36-3	--	--	--	--	0.011	2.68
Phenol	108-95-2	--	--	--	--	0.052	12.4
Toluene	108-88-3	1.5E-03	0.077	2.9E-03	0.70	0.19	45.6
1,2,4-Trimethylbenzene	95-63-6	--	--	--	--	0.15	35.4
Xylene (mixed)	1330-20-7	6.2E-04	0.031	2.2E-03	0.52	2.8E-03	0.55
INORGANIC COMPOUNDS							
Ammonia	7664-41-7	0.012	0.58	0.27	64.7	0.28	65.3
Hydrochloric Acid	7647-01-0	2.7E-03	0.14	--	--	2.7E-03	0.14
Molybdenum trioxide	1313-27-5	--	--	--	--	0.029	2.41
Silicon dioxide (respirable)	7631-86-9	--	--	--	--	5.94	1,492
POLYCYCLIC AROMATIC HYDROCARBONS (PAI							
Benzo(a)pyrene	50-32-8	5.1E-07	2.6E-05	--	--	5.1E-07	2.6E-05
Naphthalene	91-20-3	2.9E-04	0.014	2.7E-05	6.5E-03	3.1E-04	0.021
PAHs (excluding Naphthalene)*	401	5.3E-04	0.026	9.0E-06	2.2E-03	5.4E-04	0.029
METALS							
Aluminum and Compounds	7429-90-5	--	--	--	--	3.60	869
Antimony and Compounds	7440-36-0	--	--	--	--	9.9E-04	0.22
Arsenic and Compounds	7440-38-2	2.3E-05	1.2E-03	--	--	3.6E-03	0.48
Barium and Compounds	7440-39-3	--	--	--	--	6.0E-03	1.15
Beryllium and compounds	7440-41-7	--	--	--	--	2.5E-06	4.4E-04
Cadmium and Compounds	7440-43-9	2.2E-05	1.1E-03	--	--	3.7E-04	0.045
Chromium	7440-47-3	--	--	--	--	0.12	64.6
Chromium VI	18540-29-9	1.5E-06	7.3E-05	--	--	3.7E-03	2.21
Cobalt and Compounds	7440-48-4	--	--	--	--	3.1E-04	0.073
Copper and Compounds	7440-50-8	6.0E-05	3.0E-03	--	--	0.014	9.65
Lead and Compounds	7439-92-1	1.2E-04	6.1E-03	--	--	1.6E-03	0.79
Manganese and Compounds	7439-96-5	4.5E-05	2.3E-03	--	--	0.16	13.2
Mercury	7439-97-6	2.9E-05	1.5E-03	--	--	2.5E-04	0.036
Nickel and Compounds	7440-02-0	5.7E-05	2.8E-03	--	--	0.24	8.55
Phosphorus and Compounds	504	--	--	--	--	0.013	2.16
Selenium and Compounds	7782-49-2	3.2E-05	1.6E-03	--	--	4.2E-05	4.1E-03
Silver and Compounds	7440-22-4	--	--	--	--	4.7E-04	0.14
Thallium	7440-28-0	--	--	--	--	2.3E-06	3.9E-04
Vanadium (fume or dust)	7440-62-2	--	--	--	--	2.1E-04	0.035
Zinc and Compounds	7440-66-6	--	--	--	--	0.014	3.66
DIESEL PARTICULATE MATTER (DPM)							
DPM	200	0.49	24.5	--	--	0.49	24.5
Total TAC Emissions Estimate		**0.55**	**27.5**	**0.28**	**66.8**	**59.0**	**14,078**
Total HAP Emissions Estimate		**0.050**	**2.48**	**8.9E-03**	**2.14**	**0.85**	**154**

Table D1
Alloy Composition Data
Eagle Foundry Company

ALLOY	TAC Percentage of Alloy [1] (%)						TAC Fraction of Alloy [a] (ton TAC/ton melt)		
	Mn	Cr	P	Ni	Cu	Mo	Mn	Cr	Ni
	7439-96-5	7440-47-3	504	7440-02-0	7440-50-8	7439-98-7	7439-96-5	7440-47-3	7440-02-0
High Chrome Alloy									
HC25	1.05	26.0 [2]	0.10 [2]	0.80 [2]	0	0.50	0.011	0.26	--
LC25	1.05	24.5 [2]	0.10 [2]	0.80 [2]	0	0.50	0.011	0.25	--
CR20	0.90	19.0 [2]	0.10 [2]	0.80 [2]	0	0.70	9.0E-03	0.19	--
CR12	1.20	13.0 [2]	0.10 [2]	0.80 [2]	0	0.50	0.012	0.13	--
F3	1.00	15.0 [2]	0.030 [2]	0.80 [2]	0	0.325	0.010	0.15	--
Manganese Alloy									
MNB2	12.75	0.50 [2]	0.070 [2]	0.80 [2]	0	0.50	0.13	5.0E-03	8.0E-03
121L	12.75	0.50 [2]	0.070 [2]	0.80 [2]	0	0.95	0.13	5.0E-03	8.0E-03
Low Alloy									
1025	0.70	0.30 [2]	0.060 [2]	0.50 [2]	0.5	0.25	7.0E-03	3.0E-03	5.0E-03
8630	0.80	0.50 [2]	0.040 [2]	0.55	0	0.20	8.0E-03	5.0E-03	5.5E-03
4330	0.70	0.80 [2]	0.040 [2]	1.83	0	0.25	7.0E-03	8.0E-03	0.018
CM40	0.75	3.10 [2]	0.050 [2]	1.00	0	0.475	7.5E-03	0.031	0.010
Stainless Alloy									
HH	1.00	26.0 [2]	0.040 [2]	12.5	0	0.50 [2]	0.010	0.26	0.125
HK	1.00	26.0 [2]	0.040 [2]	20.0	0	0.50 [2]	0.010	0.26	0.20
HC	0.75	28.0 [2]	0.040 [2]	4.00 [2]	0	0.50 [2]	7.5E-03	0.28	0.040
All Non-Stainless Steel Alloys [3]									
Average Annual	**3.06**	**9.38**	**0.069**	**0.86**	**0.045**	**0.47**	**--**	**--**	**--**
Stainless Steel Alloy [4]									
Average Annual	**0.92**	**26.67**	**0.04**	**12.17**	**--**	**0.50**	**--**	**--**	**--**
Maximum Daily	**1.00**	**28.00**	**0.04**	**20.00**	**--**	**0.50**	**--**	**--**	**--**
MN & Low Alloy [5]									
Average Annual	**4.74**	**0.95**	**0.055**	**0.91**	**0.083**	**0.44**	**--**	**--**	**--**
Maximum Daily	**12.75**	**3.10**	**0.070**	**1.83**	**0.50**	**0.95**	**--**	**--**	**--**
Ton TAC/Ton Melt [6]									
White Iron (Maximum)	**--**	**--**	**--**	**--**	**--**	**--**	**0.012**	**0.26**	**--**
Steel (Weighted Average)	**--**	**--**	**--**	**--**	**--**	**--**	**0.053**	**0.018**	**0.011**
Stainless Steel (Weighted Average)	**--**	**--**	**--**	**--**	**--**	**--**	**0.010**	**0.26**	**0.155**
Non-Stainless Steel (Weighted Average)	**--**	**--**	**--**	**--**	**--**	**--**	**0.019**	**0.20**	**0.002**
Mn & Low Alloy (Weighted Average)	**--**	**--**	**--**	**--**	**--**	**--**	**0.054**	**0.013**	**0.008**

Notes

[a] TAC fraction of alloy (ton TAC/ton melt) = (TAC percentage of alloy [%]/100) x (1 ton melt)

References

[1] Alloy data provided by Eagle Foundry.

[2] This is not added element to the alloy. Value is the maximum trace quantity that may be in raw materials.

[3] See Table 11, PTE Grinding - Non-stainless Steel Controlled TAC Emission Estimates and Table D2, Alloy Toxicity Weighted Emission Rates. Annual emissions for non-stainless steel grinding are based on the average composition of non-stainless steel alloys. Daily emissions estimates are based on alloy MNB2, which has the highest acute toxicity weighted emission rate for non-stainless steel alloys and will result in the maximum predicted acute hazard index.

[4] See Table 9, PTE Grinding - Stainless Steel Controlled TAC Emission Estimates and Table D2, Alloy Toxicity Weighted Emission Rates. Annual emissions for stainless steel grinding are based on the average composition of stainless steel alloys. Daily emissions estimates are based on alloy HK, which has the highest acute toxicity weighted emission rate for stainless steel alloys and will result in the maximum predicted acute hazard index.

[5] See Table 7, PTE Air Arc Cutting TAC Emission Estimates and Table D2, Alloy Toxicity Weighted Emission Rates. Annual emissions for Air Arc are based on the average composition of Air Arc alloys. Daily emissions estimates are based on alloy MNB2, which has the highest acute toxicity weighted emission rate for Air Arc cut alloys and will result in the maximum predicted acute hazard index.

[6] White Iron TAC fractions of alloy are based on the maximum TAC fraction of all White Iron alloys as a conservative estimate. Steel TAC fractions of alloy are the weighted average TAC fractions of all steel alloys based on 2022 production.

Table D2
Alloy Toxicity Weighted Emission Rates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor [1]		Emissions (lb)	Acute RBC [2] (ug/m^3)	Toxicity Weighted Emissions Rate [a]
Maximum WER (HK-Steel) =						**0.027**
Maximum WER for Manganese and Low Alloy Steel (MNB2) =						**4.93E-03**
Maximum WER for Non-Stainless Steel (MNB2) =						**4.93E-03**
HC25 - White Iron						
Total WER						**3.49E-03**
Aluminum and Compounds	7429-90-5	3.66E-03	(lb/ton melt)	3.66E-03 [b]	--	--
Antimony and Compounds	7440-36-0	2.54E-05	(lb/ton melt)	2.54E-05 [b]	1	2.54E-05
Arsenic and Compounds	7440-38-2	< 4.42E-05	(lb/ton melt)	4.42E-05 [b]	0.2	2.21E-04
Barium and Compounds	7440-39-3	1.11E-04	(lb/ton melt)	1.11E-04 [b]	--	--
Beryllium and compounds	7440-41-7	ND		--	0.02	--
Cadmium and Compounds	7440-43-9	< 3.71E-06	(lb/ton melt)	3.71E-06 [b]	0.03	1.24E-04
Chromium	7440-47-3	3.24E-04	(lb/tons TAC in melt)	8.41E-05 [c]	--	--
Chromium VI	18540-29-9	1.88E-06	(lb/tons TAC in melt)	4.89E-07 [c]	0.3	1.63E-06
Cobalt and Compounds	7440-48-4	< 4.48E-06	(lb/ton melt)	4.48E-06 [b]	--	--
Copper and Compounds	7440-50-8	1.74E-04	(lb/ton melt)	1.74E-04 [b]	100	1.74E-06
Lead and Compounds	7439-92-1	< 9.92E-05	(lb/ton melt)	9.92E-05 [b]	0.15	6.61E-04
Manganese and Compounds	7439-96-5	4.67E-02	(lb/tons TAC in melt)	4.90E-04 [c]	0.3	1.63E-03
Mercury	7439-97-6	< 3.51E-06	(lb/ton melt)	3.51E-06 [b]	0.6	5.85E-06
Molybdenum Trioxide	1313-27-5	1.27E-05	(lb/ton melt)	1.27E-05 [b]	--	--
Nickel and Compounds	7440-02-0	1.62E-04	(lb/ton melt)	1.62E-04 [b]	0.2	8.11E-04
Phosphorus and Compounds	504	< 2.08E-04	(lb/ton melt)	2.08E-04 [b]	--	--
Selenium and Compounds	7782-49-2	ND		--	2	--
Silver and Compounds	7440-22-4	< 1.75E-05	(lb/ton melt)	1.75E-05 [b]	--	--
Thallium	7440-28-0	ND		--	--	--
Vanadium (fume or dust)	7440-62-2	ND		--	0.8	--
Zinc and Compounds	7440-66-6	4.32E-04	(lb/ton melt)	4.32E-04 [b]	--	--
LC25 - White Iron						
Total WER						**3.49E-03**
Aluminum and Compounds	7429-90-5	3.66E-03	(lb/ton melt)	3.66E-03 [b]	--	--
Antimony and Compounds	7440-36-0	2.54E-05	(lb/ton melt)	2.54E-05 [b]	1	2.54E-05
Arsenic and Compounds	7440-38-2	< 4.42E-05	(lb/ton melt)	4.42E-05 [b]	0.2	2.21E-04
Barium and Compounds	7440-39-3	1.11E-04	(lb/ton melt)	1.11E-04 [b]	--	--
Beryllium and compounds	7440-41-7	ND		--	0.02	--
Cadmium and Compounds	7440-43-9	< 3.71E-06	(lb/ton melt)	3.71E-06 [b]	0.03	1.24E-04
Chromium	7440-47-3	3.24E-04	(lb/tons TAC in melt)	7.93E-05 [c]	--	--
Chromium VI	18540-29-9	1.88E-06	(lb/tons TAC in melt)	4.61E-07 [c]	0.3	1.54E-06
Cobalt and Compounds	7440-48-4	< 4.48E-06	(lb/ton melt)	4.48E-06 [b]	--	--
Copper and Compounds	7440-50-8	1.74E-04	(lb/ton melt)	1.74E-04 [b]	100	1.74E-06
Lead and Compounds	7439-92-1	< 9.92E-05	(lb/ton melt)	9.92E-05 [b]	0.15	6.61E-04
Manganese and Compounds	7439-96-5	0.047	(lb/tons TAC in melt)	4.90E-04 [c]	0.3	1.63E-03
Mercury	7439-97-6	< 3.51E-06	(lb/ton melt)	3.51E-06 [b]	0.6	5.85E-06
Molybdenum Trioxide	1313-27-5	1.27E-05	(lb/ton melt)	1.27E-05 [b]	--	--
Nickel and Compounds	7440-02-0	1.62E-04	(lb/ton melt)	1.62E-04 [b]	0.2	8.11E-04
Phosphorus and Compounds	504	< 2.08E-04	(lb/ton melt)	2.08E-04 [b]	--	--
Selenium and Compounds	7782-49-2	ND		--	2	--
Silver and Compounds	7440-22-4	< 1.75E-05	(lb/ton melt)	1.75E-05 [b]	--	--
Thallium	7440-28-0	ND		--	--	--
Vanadium (fume or dust)	7440-62-2	ND		--	0.8	--
Zinc and Compounds	7440-66-6	4.32E-04	(lb/ton melt)	4.32E-04 [b]	--	--

Table D2
Alloy Toxicity Weighted Emission Rates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor [1]		Emissions (lb)	Acute RBC [2] (ug/m^3)	Toxicity Weighted Emissions Rate [a]
CR20 - White Iron						
Total WER						**3.25E-03**
Aluminum and Compounds	7429-90-5	3.66E-03	(lb/ton melt)	3.66E-03 [b]	--	--
Antimony and Compounds	7440-36-0	2.54E-05	(lb/ton melt)	2.54E-05 [b]	1	2.54E-05
Arsenic and Compounds	7440-38-2	< 4.42E-05	(lb/ton melt)	4.42E-05 [b]	0.2	2.21E-04
Barium and Compounds	7440-39-3	1.11E-04	(lb/ton melt)	1.11E-04 [b]	--	--
Beryllium and compounds	7440-41-7	ND		--	0.02	--
Cadmium and Compounds	7440-43-9	< 3.71E-06	(lb/ton melt)	3.71E-06 [b]	0.03	1.24E-04
Chromium	7440-47-3	3.24E-04	(lb/tons TAC in melt)	6.15E-05 [c]	--	--
Chromium VI	18540-29-9	1.88E-06	(lb/tons TAC in melt)	3.57E-07 [c]	0.3	1.19E-06
Cobalt and Compounds	7440-48-4	< 4.48E-06	(lb/ton melt)	4.48E-06 [b]	--	--
Copper and Compounds	7440-50-8	1.74E-04	(lb/ton melt)	1.74E-04 [b]	100	1.74E-06
Lead and Compounds	7439-92-1	< 9.92E-05	(lb/ton melt)	9.92E-05 [b]	0.15	6.61E-04
Manganese and Compounds	7439-96-5	0.047	(lb/tons TAC in melt)	4.20E-04 [c]	0.3	1.40E-03
Mercury	7439-97-6	< 3.51E-06	(lb/ton melt)	3.51E-06 [b]	0.6	5.85E-06
Molybdenum Trioxide	1313-27-5	1.27E-05	(lb/ton melt)	1.27E-05 [b]	--	--
Nickel and Compounds	7440-02-0	1.62E-04	(lb/ton melt)	1.62E-04 [b]	0.2	8.11E-04
Phosphorus and Compounds	504	< 2.08E-04	(lb/ton melt)	2.08E-04 [b]	--	--
Selenium and Compounds	7782-49-2	ND		--	2	--
Silver and Compounds	7440-22-4	< 1.75E-05	(lb/ton melt)	1.75E-05 [b]	--	--
Thallium	7440-28-0	ND		--	--	--
Vanadium (fume or dust)	7440-62-2	ND		--	0.8	--
Zinc and Compounds	7440-66-6	4.32E-04	(lb/ton melt)	4.32E-04 [b]	--	--
CR12 - White Iron						
Total WER						**3.72E-03**
Aluminum and Compounds	7429-90-5	3.66E-03	(lb/ton melt)	3.66E-03 [b]	--	--
Antimony and Compounds	7440-36-0	2.54E-05	(lb/ton melt)	2.54E-05 [b]	1	2.54E-05
Arsenic and Compounds	7440-38-2	< 4.42E-05	(lb/ton melt)	4.42E-05 [b]	0.2	2.21E-04
Barium and Compounds	7440-39-3	1.11E-04	(lb/ton melt)	1.11E-04 [b]	--	--
Beryllium and compounds	7440-41-7	ND		--	0.02	--
Cadmium and Compounds	7440-43-9	< 3.71E-06	(lb/ton melt)	3.71E-06 [b]	0.03	1.24E-04
Chromium	7440-47-3	3.24E-04	(lb/tons TAC in melt)	4.21E-05 [c]	--	--
Chromium VI	18540-29-9	1.88E-06	(lb/tons TAC in melt)	2.44E-07 [c]	0.3	8.15E-07
Cobalt and Compounds	7440-48-4	< 4.48E-06	(lb/ton melt)	4.48E-06 [b]	--	--
Copper and Compounds	7440-50-8	1.74E-04	(lb/ton melt)	1.74E-04 [b]	100	1.74E-06
Lead and Compounds	7439-92-1	< 9.92E-05	(lb/ton melt)	9.92E-05 [b]	0.15	6.61E-04
Manganese and Compounds	7439-96-5	0.047	(lb/tons TAC in melt)	5.60E-04 [c]	0.3	1.87E-03
Mercury	7439-97-6	< 3.51E-06	(lb/ton melt)	3.51E-06 [b]	0.6	5.85E-06
Molybdenum Trioxide	1313-27-5	1.27E-05	(lb/ton melt)	1.27E-05 [b]	--	--
Nickel and Compounds	7440-02-0	1.62E-04	(lb/ton melt)	1.62E-04 [b]	0.2	8.11E-04
Phosphorus and Compounds	504	< 2.08E-04	(lb/ton melt)	2.08E-04 [b]	--	--
Selenium and Compounds	7782-49-2	ND		--	2	--
Silver and Compounds	7440-22-4	< 1.75E-05	(lb/ton melt)	1.75E-05 [b]	--	--
Thallium	7440-28-0	ND		--	--	--
Vanadium (fume or dust)	7440-62-2	ND		--	0.8	--
Zinc and Compounds	7440-66-6	4.32E-04	(lb/ton melt)	4.32E-04 [b]	--	--

Table D2
Alloy Toxicity Weighted Emission Rates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor [1]		Emissions (lb)	Acute RBC [2] (ug/m^3)	Toxicity Weighted Emissions Rate [a]
F3 - White Iron						
Total WER						**3.41E-03**
Aluminum and Compounds	7429-90-5	3.66E-03	(lb/ton melt)	3.66E-03 [b]	--	--
Antimony and Compounds	7440-36-0	2.54E-05	(lb/ton melt)	2.54E-05 [b]	1	2.54E-05
Arsenic and Compounds	7440-38-2	< 4.42E-05	(lb/ton melt)	4.42E-05 [b]	0.2	2.21E-04
Barium and Compounds	7440-39-3	1.11E-04	(lb/ton melt)	1.11E-04 [b]	--	--
Beryllium and compounds	7440-41-7	ND		--	0.02	--
Cadmium and Compounds	7440-43-9	< 3.71E-06	(lb/ton melt)	3.71E-06 [b]	0.03	1.24E-04
Chromium	7440-47-3	3.24E-04	(lb/tons TAC in melt)	4.85E-05 [c]	--	--
Chromium VI	18540-29-9	1.88E-06	(lb/tons TAC in melt)	2.82E-07 [c]	0.3	9.40E-07
Cobalt and Compounds	7440-48-4	< 4.48E-06	(lb/ton melt)	4.48E-06 [b]	--	--
Copper and Compounds	7440-50-8	1.74E-04	(lb/ton melt)	1.74E-04 [b]	100	1.74E-06
Lead and Compounds	7439-92-1	< 9.92E-05	(lb/ton melt)	9.92E-05 [b]	0.15	6.61E-04
Manganese and Compounds	7439-96-5	0.047	(lb/tons TAC in melt)	4.67E-04 [c]	0.3	1.56E-03
Mercury	7439-97-6	< 3.51E-06	(lb/ton melt)	3.51E-06 [b]	0.6	5.85E-06
Molybdenum Trioxide	1313-27-5	1.27E-05	(lb/ton melt)	1.27E-05 [b]	--	--
Nickel and Compounds	7440-02-0	1.62E-04	(lb/ton melt)	1.62E-04 [b]	0.2	8.11E-04
Phosphorus and Compounds	504	< 2.08E-04	(lb/ton melt)	2.08E-04 [b]	--	--
Selenium and Compounds	7782-49-2	ND		--	2	--
Silver and Compounds	7440-22-4	< 1.75E-05	(lb/ton melt)	1.75E-05 [b]	--	--
Thallium	7440-28-0	ND		--	--	--
Vanadium (fume or dust)	7440-62-2	ND		--	0.8	--
Zinc and Compounds	7440-66-6	4.32E-04	(lb/ton melt)	4.32E-04 [b]	--	--
CM40 - Steel						
Total WER						**2.67E-03**
Aluminum and Compounds	7429-90-5	3.34E-03	(lb/ton melt)	3.34E-03 [b]	--	--
Antimony and Compounds	7440-36-0	< 3.08E-05	(lb/ton melt)	3.08E-05 [b]	1	3.08E-05
Arsenic and Compounds	7440-38-2	< 1.14E-04	(lb/ton melt)	1.14E-04 [b]	0.2	5.72E-04
Barium and Compounds	7440-39-3	1.77E-04	(lb/ton melt)	1.77E-04 [b]	--	--
Beryllium and compounds	7440-41-7	ND		--	0.02	--
Cadmium and Compounds	7440-43-9	< 1.09E-05	(lb/ton melt)	1.09E-05 [b]	0.03	3.64E-04
Chromium	7440-47-3	4.37E-03	(lb/tons TAC in melt)	1.35E-04 [c]	--	--
Chromium VI	18540-29-9	3.19E-05	(lb/tons TAC in melt)	9.89E-07 [c]	0.3	3.30E-06
Cobalt and Compounds	7440-48-4	< 4.41E-06	(lb/ton melt)	4.41E-06 [b]	--	--
Copper and Compounds	7440-50-8	< 1.54E-04	(lb/ton melt)	1.54E-04 [b]	100	1.54E-06
Lead and Compounds	7439-92-1	< 3.66E-05	(lb/ton melt)	3.66E-05 [b]	0.15	2.44E-04
Manganese and Compounds	7439-96-5	6.31E-03	(lb/tons TAC in melt)	4.73E-05 [c]	0.3	1.58E-04
Mercury	7439-97-6	< 7.08E-06	(lb/ton melt)	7.08E-06 [b]	0.6	1.18E-05
Molybdenum Trioxide	1313-27-5	1.27E-05	(lb/ton melt)	1.27E-05 [b]	--	--
Nickel and Compounds	7440-02-0	0.026	(lb/tons TAC in melt)	2.57E-04 [c]	0.2	1.28E-03
Phosphorus and Compounds	504	< 3.88E-04	(lb/ton melt)	3.88E-04 [b]	--	--
Selenium and Compounds	7782-49-2	ND 0.00E+00	0.00E+00	-- [b]	2	--
Silver and Compounds	7440-22-4	ND		--	--	--
Thallium	7440-28-0	ND		--	--	--
Vanadium (fume or dust)	7440-62-2	ND		--	0.8	--
Zinc and Compounds	7440-66-6	4.34E-04	(lb/ton melt)	4.34E-04 [b]	--	--

Table D2
Alloy Toxicity Weighted Emission Rates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor [1]		Emissions (lb)	Acute RBC [2] (ug/m^3)	Toxicity Weighted Emissions Rate [a]
MNB2 - Steel						
Total WER						**4.93E-03**
Aluminum and Compounds	7429-90-5	3.34E-03	(lb/ton melt)	3.34E-03 [b]	--	--
Antimony and Compounds	7440-36-0	< 3.08E-05	(lb/ton melt)	3.08E-05 [b]	1	3.08E-05
Arsenic and Compounds	7440-38-2	< 1.14E-04	(lb/ton melt)	1.14E-04 [b]	0.2	5.72E-04
Barium and Compounds	7440-39-3	1.77E-04	(lb/ton melt)	1.77E-04 [b]	--	--
Beryllium and compounds	7440-41-7	ND		--	0.02	--
Cadmium and Compounds	7440-43-9	< 1.09E-05	(lb/ton melt)	1.09E-05 [b]	0.03	3.64E-04
Chromium	7440-47-3	4.37E-03	(lb/tons TAC in melt)	2.18E-05 [c]	--	--
Chromium VI	18540-29-9	3.19E-05	(lb/tons TAC in melt)	1.60E-07 [c]	0.3	5.32E-07
Cobalt and Compounds	7440-48-4	< 4.41E-06	(lb/ton melt)	4.41E-06 [b]	--	--
Copper and Compounds	7440-50-8	< 1.54E-04	(lb/ton melt)	1.54E-04 [b]	100	1.54E-06
Lead and Compounds	7439-92-1	< 3.66E-05	(lb/ton melt)	3.66E-05 [b]	0.15	2.44E-04
Manganese and Compounds	7439-96-5	6.31E-03	(lb/tons TAC in melt)	8.05E-04 [c]	0.3	2.68E-03
Mercury	7439-97-6	< 7.08E-06	(lb/ton melt)	7.08E-06 [b]	0.6	1.18E-05
Molybdenum Trioxide	1313-27-5	1.27E-05	(lb/ton melt)	1.27E-05 [b]	--	--
Nickel and Compounds	7440-02-0	0.026	(lb/tons TAC in melt)	2.05E-04 [c]	0.2	1.03E-03
Phosphorus and Compounds	504	< 3.88E-04	(lb/ton melt)	3.88E-04 [b]	--	--
Selenium and Compounds	7782-49-2	ND 0.00E+00	0.00E+00	-- [b]	2	--
Silver and Compounds	7440-22-4	ND		--	--	--
Thallium	7440-28-0	ND		--	--	--
Vanadium (fume or dust)	7440-62-2	ND		--	0.8	--
Zinc and Compounds	7440-66-6	4.34E-04	(lb/ton melt)	4.34E-04 [b]	--	--
121L - Steel						
Total WER						**4.93E-03**
Aluminum and Compounds	7429-90-5	3.34E-03	(lb/ton melt)	3.34E-03 [b]	--	--
Antimony and Compounds	7440-36-0	< 3.08E-05	(lb/ton melt)	3.08E-05 [b]	1	3.08E-05
Arsenic and Compounds	7440-38-2	< 1.14E-04	(lb/ton melt)	1.14E-04 [b]	0.2	5.72E-04
Barium and Compounds	7440-39-3	1.77E-04	(lb/ton melt)	1.77E-04 [b]	--	--
Beryllium and compounds	7440-41-7	ND		--	0.02	--
Cadmium and Compounds	7440-43-9	< 1.09E-05	(lb/ton melt)	1.09E-05 [b]	0.03	3.64E-04
Chromium	7440-47-3	4.37E-03	(lb/tons TAC in melt)	2.18E-05 [c]	--	--
Chromium VI	18540-29-9	3.19E-05	(lb/tons TAC in melt)	1.60E-07 [c]	0.3	5.32E-07
Cobalt and Compounds	7440-48-4	< 4.41E-06	(lb/ton melt)	4.41E-06 [b]	--	--
Copper and Compounds	7440-50-8	< 1.54E-04	(lb/ton melt)	1.54E-04 [b]	100	1.54E-06
Lead and Compounds	7439-92-1	< 3.66E-05	(lb/ton melt)	3.66E-05 [b]	0.15	2.44E-04
Manganese and Compounds	7439-96-5	6.31E-03	(lb/tons TAC in melt)	8.05E-04 [c]	0.3	2.68E-03
Mercury	7439-97-6	< 7.08E-06	(lb/ton melt)	7.08E-06 [b]	0.6	1.18E-05
Molybdenum Trioxide	1313-27-5	1.27E-05	(lb/ton melt)	1.27E-05 [b]	--	--
Nickel and Compounds	7440-02-0	0.026	(lb/tons TAC in melt)	2.05E-04 [c]	0.2	1.03E-03
Phosphorus and Compounds	504	< 3.88E-04	(lb/ton melt)	3.88E-04 [b]	--	--
Selenium and Compounds	7782-49-2	ND 0.00E+00	0.00E+00	-- [b]	2	--
Silver and Compounds	7440-22-4	ND		--	--	--
Thallium	7440-28-0	ND		--	--	--
Vanadium (fume or dust)	7440-62-2	ND		--	0.8	--
Zinc and Compounds	7440-66-6	4.34E-04	(lb/ton melt)	4.34E-04 [b]	--	--

Table D2
Alloy Toxicity Weighted Emission Rates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor [1]		Emissions (lb)	Acute RBC [2] (ug/m^3)	Toxicity Weighted Emissions Rate [a]
1025 - Steel						
Total WER						**2.01E-03**
Aluminum and Compounds	7429-90-5	3.34E-03	(lb/ton melt)	3.34E-03 [b]	--	--
Antimony and Compounds	7440-36-0	< 3.08E-05	(lb/ton melt)	3.08E-05 [b]	1	3.08E-05
Arsenic and Compounds	7440-38-2	< 1.14E-04	(lb/ton melt)	1.14E-04 [b]	0.2	5.72E-04
Barium and Compounds	7440-39-3	1.77E-04	(lb/ton melt)	1.77E-04 [b]	--	--
Beryllium and compounds	7440-41-7	ND		--	0.02	--
Cadmium and Compounds	7440-43-9	< 1.09E-05	(lb/ton melt)	1.09E-05 [b]	0.03	3.64E-04
Chromium	7440-47-3	4.37E-03	(lb/tons TAC in melt)	1.31E-05 [c]	--	--
Chromium VI	18540-29-9	3.19E-05	(lb/tons TAC in melt)	9.57E-08 [c]	0.3	3.19E-07
Cobalt and Compounds	7440-48-4	< 4.41E-06	(lb/ton melt)	4.41E-06 [b]	--	--
Copper and Compounds	7440-50-8	< 1.54E-04	(lb/ton melt)	1.54E-04 [b]	100	1.54E-06
Lead and Compounds	7439-92-1	< 3.66E-05	(lb/ton melt)	3.66E-05 [b]	0.15	2.44E-04
Manganese and Compounds	7439-96-5	6.31E-03	(lb/tons TAC in melt)	4.42E-05 [c]	0.3	1.47E-04
Mercury	7439-97-6	< 7.08E-06	(lb/ton melt)	7.08E-06 [b]	0.6	1.18E-05
Molybdenum Trioxide	1313-27-5	1.27E-05	(lb/ton melt)	1.27E-05 [b]	--	--
Nickel and Compounds	7440-02-0	0.026	(lb/tons TAC in melt)	1.28E-04 [c]	0.2	6.42E-04
Phosphorus and Compounds	504	< 3.88E-04	(lb/ton melt)	3.88E-04 [b]	--	--
Selenium and Compounds	7782-49-2	ND 0.00E+00	0.00E+00	-- [b]	2	--
Silver and Compounds	7440-22-4	ND		--	--	--
Thallium	7440-28-0	ND		--	--	--
Vanadium (fume or dust)	7440-62-2	ND		--	0.8	--
Zinc and Compounds	7440-66-6	4.34E-04	(lb/ton melt)	4.34E-04 [b]	--	--
8630 - Steel						
Total WER						**2.10E-03**
Aluminum and Compounds	7429-90-5	3.34E-03	(lb/ton melt)	3.34E-03 [b]	--	--
Antimony and Compounds	7440-36-0	< 3.08E-05	(lb/ton melt)	3.08E-05 [b]	1	3.08E-05
Arsenic and Compounds	7440-38-2	< 1.14E-04	(lb/ton melt)	1.14E-04 [b]	0.2	5.72E-04
Barium and Compounds	7440-39-3	1.77E-04	(lb/ton melt)	1.77E-04 [b]	--	--
Beryllium and compounds	7440-41-7	ND		--	0.02	--
Cadmium and Compounds	7440-43-9	< 1.09E-05	(lb/ton melt)	1.09E-05 [b]	0.03	3.64E-04
Chromium	7440-47-3	4.37E-03	(lb/tons TAC in melt)	2.18E-05 [c]	--	--
Chromium VI	18540-29-9	3.19E-05	(lb/tons TAC in melt)	1.60E-07 [c]	0.3	5.32E-07
Cobalt and Compounds	7440-48-4	< 4.41E-06	(lb/ton melt)	4.41E-06 [b]	--	--
Copper and Compounds	7440-50-8	< 1.54E-04	(lb/ton melt)	1.54E-04 [b]	100	1.54E-06
Lead and Compounds	7439-92-1	< 3.66E-05	(lb/ton melt)	3.66E-05 [b]	0.15	2.44E-04
Manganese and Compounds	7439-96-5	6.31E-03	(lb/tons TAC in melt)	5.05E-05 [c]	0.3	1.68E-04
Mercury	7439-97-6	< 7.08E-06	(lb/ton melt)	7.08E-06 [b]	0.6	1.18E-05
Molybdenum Trioxide	1313-27-5	1.27E-05	(lb/ton melt)	1.27E-05 [b]	--	--
Nickel and Compounds	7440-02-0	0.026	(lb/tons TAC in melt)	1.41E-04 [c]	0.2	7.06E-04
Phosphorus and Compounds	504	< 3.88E-04	(lb/ton melt)	3.88E-04 [b]	--	--
Selenium and Compounds	7782-49-2	ND 0.00E+00	0.00E+00	-- [b]	2	--
Silver and Compounds	7440-22-4	ND		--	--	--
Thallium	7440-28-0	ND		--	--	--
Vanadium (fume or dust)	7440-62-2	ND		--	0.8	--
Zinc and Compounds	7440-66-6	4.34E-04	(lb/ton melt)	4.34E-04 [b]	--	--

Table D2
Alloy Toxicity Weighted Emission Rates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor [1]		Emissions (lb)	Acute RBC [2] (ug/m^3)	Toxicity Weighted Emissions Rate [a]
4330 - Steel						
Total WER						**3.72E-03**
Aluminum and Compounds	7429-90-5	3.34E-03	(lb/ton melt)	3.34E-03 [b]	--	--
Antimony and Compounds	7440-36-0	< 3.08E-05	(lb/ton melt)	3.08E-05 [b]	1	3.08E-05
Arsenic and Compounds	7440-38-2	< 1.14E-04	(lb/ton melt)	1.14E-04 [b]	0.2	5.72E-04
Barium and Compounds	7440-39-3	1.77E-04	(lb/ton melt)	1.77E-04 [b]	--	--
Beryllium and compounds	7440-41-7	ND		--	0.02	--
Cadmium and Compounds	7440-43-9	< 1.09E-05	(lb/ton melt)	1.09E-05 [b]	0.03	3.64E-04
Chromium	7440-47-3	4.37E-03	(lb/tons TAC in melt)	3.49E-05 [c]	--	--
Chromium VI	18540-29-9	3.19E-05	(lb/tons TAC in melt)	2.55E-07 [c]	0.3	8.51E-07
Cobalt and Compounds	7440-48-4	< 4.41E-06	(lb/ton melt)	4.41E-06 [b]	--	--
Copper and Compounds	7440-50-8	< 1.54E-04	(lb/ton melt)	1.54E-04 [b]	100	1.54E-06
Lead and Compounds	7439-92-1	< 3.66E-05	(lb/ton melt)	3.66E-05 [b]	0.15	2.44E-04
Manganese and Compounds	7439-96-5	6.31E-03	(lb/tons TAC in melt)	4.42E-05 [c]	0.3	1.47E-04
Mercury	7439-97-6	< 7.08E-06	(lb/ton melt)	7.08E-06 [b]	0.6	1.18E-05
Molybdenum Trioxide	1313-27-5	1.27E-05	(lb/ton melt)	1.27E-05 [b]	--	--
Nickel and Compounds	7440-02-0	0.026	(lb/tons TAC in melt)	4.69E-04 [c]	0.2	2.34E-03
Phosphorus and Compounds	504	< 3.88E-04	(lb/ton melt)	3.88E-04 [b]	--	--
Selenium and Compounds	7782-49-2	ND 0.00E+00	0.00E+00	-- [b]	2	--
Silver and Compounds	7440-22-4	ND		--	--	--
Thallium	7440-28-0	ND		--	--	--
Vanadium (fume or dust)	7440-62-2	ND		--	0.8	--
Zinc and Compounds	7440-66-6	4.34E-04	(lb/ton melt)	4.34E-04 [b]	--	--
HC - Steel						
Total WER						**6.55E-03**
Aluminum and Compounds	7429-90-5	3.34E-03	(lb/ton melt)	3.34E-03 [b]	--	--
Antimony and Compounds	7440-36-0	< 3.08E-05	(lb/ton melt)	3.08E-05 [b]	1	3.08E-05
Arsenic and Compounds	7440-38-2	< 1.14E-04	(lb/ton melt)	1.14E-04 [b]	0.2	5.72E-04
Barium and Compounds	7440-39-3	1.77E-04	(lb/ton melt)	1.77E-04 [b]	--	--
Beryllium and compounds	7440-41-7	ND		--	0.02	--
Cadmium and Compounds	7440-43-9	< 1.09E-05	(lb/ton melt)	1.09E-05 [b]	0.03	3.64E-04
Chromium	7440-47-3	4.37E-03	(lb/tons TAC in melt)	1.22E-03 [c]	--	--
Chromium VI	18540-29-9	3.19E-05	(lb/tons TAC in melt)	8.93E-06 [c]	0.3	2.98E-05
Cobalt and Compounds	7440-48-4	< 4.41E-06	(lb/ton melt)	4.41E-06 [b]	--	--
Copper and Compounds	7440-50-8	< 1.54E-04	(lb/ton melt)	1.54E-04 [b]	100	1.54E-06
Lead and Compounds	7439-92-1	< 3.66E-05	(lb/ton melt)	3.66E-05 [b]	0.15	2.44E-04
Manganese and Compounds	7439-96-5	6.31E-03	(lb/tons TAC in melt)	4.73E-05 [c]	0.3	1.58E-04
Mercury	7439-97-6	< 7.08E-06	(lb/ton melt)	7.08E-06 [b]	0.6	1.18E-05
Molybdenum Trioxide	1313-27-5	1.27E-05	(lb/ton melt)	1.27E-05 [b]	--	--
Nickel and Compounds	7440-02-0	0.026	(lb/tons TAC in melt)	1.03E-03 [c]	0.2	5.14E-03
Phosphorus and Compounds	504	< 3.88E-04	(lb/ton melt)	3.88E-04 [b]	--	--
Selenium and Compounds	7782-49-2	ND 0.00E+00	0.00E+00	-- [b]	2	--
Silver and Compounds	7440-22-4	ND		--	--	--
Thallium	7440-28-0	ND		--	--	--
Vanadium (fume or dust)	7440-62-2	ND		--	0.8	--
Zinc and Compounds	7440-66-6	4.34E-04	(lb/ton melt)	4.34E-04 [b]	--	--

Table D2
Alloy Toxicity Weighted Emission Rates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor [1]		Emissions (lb)	Acute RBC [2] (ug/m^3)	Toxicity Weighted Emissions Rate [a]
HH - Steel						
Total WER						**0.018**
Aluminum and Compounds	7429-90-5	3.34E-03	(lb/ton melt)	3.34E-03 [b]	--	--
Antimony and Compounds	7440-36-0	< 3.08E-05	(lb/ton melt)	3.08E-05 [b]	1	3.08E-05
Arsenic and Compounds	7440-38-2	< 1.14E-04	(lb/ton melt)	1.14E-04 [b]	0.2	5.72E-04
Barium and Compounds	7440-39-3	1.77E-04	(lb/ton melt)	1.77E-04 [b]	--	--
Beryllium and compounds	7440-41-7	ND		--	0.02	--
Cadmium and Compounds	7440-43-9	< 1.09E-05	(lb/ton melt)	1.09E-05 [b]	0.03	3.64E-04
Chromium	7440-47-3	4.37E-03	(lb/tons TAC in melt)	1.14E-03 [c]	--	--
Chromium VI	18540-29-9	3.19E-05	(lb/tons TAC in melt)	8.29E-06 [c]	0.3	2.76E-05
Cobalt and Compounds	7440-48-4	< 4.41E-06	(lb/ton melt)	4.41E-06 [b]	--	--
Copper and Compounds	7440-50-8	< 1.54E-04	(lb/ton melt)	1.54E-04 [b]	100	1.54E-06
Lead and Compounds	7439-92-1	< 3.66E-05	(lb/ton melt)	3.66E-05 [b]	0.15	2.44E-04
Manganese and Compounds	7439-96-5	6.31E-03	(lb/tons TAC in melt)	6.31E-05 [c]	0.3	2.10E-04
Mercury	7439-97-6	< 7.08E-06	(lb/ton melt)	7.08E-06 [b]	0.6	1.18E-05
Molybdenum Trioxide	1313-27-5	1.27E-05	(lb/ton melt)	1.27E-05 [b]	--	--
Nickel and Compounds	7440-02-0	0.026	(lb/tons TAC in melt)	3.21E-03 [c]	0.2	1.61E-02
Phosphorus and Compounds	504	< 3.88E-04	(lb/ton melt)	3.88E-04 [b]	--	--
Selenium and Compounds	7782-49-2	ND 0.00E+00	0.00E+00	-- [b]	2	--
Silver and Compounds	7440-22-4	ND		--	--	--
Thallium	7440-28-0	ND		--	--	--
Vanadium (fume or dust)	7440-62-2	ND		--	0.8	--
Zinc and Compounds	7440-66-6	4.34E-04	(lb/ton melt)	4.34E-04 [b]	--	--
HK - Steel						
Total WER						**0.027**
Aluminum and Compounds	7429-90-5	3.34E-03	(lb/ton melt)	3.34E-03 [b]	--	--
Antimony and Compounds	7440-36-0	< 3.08E-05	(lb/ton melt)	3.08E-05 [b]	1.00	3.08E-05
Arsenic and Compounds	7440-38-2	< 1.14E-04	(lb/ton melt)	1.14E-04 [b]	0.2	5.72E-04
Barium and Compounds	7440-39-3	1.77E-04	(lb/ton melt)	1.77E-04 [b]	--	--
Beryllium and compounds	7440-41-7	ND		--	0.02	--
Cadmium and Compounds	7440-43-9	< 1.09E-05	(lb/ton melt)	1.09E-05 [b]	0.03	3.64E-04
Chromium	7440-47-3	4.37E-03	(lb/tons TAC in melt)	1.14E-03 [c]	--	--
Chromium VI	18540-29-9	3.19E-05	(lb/tons TAC in melt)	8.29E-06 [c]	0.3	2.76E-05
Cobalt and Compounds	7440-48-4	< 4.41E-06	(lb/ton melt)	4.41E-06 [b]	--	--
Copper and Compounds	7440-50-8	< 1.54E-04	(lb/ton melt)	1.54E-04 [b]	100	1.54E-06
Lead and Compounds	7439-92-1	< 3.66E-05	(lb/ton melt)	3.66E-05 [b]	0.15	2.44E-04
Manganese and Compounds	7439-96-5	6.31E-03	(lb/tons TAC in melt)	6.31E-05 [c]	0.3	2.10E-04
Mercury	7439-97-6	< 7.08E-06	(lb/ton melt)	7.08E-06 [b]	0.6	1.18E-05
Molybdenum Trioxide	1313-27-5	1.27E-05	(lb/ton melt)	1.27E-05 [b]	--	--
Nickel and Compounds	7440-02-0	0.026	(lb/tons TAC in melt)	5.14E-03 [c]	0.2	2.57E-02
Phosphorus and Compounds	504	< 3.88E-04	(lb/ton melt)	3.88E-04 [b]	--	--
Selenium and Compounds	7782-49-2	ND 0.00E+00	0.00E+00	-- [b]	2	--

Table D2
Alloy Toxicity Weighted Emission Rates
Eagle Foundry Company

Toxic Air Contaminant	CAS/DEQ ID	Emission Factor [1]	Emissions (lb)	Acute RBC [2] (ug/m^3)	Toxicity Weighted Emissions Rate [a]
Silver and Compounds	7440-22-4	ND	--	--	--
Thallium	7440-28-0	ND	--	--	--
Vanadium (fume or dust)	7440-62-2	ND	--	0.8	--
Zinc and Compounds	7440-66-6	4.34E-04 (lb/ton melt)	4.34E-04 [b]	--	--

Notes

ND = non-detect

[a] Toxicity weighted emission rate = (emissions [lb]) / (acute RBC [ug/m^3])

[b] Emissions estimate (lb) = (emission factor [lb/tons melt]) x (metal melted [tons])

Metal melted (tons) = 1

[c] Emissions estimate (lb) = (emission factor [lb/tons TAC in melt]) x (metal melted [tons]) x (tons TAC/tons metal melted)

ALLOY	TAC in Melt [3] (tons TAC/ton melt)		
	Mn	Cr	Ni
HC25	0.011	0.26	--
LC25	0.011	0.245	--
CR20	9.0E-03	0.19	--
CR12	0.012	0.13	--
F3	0.010	0.15	--
CM40	7.5E-03	0.031	0.010
MNB2	0.128	5.0E-03	8.0E-03
121L	0.128	5.0E-03	8.0E-03
1025	7.0E-03	3.0E-03	5.0E-03
8630	8.0E-03	5.0E-03	5.5E-03
4330	7.0E-03	8.0E-03	0.018
HC	7.5E-03	0.28	0.04
HH	0.010	0.26	0.13
HK	0.010	0.26	0.20

References

[1] See Table 2, Foundry Emission Factors. Value assumes the sum of the Main Foundry and Cooling Bunker emission factors.

[2] OAR 340-245-8010, Table 2.

[3] See Table D1, Alloy Composition Data.

Table D3
Silica Data
Eagle Foundry Company

Product	Product Constituent [1]	CAS	Product Constituent Weight Percent (%)	Constituent Molecular Formula	Constituent Molecular Weight (g/mol)	TAC	CAS	TAC Compound Molecular Weight (g/mol)	TAC Compound Count	TAC Percentage (%)	Total TAC Percentage in Product [b] (%)
Naigai Cerabead Coated Cerabead	Mullite	1302-93-8	90	$3Al_2O_3 \cdot 2SiO_2$	426.2	Aluminum	7429-90-5	54	3	38.0 [a]	34.21
						Silica, crystalline	7631-86-9	60.1	2	28.2 [a]	25.38
										Total crystalline silica percentage in product (%) =	**25.38**
Unibond Core Paste	Sodium Silicate	1344-09-8	55	NA_2SiO_3	122.1	Silica, crystalline	7631-86-9	60.1	1	49.2 [a]	27.08
										Total crystalline silica percentage in product (%) =	**27.08**

Element	MW (g/mol)
Oxygen (O)	16.0
Silica (Si)	28.1
Aluminum (Al)	27.0
Sodium	23.0

Notes

[a] TAC percentage (%) = (TAC compound molecular weight [g/mol]) x (TAC compound count) /(constituent molecular weight [g/mol]) x 100

[b] Total TAC percentage in product (%) = (TAC percentage [%]) x (product constituent weight percentage [%]/100)

References

[1] Solid constituent as identified in the product SDS.

Attachment C

Material Handling SDS

MAUL
FOSTER
ALONGI

SAFETY DATA SHEET

Creation Date 12-Oct-2010 **Revision Date** 29-Mar-2024 **Revision Number** 5

1. Identification

Product Name **Aluminum wire**

Cat No. : **43336**

CAS No 7429-90-5
Synonyms No information available

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757

Emergency Telephone Number
For information **US** call: 001-800-227-6701 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No. **US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
Classification under 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Label Elements
None required

Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Aluminum	7429-90-5	99

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Get medical attention immediately if symptoms occur.

Inhalation Remove to fresh air. Get medical attention immediately if symptoms occur.

Ingestion Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.

Most important symptoms and effects None reasonably foreseeable.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media No information available

Flash Point Not applicable
Method - No information available

Autoignition Temperature No information available

Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Fumes of aluminum or aluminum oxide.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
0	1	1	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment as required. Ensure adequate ventilation. Avoid dust formation.

Environmental Precautions Should not be released into the environment.

Methods for Containment and Clean Up Sweep up and shovel into suitable containers for disposal. Avoid dust formation.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Ensure adequate ventilation. Avoid contact with skin, eyes or clothing. Avoid ingestion and inhalation. Avoid dust formation.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Incompatible Materials. Strong oxidizing agents.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH	Mexico OEL (TWA)
Aluminum	TWA: 1 mg/m³	(Vacated) TWA: 15 mg/m³ (Vacated) TWA: 5 mg/m³ TWA: 15 mg/m³ TWA: 5 mg/m³	TWA: 10 mg/m³ TWA: 5 mg/m³	TWA: 1 mg/m³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures None under normal use conditions.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection No protective equipment is needed under normal use conditions.

Recommended Filter type: Particle filter.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Solid; Various Form
Appearance	Silver / Grey
Odor	Odorless
Odor Threshold	No information available
pH	Not applicable
Melting Point/Range	660 °C / 1220 °F
Boiling Point/Range	2327 °C / 4220.6 °F @ 760 mmHg
Flash Point	Not applicable
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	2.700
Solubility	insoluble
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available

Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Al
Molecular Weight	26.97

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Avoid dust formation. Exposure to air. Exposure to moist air or water.

Incompatible Materials Strong oxidizing agents

Hazardous Decomposition Products Fumes of aluminum or aluminum oxide

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Aluminum	Not listed	Not listed	LC50 > 0.888 mg/L (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Aluminum	7429-90-5	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity
Do not empty into drains.

Persistence and Degradability Insoluble in water

Bioaccumulation/ Accumulation No information available.

Mobility Is not likely mobile in the environment due its low water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT Not regulated
TDG Not regulated
IATA Not regulated
IMDG/IMO Not regulated

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Aluminum	7429-90-5	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA - Per 40 CFR 751, Regulation of Certain Chemical Substances & Mixtures, Under TSCA Section 6(h) (PBT) Not applicable

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Aluminum	7429-90-5	X	-	231-072-3	X	X		X	X	KE-00881

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

Component	CAS No	Weight %	SARA 313 - Threshold Values %	SARA 313 - Reporting threasholds

Aluminum	7429-90-5	99	1.0 %	-

SARA 311/312 Hazard Categories
Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Aluminum	X	X	X	-	X

U.S. Department of Transportation
Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product contains the following DHS chemicals:
Legend - STQs = Screening Threshold Quantities, APA = A placarded amount

Component	DHS Chemical Facility Anti-Terrorism Standard
Aluminum	-

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Component	CAS No	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Aluminum	7429-90-5	-	Use restricted. See item 75. (see link for restriction details)	-

REACH links
https://echa.europa.eu/substances-restricted-under-reach

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Aluminum	7429-90-5	Listed	Not applicable	Not applicable	Not applicable

Contains component(s) that meet a 'definition' of per & poly fluoroalkyl substance (PFAS)?
Not applicable

Other International Regulations

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Aluminum	7429-90-5	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

Prepared By
Health, Safety and Environmental Department
Email: chem.techinfo@thermofisher.com
www.thermofisher.com

Creation Date 12-Oct-2010
Revision Date 29-Mar-2024
Print Date 29-Mar-2024
Revision Summary New emergency telephone response service provider.

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

Material Safety Data Sheet

Ferro Chrome Low Carbon

Section 1 - Chemical Product

MSDS Name: Ferro Chrome Low Carbon;LOWCARBONFERROCHROME

SUPPLIER:

HENAN XINXIN SILICON ALLOY CO.,LTD.
ADDRESS: WORLD TRADE CENTER 1401, WENFENG DISTRIC ,ANYANG CITY ,HENAN PROVINCE ,CHINA
TEL: +86-372-5375259

Synonyms: Iron Chrome

CAS NO.	CHEMICAL NAME	PERCENT
7439-89-6	FE	30~35%
7440-47-3	CR	60~65%
---------	OTHERS	1~5%

Section 2 - Composition, Information on Ingredron Sulphideients

Main component: Ferro Chrome Low Carbon

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Warning! Causes Low toxicity class stimulation, out. Ingestion may cause gastrointestinal irritation. The long-term inhalation of dust may cause siderosis. This product is flammable and irritating

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin: Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

Ingestion: Drink plenty of warm water to induce vomiting. Seek medical advice

Inhalation: Remove to fresh air. To maintain airway patency. If breathing is difficult, give oxygen. If breathing has stopped, artificial respiration immediately. Doctor.

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

H**azard characteristics:** Contact acid or acid gas can produce poisonous gas. It is decomposed by high heat to give off poisonous gas.
Hazardous combustion product: Hydrogen sulfide, sulfur oxides
Hxtinguishing method: Fire fighters should wear gas masks, wear full body fire clothing, and fire in the wind. Fire agents: fog water, foam, dry powder, carbon dioxide, sand

Section 6 - Accidental Release Measures

Emergency handling : Isolation of contaminated area, restricted access. Cut off the fire. The proposed emergency personnel wearing anti-dust masks, wearing protective clothing. Do not contact with the leakage. A small leak: carefully scan, bag placed transfer to a safe place. A large leak: recycling or shipped to the waste disposal sites at home.

Section 7 - Handling and Storage

Handling: Closed operation, local exhaust. Released to prevent dust in the air of workplace. The operator must go through specialized training, strictly abide by the rules. The operating personnel wear self absorption filter anti-dust masks, wearing protective chemical safety glasses, wear protective overalls on infiltration, wearing rubber gloves. Keep away from fire, heat, smoking is strictly prohibited place. Use explosion-proof ventilation systems and equipment. To avoid dust. Avoid alkali and oxidant contact. Equipped with corresponding quantity and variety of fire equipment and emergency treatment equipment. The empty containers may be left harmful.
Storage: Store in a cool, ventilated warehouse. Stay away from fire and heat. Avoid direct sunlight. Packing seal. With oxidant, alkali, edible chemicals stored separately, avoid mixing reservoir. With the corresponding variety and quantity of fire equipment. Storage areas should be equipped with appropriate material for leakage.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Personal Protective Equipment
Eyes: Wear chemical safety goggles.
Skin: Wear impervious gloves.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European

Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: solid
Appearance: Dark grey to black metal flake or granular solid.
Vapor Pressure: not available
Vapor Density: Not available.
Evaporation Rate:not available
Viscosity: Not available.
Decomposition Temperature: Not available.
Solubility: Insoluble in water

Section 10 - Stability and Reactivity

Banned substance: Strong oxidant, strong base

Section 11 - Toxicological Information

No information available.

Section 12 - Ecological Information

Other harmful effects: The substance is harmful to the environment, and special attention should be paid to the pollution of the water.

Section 13 - Disposal Considerations

Incineration is recommended. Disposal of damaged containers shall not be allowed again and shall be buried at designated sites

Section 14 - Transport Information NOT REGULATED BY IMDG/IMO

Transportation note: Shipment to complete the packing, loading should be secure. In the process of transportation to ensure that the container does not leak, do not collapse, not falling, not damaged. With no oxidant, alkali, edible chemicals mixed mixed transport. Transportation should prevent insolation, rain, and high temperature. Transport vehicles should be equipped with the corresponding varieties and the number of fire equipment and emergency treatment equipment.

The product of the shipment of vehicle exhaust pipe must have a fire resistance device. Midway away from fire, heat retention. Transport vehicles should be thoroughly cleared. The railway transportation should be prohibited. Rolling highway transportation according to regulations when driving route.

Section 15 - Regulatory Information

The chemical dangerous goods safety management regulations (issued by the State Council on February 17, 1987), the detailed rules for the implementation of regulations on safety management of hazardous chemicals (Lowe hair [1992] No. 677), using chemical workplace safety regulation (labor department is sent [1996] No. 423) and other relevant laws and regulations, for the safe use of hazardous chemicals, production, storage, transportation, loading and unloading etc. the corresponding provisions.

Section 16 - Additional Information

MSDS Creation Date: 9/15/2022
Revision #6 Date: 9/15/2024

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

High Carbon Ferrochrome

Safety Data Sheet

according to Regulation (EU) 2015/830

Date of issue: 2/25/2016 Revision date: Supersedes: Version: 1.0

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form : Mixture

Product name : High Carbon Ferrochrome

Product code : 1001

Type of product : Alloy

Other means of identification : FeCr
Ferrochrome
Ferrochromium

1.2. Relevant identified uses of the substance or mixture and uses advised against

1.2.1. Relevant identified uses

Use of the substance/mixture : Manufacture of basic metals, including alloys

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

Only Representative
Intertek Deutschland GmbH
Stangenstrasse 1
70771 Leinfelden-Echterdingen
T +49 711 27311-152 - F +49 711 27311-559
REACH-OR.de@intertek.de

Manufacturer
Albchrome shpk
Rr."Dervish Hima", Pallati Ambasador 3, kati 1, nr.3,
Tiranë, Albania
Tel. +35542242938

1.4. Emergency telephone number

Emergency number : +27 21 577 1333 / +27 825 774 766 / +27 827 740 071

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Not classified

Adverse physicochemical, human health and environmental effects

No additional information available

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

No labelling applicable

2.3. Other hazards

This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII

This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

SECTION 3: Composition/information on ingredients

3.1. Substance

Not applicable

3.2. Mixture

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Chromium	(CAS No) 7440-47-3 (EC no) 231-157-5 (REACH-no) 01-2119485652-31-0099	50 - 71	Not classified

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Iron	(CAS No) 7439-89-6 (EC no) 231-096-4 (REACH-no) 01-2119462838-24-0393	20 - 41	Not classified
Carbon	(CAS No) 7440-44-0 (EC no) 231-153-3;931-328-0 (REACH-no) Not available	4 - 8	Not classified
Silicon	(CAS No) 7440-21-3 (EC no) 231-130-8 (REACH-no) Not available	0 - 1.5	Not classified

Full text of H-statements: see section 16

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. In case of breathing difficulties administer oxygen. If unconscious, place in the recovery position and seek medical advice. In case of excessive inhalation of fumes move the person to fresh air. Call for medical help.

First-aid measures after skin contact : Wash skin thoroughly with mild soap and water. If skin irritation occurs: Get medical advice/attention.

First-aid measures after eye contact : IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Protect uninjured eye. Consult an ophtalmologist if irritation persists.

First-aid measures after ingestion : If swallowed, rinse mouth with water (only if the person is conscious). Do not induce vomiting. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

4.2. Most important symptoms and effects, both acute and delayed

No additional information available

4.3. Indication of any immediate medical attention and special treatment needed

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition products in case of fire : Silicon dioxide.

5.3. Advice for firefighters

Protective equipment for firefighters : Extra personal protection: complete protective clothing including self-contained breathing apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Emergency procedures : Immediately contact emergency personnel.

6.1.2. For emergency responders

Protective equipment : Wear suitable protective clothing, gloves and eye/face protection. Avoid breathing dust/fume/gas/mist/vapours/spray.

Emergency procedures : Evacuate unnecessary personnel.

6.2. Environmental precautions

Do not discharge into drains or the environment.

6.3. Methods and material for containment and cleaning up

For containment : Take up mechanically (sweeping, shovelling) and collect in suitable container for disposal. Use care during processing to minimize generation of dust.

Methods for cleaning up : Wash with plenty of water and detergent.

6.4. Reference to other sections

For further information refer to section 8: "Exposure controls/personal protection". For disposal of residues refer to section 13: Disposal considerations.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed : Chromium VI may be formed at elevated temperature processing operations such as welding.

Precautions for safe handling : Handle in accordance with good industrial hygiene and safety procedures. Avoid generation of dust. Wear suitable gloves. Avoid contact with skin and eyes.

Hygiene measures : Do not eat, drink or smoke when using this product. Always wash hands and face immediately after handling this product, and once again before leaving the workplace.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Keep container tightly closed. Store in a well-ventilated place. Keep cool.

Incompatible products : Acids.

Heat and ignition sources : Keep away from open flames, hot surfaces and sources of ignition.

Prohibitions on mixed storage : Acids. Keep away from food, drink and animal feeding stuffs.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Chromium (7440-47-3)		
EU	IOELV TWA (mg/m³)	2 mg/m³
Austria	MAK (mg/m³)	2 mg/m³
Belgium	Limit value (mg/m³)	0.5 mg/m³
Bulgaria	OEL TWA (mg/m³)	2.0 mg/m³
Croatia	GVI (granična vrijednost izloženosti) (mg/m³)	2 mg/m³
Cyprus	OEL TWA (mg/m³)	2 mg/m³
Czech Republic	Expoziční limity (PEL) (mg/m³)	0.5 mg/m³ (dust)
Denmark	Grænseværdie (langvarig) (mg/m³)	0.5 mg/m³ (powder)
Estonia	OEL TWA (mg/m³)	2 mg/m³
Finland	HTP-arvo (8h) (mg/m³)	0.005 mg/m³
France	VME (mg/m³)	2 mg/m³ (indicative limit)
France	France - BEI	0.01 mg/g Kreatinin (Medium: urine - Time: augmented during shift - Parameter: Total Chromium (Background noise on non-exposed subjects (soluble aerosol)) 0.03 mg/g Kreatinin (Medium: urine - Time: end of shift at end of workweek - Parameter: Total Chromium (Background noise on non-exposed subjects (soluble aerosol))
Germany	TRGS 900 Occupational exposure limit value (mg/m³)	2 mg/m³ (the limit values at the workplace is related to the elemental content of the metal-inhalable fraction)
Gibraltar	OEL TWA (mg/m³)	2 mg/m³
Greece	OEL TWA (mg/m³)	1 mg/m³
Hungary	AK-érték	2 mg/m³
Ireland	OEL (8 hours ref) (mg/m³)	2 mg/m³
Ireland	OEL (15 min ref) (mg/m3)	6 mg/m³ (calculated)
Italy	OEL TWA (mg/m³)	0.5 mg/m³
Latvia	OEL TWA (mg/m³)	2 mg/m³
Latvia	Latvia - BEI	10 µg/g creatinine (Medium: urine - Time: change of shift - Parameter: Chromium (reference value for total Chromium concentration for occupationally unexposed population in blood <0.5µg/L, and in urine 0.5 g/L)
Lithuania	IPRV (mg/m³)	2 mg/m³
Luxembourg	OEL TWA (mg/m³)	2 mg/m³
Malta	OEL TWA (mg/m³)	2 mg/m³
Netherlands	Grenswaarde TGG 8H (mg/m³)	0.5 mg/m³
Poland	NDS (mg/m³)	0.5 mg/m³
Portugal	OEL TWA (mg/m³)	2 mg/m³ (indicative limit value)
Romania	OEL TWA (mg/m³)	0.05 mg/m³ (from metallurgy) 2 mg/m³ (metallic)

Chromium (7440-47-3)		
Romania	Romania - BEI	10 µg/g creatinine (Medium: urine - Time: during working hours - Parameter: Chrome) 30 µg/g creatinine (Medium: urine - Time: end of work week - Parameter: Chrome)
Slovenia	OEL TWA (mg/m³)	2 mg/m³
Spain	VLA-ED (mg/m³)	2 mg/m³ (indicative limit value)
Sweden	nivågränsvärde (NVG) (mg/m³)	0.5 mg/m³ (total dust)
United Kingdom	WEL TWA (mg/m³)	0.5 mg/m³
United Kingdom	WEL STEL (mg/m³)	1.5 mg/m³ (calculated)
Norway	Grenseverdier (AN) (mg/m³)	0.5 mg/m³
Norway	Grenseverdier (Korttidsverdi) (mg/m3)	0.5 mg/m³
Switzerland	VME (mg/m³)	0.5 mg/m³ (inhalable dust)
Australia	TWA (mg/m³)	0.5 mg/m³
Canada (Quebec)	VEMP (mg/m³)	0.5 mg/m³
USA - ACGIH	ACGIH TWA (mg/m³)	0.5 mg/m³
USA - IDLH	US IDLH (mg/m³)	250 mg/m³
USA - NIOSH	NIOSH REL (TWA) (mg/m³)	0.5 mg/m³
USA - OSHA	OSHA PEL (TWA) (mg/m³)	1 mg/m³

Iron (7439-89-6)		
Bulgaria	OEL TWA (mg/m³)	6.0 mg/m³ (containing <2% free Crystalline silicon dioxide in respirable fraction-dust, inhalable fraction)
Slovakia	NPHV (priemerná) (mg/m³)	6.0 mg/m³ (total aerosol)

Carbon (7440-44-0)		
Austria	MAK (mg/m³)	5 mg/m³ (alveolar dust with <1% Quartz, respirable fraction)
Austria	MAK Short time value (mg/m³)	10 mg/m³ (alveolar dust with <1% quartz, respirable fraction)
Poland	NDS (mg/m³)	4.0 mg/m³ (natural-inhalable fraction) 1.0 mg/m³ (natural-respirable fraction) 6.0 mg/m³ (synthetic-inhalable fraction)

Silicon (7440-21-3)		
Belgium	Limit value (mg/m³)	10 mg/m³
Croatia	GVI (granična vrijednost izloženosti) (mg/m³)	10 mg/m³ (total dust) 4 mg/m³ (respirable dust)
Denmark	Grænseværdie (langvarig) (mg/m³)	10 mg/m³
Estonia	OEL TWA (mg/m³)	10 mg/m³ 5 mg/m³ (respirable dust)
France	VME (mg/m³)	10 mg/m³
Greece	OEL TWA (mg/m³)	10 mg/m³ (inhalable fraction) 5 mg/m³ (respirable fraction)
Ireland	OEL (8 hours ref) (mg/m³)	10 mg/m³ (total inhalable dust) 4 mg/m³ (respirable dust)
Ireland	OEL (15 min ref) (mg/m3)	30 mg/m³ (calculated-total inhalable dust) 12 mg/m³ (calculated-respirable dust)
United Kingdom	WEL TWA (mg/m³)	10 mg/m³ (inhalable dust) 4 mg/m³ (respirable dust)
United Kingdom	WEL STEL (mg/m³)	12 mg/m³ (calculated-respirable dust)
United Kingdom	WEL STEL (ppm)	30 ppm (calculated-inhalable dust)
Norway	Grenseverdier (AN) (mg/m³)	10 mg/m³ (equal to the standard for nuisance dust)
Norway	Grenseverdier (Korttidsverdi) (mg/m3)	20 mg/m³ (equal to the standard for nuisance dust)
Switzerland	VME (mg/m³)	3 mg/m³ (respirable dust)
Australia	TWA (mg/m³)	10 mg/m³ (containing no asbestos and <1% crystalline silica-inhalable dust)
Canada (Quebec)	VEMP (mg/m³)	10 mg/m³ (containing no Asbestos and <1% Crystalline silica-total dust)
USA - NIOSH	NIOSH REL (TWA) (mg/m³)	10 mg/m³ (total dust) 5 mg/m³ (respirable dust)

Silicon (7440-21-3)		
USA - OSHA	OSHA PEL (TWA) (mg/m³)	15 mg/m³ (total dust) 5 mg/m³ (respirable fraction)

8.2. Exposure controls

Appropriate engineering controls : Use adequate general or local ventilation to keep airborne concentrations below the exposure limits. Follow recommendations presented in the paper 'REACH and the Welding of Metals and Alloys', published by Eurometaux, Eurofer and European Welding Association (May 2010).

Personal protective equipment : Gloves. In case of dust production: protective goggles.

Hand protection : Wear suitable gloves tested to EN374

Eye protection : In case of dust production: protective goggles

Skin and body protection : Wear suitable protective clothing

Respiratory protection : Where excessive dust may result, wear approved mask. In welding operation where Chromium VI may be formed: wear suitable respirator.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Solid
Molecular mass	: 107.85 g/mol
Colour	: Grey.
Odour	: Odourless.
Odour threshold	: No data available
pH	: Not applicable, solid
Relative evaporation rate (butyl acetate=1)	: Not applicable, solid
Melting point	: 1350 - 1500 °C DIN 53736
Freezing point	: No data available
Boiling point	: No data available
Flash point	: Not applicable, solid
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Flammability (solid, gas)	: Non flammable
Vapour pressure	: Not applicable, solid
Relative vapour density at 20 °C	: Not applicable, solid
Relative density	: No data available
Density	: 6.7 - 7.1 g/cm³ ISO 1183
Solubility	: insoluble in water. Organic solvent:Virtually insoluble
Log Pow	: No data available
Log Kow	: Not applicable
Viscosity, kinematic	: Not applicable, solid
Viscosity, dynamic	: Not applicable, solid
Explosive properties	: No data available
Oxidising properties	: No data available
Explosive limits	: No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Stable under normal conditions of use.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Hazardous polymerization will not occur.

10.4. Conditions to avoid

No additional information available

10.5. Incompatible materials

Strong acids.

10.6. Hazardous decomposition products

Release of highly flammable gases/vapours hydrogen. Fumes containing hexavalent chromium may be formed during high temperature processes (production and welding).

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Chromium (7440-47-3)	
LD50 oral rat	> 5000 mg/kg (OECD TG 420)
LC50 inhalation rat (Dust/Mist - mg/l/4h)	> 5.41 mg/l/4h (OECD TG 403)

Iron (7439-89-6)	
LD50 oral rat	98.6 g/kg (Boyd EM, Shanas MN, 1963, Canad Med Ass J July 27, 1963, vol. 89, 171-175)

Skin corrosion/irritation : Not classified
pH: Not applicable, solid

Serious eye damage/irritation : Not classified
pH: Not applicable, solid

Respiratory or skin sensitisation : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : Not classified

Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : Not classified

Specific target organ toxicity (repeated exposure) : Not classified

Chromium (7440-47-3)	
LOAEL (inhalation, rat,dust/mist/fume, 90 days)	>= 4.4 mg/l/6h/day (Derelanko, M. J., W. E. Rinehart, et al., 1999, Toxicol Sci.52: 278-288)
NOAEL (oral, rat, 90 days)	1216 mg/kg bodyweight/day (Ivankovic, S. and R. Preussman, 1975, Food Cosmet Toxicol.13(3): 347-51)

Aspiration hazard : Not classified

Potential Adverse human health effects and symptoms : Chromium VI may be formed at elevated temperature processing operations such as welding, with related risks and effects.

SECTION 12: Ecological information

12.1. Toxicity

No additional information available

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

High Carbon Ferrochrome	
Log Kow	Not applicable

12.4. Mobility in soil

No additional information available

12.5. Results of PBT and vPvB assessment

High Carbon Ferrochrome
This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII
This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

12.6. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods	:	Dispose of contents/container to industrial incineration plant. Dispose of contents/container to comply with applicable local, national and international regulations. Consult the appropriate local waste disposal expert about waste disposal.
Waste disposal recommendations	:	Empty containers should be taken for recycling, recovery or waste in accordance with local regulation. Handle uncleaned empty containers as full ones.
European List of Waste (LoW) code	:	01 00 00 - WASTES RESULTING FROM EXPLORATION, MINING, QUARRYING, AND PHYSICAL AND CHEMICAL TREATMENT OF MINERALS

SECTION 14: Transport information

In accordance with ADR / RID / IMDG / IATA / ADN

14.1. UN number

UN-No. (ADR)	:	Not applicable
UN-No. (IMDG)	:	Not applicable
UN-No. (IATA)	:	Not applicable
UN-No. (ADN)	:	Not applicable
UN-No. (RID)	:	Not applicable

14.2. UN proper shipping name

Proper Shipping Name (ADR)	:	Not applicable
Proper Shipping Name (IMDG)	:	Not applicable
Proper Shipping Name (IATA)	:	Not applicable
Proper Shipping Name (ADN)	:	Not applicable
Proper Shipping Name (RID)	:	Not applicable

14.3. Transport hazard class(es)

ADR

Transport hazard class(es) (ADR) : Not applicable

IMDG

Transport hazard class(es) (IMDG) : Not applicable

IATA

Transport hazard class(es) (IATA) : Not applicable

ADN

Transport hazard class(es) (ADN) : Not applicable

RID

Transport hazard class(es) (RID) : Not applicable

14.4. Packing group

Packing group (ADR)	:	Not applicable
Packing group (IMDG)	:	Not applicable
Packing group (IATA)	:	Not applicable
Packing group (ADN)	:	Not applicable
Packing group (RID)	:	Not applicable

14.5. Environmental hazards

Dangerous for the environment	:	No
Marine pollutant	:	No
Other information	:	No supplementary information available

14.6. Special precautions for user

- Overland transport

Not applicable

- Transport by sea

Not applicable

- Air transport

Not applicable

- Inland waterway transport

Not applicable

- Rail transport

Not applicable

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.1.1. EU-Regulations

Contains no REACH substances with Annex XVII restrictions

Contains no substance on the REACH candidate list

Contains no REACH Annex XIV substances

15.1.2. National regulations

Germany

VwVwS Annex reference	:	Water hazard class (WGK) 2, hazard to waters (Classification according to VwVwS, Annex 4)
12th Ordinance Implementing the Federal Immission Control Act - 12.BImSchV	:	Is not subject of the 12. BImSchV (Hazardous Incident Ordinance)

Netherlands

SZW-lijst van kankerverwekkende stoffen	:	None of the components are listed
SZW-lijst van mutagene stoffen	:	None of the components are listed
NIET-limitatieve lijst van voor de voortplanting giftige stoffen – Borstvoeding	:	None of the components are listed
NIET-limitatieve lijst van voor de voortplanting giftige stoffen – Vruchtbaarheid	:	None of the components are listed
NIET-limitatieve lijst van voor de voortplanting giftige stoffen – Ontwikkeling	:	None of the components are listed

15.2. Chemical safety assessment

This mixture is classified as not hazardous according to regulation (EC) 1272/2008 [CLP]

SECTION 16: Other information

Abbreviations and acronyms:

SDS	Safety Data Sheet
RID	Regulations concerning the International Carriage of Dangerous Goods by Rai
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006
OECD	Organisation for Economic Co-operation and Development
NOEC	No-Observed Effect Concentration
NOAEL	No-Observed Adverse Effect Level
NOAEC	No-Observed Adverse Effect Concentration
LOAEL	Lowest Observed Adverse Effect Level
LD50	Median lethal dose
LC50	Median lethal concentration
IMDG	International Maritime Dangerous Goods
IATA	International Air Transport Association
EC50	Median effective concentration
CLP	Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008
BCF	Bioconcentration factor
ATE	Acute Toxicity Estimate
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways

PNEC	Predicted No-Effect Concentration
vPvB	Very Persistent and Very Bioaccumulative
PBT	Persistent Bioaccumulative Toxic
DNEL	Derived-No Effect Level

Other information : The information presented in this Safety Data Sheet is based on current knowledge and is believed to be complete and accurate. It describes the product for the purposes of health, safety and environment requirements only and shall, therefore, be used only as a guide. The data refers to a specific product and may not be valid for combined uses with other products. It is the user´s obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The Supplier of this SDS shall not be responsible for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices.

SDS EU (REACH Annex II)

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product

SAFETY DATA SHEET

IN ACCORDANCE WITH OSHA HAZARD COMMUNICATION STANDARD 29CFR1910.1200

Revision Date: 10-Nov-2021 **Revision Number 2**

1. PRODUCT AND COMPANY IDENTIFICATION

Product identifier

Trade name Ferro Molybdenum (Solid, Powder)

Recommended use For industrial and professional use
Uses advised against Any other purposes

Details of the supplier of the safety data sheet

Titan International, Inc.
Titan Metal Powders
740 Queen Street
Pottstown, PA 19464
(856) 735-2220
Email: info@titanintl.com
www.titanintl.com

Emergency telephone number

INFORTAC **United States:** (800) 535-5053 **International:** +1(352) 352-3500
Call INFOTRAC 24 Hours – only in the event of a chemical emergency involving a spill, leak, fire, exposure or accident.

2. HAZARDS IDENTIFICATION

Classification

OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

Physical Hazards: Combustible Dust
Health Hazards: Not classified

Label Elements

Signal word
Warning

Hazard statements
May form combustible dust concentration in air

Precautionary Statements
None

Hazards not otherwise classified (HNOC)
Health: Not Applicable
Physical: Not Applicable

Other Information
None

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No	Weight - %
Molybdenum	7439-98-7	62
Iron	7439-89-6	37

4. FIRST AID MEASURES

Description of first aid measures

General Advice Do not breathe dust. If symptoms persist, call a physician.

Inhalation Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.

Skin contact Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.

Eye contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Ingestion Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.

Protection of First-aiders Use personal protective equipment. Avoid contact with skin, eyes, and clothing. Remove all sources of ignition.

Most important symptoms and effects, both acute and delayed

Main symptoms None known

Indication of immediate medical attention and special treatment needed

Notes to physician Treat symptomatically

5. FIRE-FIGHTING MEASURES

Extinguishing media

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Use CO2, dry chemical, or foam, water spray or fog.

Extinguishing media which shall not be used for safety reasons
None known

Special hazards arising from the substance or mixture

Special Hazard
Thermal decomposition can lead to release of irritating gases and vapors. Water runoff can cause environmental damage.

Hazardous decomposition products
None under normal conditions

Advice for firefighters

Special protective equipment for firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment, and emergency procedures
Evacuate personnel to safe areas. Keep people away from and upwindof spill/leak. Eliminate all ignition sources (no smoking, flares, sparks or flames in immediately area). Use personal protective equipment. Avoid contact with skin, eyes and clothing.

Advice for non-emergency personnel	Material can create slippery conditions
Advice for emergency responders	For personal protection see section 8

Environmental precautions
Prevent further leakage or spillage if safe to do so. Prevent product from entering drains. Keep people away from and upwind of spill/leak. Do not flush into surface water or sanitary sewer system. Local authorities should be advised if significant spillages cannot be contained.

Methods and materials for containment and cleaning up
Sweep up and shovel into suitable containers for disposal. Keep in suitable, closed containers for disposal.

Reference to other sections
See Section 8/12/13 for additional information

7. HANDLING AND STORAGE

Precautions for Safe handling
Wear personal protective equipment/face protection. Ensure adequate ventilation. Avoid contact with skin, eyes, and clothing. Avoid ingestion and inhalation. Avoid dust formation.

Conditions for safe storage, including any incompatibilities

Technical measures/Storage conditions
Keep container tightly closed in a dry and well-ventilated place

Recommended Shelf Life
No information available

Incompatible materials
Lithium

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Molybdenum	TWA: 10 mg/m^3	TWA: 10 mg/m^3 (Vacated)	TWA: 10 mg/m^3 (Vacated)	TWA: 10 mg/m^3 TWA: 1 ppm
Iron	TWA: 5 mg/m^3	TWA: 10 mg/m^3 (Vacated)	TWA: 5 mg/m^3	TWA: 10 mg/m^3 TWA: 3 mg/m^3

Legend
ACGIH *- American Conference of Governmental Industrial Hygienists*
OSHA *- Occupational Safety and Health Administration*
NIOSH IDLH *- NIOSH - National Institute for Occupational Safety and Health*

Exposure controls

Engineering Controls Ensure that eyewash stations and safety showers are close to the workstation location.

Individual protection measures, such as personal protective equipment

Eye protection	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin and body protection	Wear appropriate protective gloves and clothing to prevent skin exposure.
Respiratory protection	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
Hygiene measures	Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid	**Odor**	Odorless
Appearance	Silver/Gray	**Odor threshold**	No information available

Property	**Values**	**Remarks / • Method**
pH	No information available	
Melting point/freezing point	2966 ºF	
Boiling point/boiling range	No information available	
Flash point	No information available	
Evaporation rate	No information available	
Flammability (solid, gas)	No information available	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit:	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specfic Gravity	9	
Water solubility	Insoluble	
Solubility in other solvents	No information available	
Partition coefficient	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Explosive properties	No information available	
Oxidizing properties	No information available	

Other information

Molecular weight	No information available
VOC Content	No information available
VOC content (ASTM E-1868-10)	No information available
Bulk density	No information available

10. STABILITY AND REACTIVITY

Reactivity
None under normal use conditions

Chemical Stability
Stable under recommended storage conditions

Possibility of Hazardous Reactions
Hazard polymerization has not been reported to occur under normal temperatures and pressures

Conditions to avoid
Avoid heat, flames, sparks and other sources of ignition. Incompatible products.

Incompatible materials
Lithium

Hazardous Decomposition Products
Thermal decomposition may release toxic and/or hazardous gases, which may include iron and molybdenum.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information

LD50 (Oral)	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg
LD50 (Dermal)	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg
LC50 (Inhalation)	Based on ATE data, the classification criteria are not met. ATE > 5 mg/l
Inhalation	Based on available data, the classification criteria are not met
Eye contact	Based on available data, the classification criteria are not met
Skin contact	Based on available data, the classification criteria are not met
Ingestion	Based on available data, the classification criteria are not met

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Molybdenum	> 114mg/kg (Rat)	Not listed	Not listed
Iron	30 mg/kg (Guinea pig)	Not listed	Not listed

Information on toxicological effects

Symptoms No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation	Based on available data, the classification criteria are not met
Serious eye damage / eye irritation	Based on available data, the classification criteria are not met
Sensitization	Based on available data, the classification criteria are not met
Germ cell mutagenicity	Based on available data, the classification criteria are not met
Carcinogenicity	Based on available data, the classification criteria are not met
Reproductive toxicity	Based on available data, the classification criteria are not met
Specific target organ toxicity - single exposure	Based on available data, the classification criteria are not met
Specific target organ toxicity - Repeated exposure	Based on available data, the classification criteria are not met
Aspiration hazard	Based on available data, the classification criteria are not met

12. ECOLOGICAL INFORMATION

Ecotoxicity
Harmful to aquatic life.

Toxicity to fish static test - Morone saxatilis - 13.6 mg/l - 96 h(Iron)

Persistence and degradability
Insoluble in water. May persist

Bioaccumulation
No data available on the product itself

Mobility
It is not likely mobile in the environment due to low water solubility.

Other adverse effects
No data available on the product itself

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste Disposal methods	Dispose in accordance with applicable regional, national, and local laws and regulations.
Contaminated packaging	This product does possess characteristics which may qualify as hazardous waste. Containers must be disposed of in accordance with applicable local guidelines.

14. TRANSPORT INFORMATION

DOT	Not regulated as a dangerous good
TDG	Not regulated as a dangerous good
IATA	Not regulated as a dangerous good
IMDG/IMO	Not regulated as a dangerous good

5. REGULATORY INFORMATION

International Inventories

USA (TSCA):	Complies
EU (EINECS):	Complies
CANADA (DSL):	Complies
CANADA (NDSL):	Not applicable
JAPAN (ENCS):	Complies
PHILIPPINES (PICCS):	Complies
KOREA (KECL):	Complies
China (IECSC):	Complies
AUSTRALIA (AICS):	Complies
NEW ZEALAND (NZIoC):	Complies
TAIWAN (NECI):	Complies

Legend:
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
ENCS - Japan Existing and New Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals
NECI - Taiwan National Existing Chemical InventoryUS Federal Regulations

United States of America Inventory

Sara 313
Section 313 of the Tittle III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains the following chemicals which are subject to the reporting requirements of the Act and Tittle 40 of the Code of Federal Regulations, Part 372:

Component	Sara 313 – Threshold Values %
Molybdenum	1.0
Iron	1.0

Sara 311/312
- Combustible dust

CWA (Clean Water Act)
This product contains no substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA
This product contains no substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorized Act (SARA) (40 CFR 355).

HAPS (Hazardous Air Pollutants:
This product contains no substances regulated as Hazardous Air Pollutants (HAPS) pursuant to the clean air act.

US State Regulations

California Proposition 65
This product contains no chemicals known to the State of California to cause Cancer/reproductive harm.

U.S. State Right-to-know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Molybdenum	X	X	X	-	X
Iron	-	-	-	-	-

U.S. EPA Label Information
EPA Pesticide Registration Number: No applicable

16. OTHER INFORMATION

NFPA	**Health hazards** 0	**Flammability** 1	**Instability** 0	**Physical and Chemical Properties** -

Issue Date 10-Nov-2021
Revision Date 12-Mar-2020
Revision Note SDS review

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guideline for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet

Safety Data Sheet

Acc. to OSHA HCS (29 CFR 1910.1200)

Printing date: October 15, 2018 Revision: October 15, 2018

1 Identification

· **Product identifier**

· **Trade name: Graph-Hex**

· **Article number:** 9921
· **Other product identifiers:** Carbon, Synthetic Graphite, Graphitized Petroleum Coke, Graphite Powder.
· **CAS Number:**
7782-42-5

· **Recommended use and restriction on use**
· **Recommended use:**
Carbon additive/raiser/recarburizer in iron and steel manufacturing. Cover carbon in non-ferrous melting/ holding operations. Used in high temperature coatings.
· **Restrictions on use:** No relevant information available.

· **Details of the supplier of the Safety Data Sheet**
· **Manufacturer/Supplier:**
Larpen Metallurgical Service
1111 Western Dr
Hartford, WI, 53027
(262) 673-9709
sales@larpen.com

· **Emergency telephone number:** (262) 673-9709

2 Hazard(s) identification

· **Classification of the substance or mixture**
The substance is not classified as hazardous according to the Globally Harmonized System (GHS).

· **Label elements**
· **GHS label elements**
The product is not classified as hazardous according to OSHA GHS regulations within the United States.
· **Hazard pictograms:** Not regulated.
· **Signal word:** Not regulated.
· **Hazard statements:** Not regulated.
· **Precautionary statements:** Not regulated.

· **Other hazards**
There are no other hazards not otherwise classified that have been identified.
Long term inhalation of product dust may be harmful.

3 Composition/information on ingredients

· **Chemical characterization: Substances**
· **CAS No. Description**
7782-42-5 Graphite

4 First-aid measures

· **Description of first aid measures**
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.

(Cont'd. on page 2)

Safety Data Sheet
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Trade name: Graph-Hex

(Cont'd. of page 1)

· **After skin contact:**
Brush off loose particles from skin.
Wash with soap and water.
If skin irritation is experienced, consult a doctor.
· **After eye contact:**
Remove contact lenses if worn.
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
· **After swallowing:**
Rinse out mouth and then drink plenty of water.
Do not induce vomiting; immediately call for medical help.
· **Most important symptoms and effects, both acute and delayed:**
Gastric or intestinal disorders when ingested.
· **Indication of any immediate medical attention and special treatment needed:**
No relevant information available.

5 Fire-fighting measures

· **Extinguishing media**
· **Suitable extinguishing agents:**
The product is not flammable.
Use fire fighting measures that suit the environment.
· **For safety reasons unsuitable extinguishing agents:** None.
· **Special hazards arising from the substance or mixture** No relevant information available.
· **Advice for firefighters**
· **Protective equipment:**
Wear self-contained respiratory protective device.
Wear fully protective suit.

6 Accidental release measures

· **Personal precautions, protective equipment and emergency procedures**
Ensure adequate ventilation.
Use personal protective equipment as required.
Avoid formation of dust.
Avoid breathing dust.
· **Environmental precautions** No special measures required.
· **Methods and material for containment and cleaning up**
Pick up mechanically.
Dispose of the collected material according to regulations.
· **Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

· **Handling**

(Cont'd. on page 3)

Safety Data Sheet
Acc. to OSHA HCS (29 CFR 1910.1200)

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Trade name: Graph-Hex

(Cont'd. of page 2)

· **Precautions for safe handling:**
Use only in well ventilated areas.
Prevent formation of dust.
Avoid breathing dust.
Any deposit of dust which cannot be avoided must be regularly removed.
Do not dry clean dust covered objects and floors. Wash thoroughly with plenty of water.
· **Information about protection against explosions and fires:** No special measures required.

· **Conditions for safe storage, including any incompatibilities**
· **Requirements to be met by storerooms and receptacles:**
Storage area should be dry and well-ventilated.
· **Information about storage in one common storage facility:** Store away from foodstuffs.
· **Specific end use(s)** No relevant information available.

8 Exposure controls/personal protection

· **Control parameters**

· **Components with limit values that require monitoring at the workplace:**	
7782-42-5 Graphite	
PEL (USA)	Long-term value: 15 mppcf* mg/m³ *impinger samples counted by light field techn.
REL (USA)	Long-term value: 2.5* mg/m³ *respirable dust
TLV (USA)	Long-term value: 2* mg/m³ all forms except graphite fibers;*resp. fraction
EL (Canada)	Long-term value: 2 mg/m³ respirable
EV (Canada)	Long-term value: 2 mg/m³ respirable
LMPE (Mexico)	Long-term value: 2* mg/m³ *fracción respirable

· **Exposure controls**
· **Engineering measures** Provide adequate ventilation.
· **General protective and hygienic measures:**
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Avoid contact with the eyes.
· **Engineering controls:** No relevant information available.
· **Breathing equipment:**
Not required under normal conditions of use.
NIOSH or EU approved dust respirator should be used for operations generating dust.
· **Protection of hands:**
Gloves not required under normal conditions of use.
Protection may be required for spills.
· **Eye protection:**

(Cont'd. on page 4)

Safety Data Sheet

Acc. to OSHA HCS (29 CFR 1910.1200)

Printing date: October 15, 2018 Revision: October 15, 2018

Trade name: Graph-Hex

(Cont'd. of page 3)

Safety glasses

· **Body protection:**
Not required under normal conditions of use.
Protection may be required for spills.
· **Limitation and supervision of exposure into the environment** No special requirements.
· **Risk management measures** No special requirements.

9 Physical and chemical properties

· **Information on basic physical and chemical properties**	
· **Appearance:**	
Form:	Granulate
Color:	Grey to Black.
· **Odor:**	Odorless
· **Odor threshold:**	Not determined.
· **pH-value:**	Not applicable.
· **Melting point/Melting range:**	Not determined.
· **Boiling point/Boiling range:**	Not determined.
· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Product is not flammable.
· **Auto-ignition temperature:**	Not determined.
· **Decomposition temperature:**	Not determined.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits**	
Lower:	Not determined.
Upper:	Not determined.
· **Oxidizing properties:**	Non-oxidizing.
· **Vapor pressure:**	Not determined.
· **Density:**	
Relative density:	2.1 ± 0.1 g/cm³ (17.52 lbs/gal)
Bulk density	800-810 kg/m³ (~50 lbs/ft³)
Vapor density:	Not applicable.
Evaporation rate:	Not applicable.
· **Solubility in / Miscibility with**	
Water:	Insoluble.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity**	
Dynamic:	Not applicable.
Kinematic:	Not applicable.

(Cont'd. on page 5)

Safety Data Sheet

Acc. to OSHA HCS (29 CFR 1910.1200)

Printing date: October 15, 2018 Revision: October 15, 2018

Trade name: Graph-Hex

(Cont'd. of page 4)

· **Other information** No relevant information available.

10 Stability and reactivity

· **Reactivity:** No relevant information available.
· **Chemical stability:** Stable under normal temperatures and pressures.
· **Thermal decomposition / conditions to be avoided:**
No decomposition if used and stored according to specifications.
· **Possibility of hazardous reactions**
As the product is supplied it is not capable of dust explosion; however enrichment with fine dust causes risk of dust explosion.
· **Conditions to avoid** No relevant information available.
· **Incompatible materials** No relevant information available.
· **Hazardous decomposition products** Possible in traces.

11 Toxicological information

· **Information on toxicological effects**
· **Acute toxicity:** Based on available data, the classification criteria are not met.
· **LD/LC50 values that are relevant for classification:** None.
· **Primary irritant effect:**
· **On the skin:** Based on available data, the classification criteria are not met.
· **On the eye:**
Based on available data, the classification criteria are not met.
Mechanical irritation only.
· **Sensitization:** Based on available data, the classification criteria are not met.

· **Carcinogenic categories**

· **IARC (International Agency for Research on Cancer):**
Substance is not listed.
· **NTP (National Toxicology Program):**
Substance is not listed.
· **OSHA-Ca (Occupational Safety & Health Administration):**
Substance is not listed.

· **Probable route(s) of exposure:**
Ingestion.
Inhalation.
Eye contact.
Skin contact.
· **Repeated dose toxicity:**
Repeated or long-term inhalation of product dusts may cause pulmonary disease.
· **Germ cell mutagenicity:** Based on available data, the classification criteria are not met.
· **Carcinogenicity:** Based on available data, the classification criteria are not met.
· **Reproductive toxicity:** Based on available data, the classification criteria are not met.
· **STOT-single exposure:** Based on available data, the classification criteria are not met.

(Cont'd. on page 6)

Safety Data Sheet

Acc. to OSHA HCS (29 CFR 1910.1200)

Printing date: October 15, 2018 Revision: October 15, 2018

Trade name: Graph-Hex

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· **STOT-repeated exposure:** Based on available data, the classification criteria are not met.
· **Aspiration hazard:** Based on available data, the classification criteria are not met.

12 Ecological information

· **Toxicity**
· **Aquatic toxicity** No relevant information available.
· **Persistence and degradability** No relevant information available.
· **Bioaccumulative potential:** No relevant information available.
· **Mobility in soil:** No relevant information available.
· **Additional ecological information**
· **General notes:** Generally not hazardous for water
· **Other adverse effects** No relevant information available.

13 Disposal considerations

· **Waste treatment methods**
· **Recommendation:**
Smaller quantities can be disposed of with household waste.
The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes.

· **Uncleaned packagings**
· **Recommendation:** Disposal must be made according to official regulations.

14 Transport information

· **UN-Number** · **DOT, ADR, ADN, IMDG, IATA**	Not regulated.
· **UN proper shipping name** · **DOT, ADR, IMDG, IATA**	Not regulated.
· **Transport hazard class(es)** · **DOT, ADR, IMDG, IATA** · **Class**	Not regulated.
· **Packing group** · **DOT, ADR, IMDG, IATA**	Not regulated.
· **Environmental hazards** · **Marine pollutant:**	No
· **Special precautions for user**	Not applicable.

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Safety Data Sheet
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Printing date: October 15, 2018 Revision: October 15, 2018

Trade name: Graph-Hex

(Cont'd. of page 6)

· **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code** Not applicable.

15 Regulatory information

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **United States (USA)**
· **SARA**

· **Section 302 (extremely hazardous substances):**
Substance is not listed.
· **Section 355 (extremely hazardous substances):**
Substance is not listed.
· **Section 313 (Specific toxic chemical listings):**
Substance is not listed.
· **TSCA (Toxic Substances Control Act)**
Substance is listed.

· **Proposition 65 (California)**

· **Chemicals known to cause cancer:**
Substance is not listed.
· **Chemicals known to cause developmental toxicity for females:**
Substance is not listed.
· **Chemicals known to cause developmental toxicity for males:**
Substance is not listed.
· **Chemicals known to cause developmental toxicity:**
Substance is not listed.
· **EPA (Environmental Protection Agency):**
Substance is not listed.
· **IARC (International Agency for Research on Cancer):**
Substance is not listed.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Date of preparation / last revision** October 15, 2018 / -
· **Sources**
Website, European Chemicals Agency (echa.europa.eu)
Website, US EPA Substance Registry Services (ofmpub.epa.gov/sor internet/registry/substreg/home/overview/home.do)
Website, Chemical Abstracts Registry, American Chemical Society (www.cas.org)

(Cont'd. on page 8)

Safety Data Sheet

Acc. to OSHA HCS (29 CFR 1910.1200)

Printing date: October 15, 2018 Revision: October 15, 2018

Trade name: Graph-Hex

(Cont'd. of page 7)

Patty's Industrial Hygiene, 6th ed., Rose, Vernon, ed. ISBN: 978-0-470-07488-6
Casarett and Doull's Toxicology: The Basic Science of Poisons, 8th Ed., Klaasen, Curtis D., ed., ISBN: 978-0-07-176923-5.
Safety Data Sheets, Individual Manufacturers

SDS Prepared by:
ChemTel Inc.
1305 North Florida Avenue
Tampa, Florida USA 33602-2902
Toll Free North America 1-888-255-3924 Intl. +01 813-248-0573
Website: www.chemtelinc.com

Ferromanganese, Standard Ferromanganese, Medium Carbon Ferromanganese, Low Carbon Ferromanganese

SAFETY DATA SHEET

Section 1 IDENTIFICATION

Product Name: High Carbon Ferromanganese, Standard Ferromanganese, Medium Carbon Ferromanganese, Low Carbon Ferromanganese

Recommended use: Additive to the Steel, Superalloy, Iron and related industries.

Restrictions on use: Use only as Directed

Company Name: Millbank Materials USA, Ltd.
15540 N. Lombard Street
Portland, Oregon 97203

Emergency phone number: 800-373-7542 –INTERNATIONAL 1-484-951-2432

SDS Date of Preparation: June 22, 2015

2. HAZARD(S) IDENTIFICATION

Classification:

Physical	Health
Not Hazardous	Skin Sensitization Category 1 Carcinogen Category 1B Specific Target Organ Toxicity – Repeat Exposure Category 1

Hazards Not Otherwise Classified (HNOC): Reacts with water and acids to form toxic and/or flammable gases.

Labeling:
Danger!

Hazard Statements

H317 May cause an allergic skin reaction.
H350 May cause cancer.
H372 Causes damage to brain, central nervous system and respiratory tract through prolonged or repeated exposure.

Precautionary Statements

P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P260 Do not breathe dust or fumes.
P264 Wash thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P272 Contaminated work clothing should not be allowed out of the workplace.
P280 Wear protective gloves and protective clothing.
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P333 + P313 If skin irritation or rash occurs: Get medical

attention.
P362 + P364 Take off contaminated clothing and wash it before reuse.
P308 + P313 IF exposed or concerned: Get medical attention.
P405 Store locked up.
P501 Dispose of contents and container in accordance with local and national regulations.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical name	CAS No.	Concentration
Manganese	7439-95-6	>78
Iron	7439-89-6	<20
Carbon	7440-44-0	<7.5
Silicon	7440-21-3	<1.5
Chromium	7440-47-3	<0.5
Nickel	7440-02-0	<0.5

The specific identity and/or exact concentration has been withheld as a trade secret.

4. FIRST-AID MEASURES

Inhalation: If dust or fumes are inhaled, remove to fresh air. If irritation or other symptoms develop, get medical attention.
Skin contact: Wash hands with soap and water. On moist skin, dust may react with moisture to create corrosive by-products. If product is molten, get immediate medical attention.
Eye contact: If dust gets in the eye**,** immediately wash thoroughly with water, while holding open eyelids. Get immediate medical attention if irritation persists. Dust may react with moist mucous membranes producing corrosive by-products. If product is molten, get immediate medical attention.
Ingestion: Ingestion is an unlikely route of exposure for this product. Get medical attention if large amounts of dust is swallowed.

Most important symptoms/effects, acute and delayed: Dust may cause mechanical eye and skin irritation. Dust may react with moist skin and mucous membranes producing corrosive by-products. May cause allergic skin reaction. Molten product may cause eye and skin burns. Inhalation of dust may cause nose, throat and upper respiratory tract irritation. Prolonged inhalation of high concentration of dust may cause adverse effects on the lungs and damage to the brain and central nervous system. Swallowing large amounts of dust may cause gastric upset and nausea. May cause cancer based on animal data. Reacts with water and acids to form toxic and/or flammable gases.

Indication of immediate medical attention and special treatment, if necessary: If eye or skin burns occur, get immediate medical attention.

5. FIRE-FIGHTING MEASURES

Suitable (and unsuitable) extinguishing media: Use dry chemical, sand or carbon dioxide to extinguish. Do not use water.

Specific hazards arising from the chemical: None expected under ambient conditions. Fine dust dispersed in air in sufficient concentrations and in the presence of an ignition source is a potential dust explosion hazard. Contact with water may produce phosphine and arsine gases which are highly flammable and toxic. Combustion may produce oxides of manganese, iron, carbon, silicon, chromium and nickel.

Special protective equipment and precautions for fire-fighters: Firefighters should wear full emergency equipment and NIOSH approved positive pressure self-contained breathing apparatus. Cool fire exposure containers with water.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment, and emergency procedures: Avoid generating dust. Avoid breathing dust or fumes. Wash skin thoroughly after handling.

Environmental hazards: Report spill as required by local and federal regulations.

Methods and materials for containment and cleaning up: Pick-up solid material for reuse or disposal. Collect dust using dustless method (HEPA vacuum or wet method) and place in appropriate container for disposal or use. Do not use compressed air. Do not sweep up. Separate wet and dry material. Avoid repackaging wet materials in sealed containers.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid creation and inhalation of dust or fumes. Provide local exhaust ventilation at points where dust may be generated. Do not use compressed air for cleaning. Follow good housekeeping procedures to minimize the accumulation of dust in the workplace. Do not add wet product to molten metal as this may cause an explosion.

Conditions for safe storage, including any incompatibilities: Store in a dry area at ambient temperatures away from water and other incompatible materials. Protect from physical damage.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure guidelines:

Manganese	5 mg/m^3 Ceiling TWA OSHA PEL 0.02 mg/m^3 TWA (respirable), 0.1 mg/m^3 TWA (inhalable) ACGIH TLV
Iron	10 mg/m^3 TWA OSHA PEL (as fume) 5 mg/m^3 TWA ACGIH TLV (respirable) (as iron oxide)
Carbon	None Established
Silicon	5 mg/m3 TWA (respirable fraction), 10 mg/m3 TWA (total dust OSHA PEL
Chromium (metal)	1 mg/m^3 TWA OSHA PEL 0.5 mg/m^3 TWA ACGIH TLV
Nickel (elemental)	1 mg/m^3 TWA OSHA PEL 1.5 mg/m^3 TWA (inhalable)
Hexavalent Chromium (fume constituent)*	0.05 mg/m3 TWA OSHA PEL 0.01 mg/m3 TWA (insoluble compounds), 0.05 mg/m3 TWA (water soluble compounds ACGIH TLV

*It is known that high temperatures processes can lead to the generation of fumes containing hexavalent chromium (VI). Although the precise identity of the hexavalent chromium substances present have not been identified, it is important to recognize that hexavalent chromium compounds have been classified as carcinogenic, mutagenic, toxic to reproduction and hazardous to the environment. It is essential that workplace activates and releases to the environment associated with these activities are monitored to ensure compliance with applicable regulations.

Appropriate engineering controls: No special ventilation required for handling solid material. Local exhaust or process enclosures may be needed if fumes are generated. Use explosion proof equipment where required.

Individual protection measures, such as personal protective equipment:
Respiratory protection: None required for handling solid material. If processing generates fumes and engineering controls are not available to control the exposures, appropriate respiratory protection may be

required. If exposure to phosphine or arsine is suspected, a self-contained breathing apparatus or air supplied respirator is recommended. Selection of respiratory protection depends on the contaminant type, form and concentration. Select in accordance with OSHA 1910.134 and good Industrial Hygiene practice.
Skin protection: Impervious gloves are recommended to avoid skin contact at ambient temperatures. Thermal gloves are recommended when handling molten material.
Eye protection: Chemical safety goggles are recommended to avoid contact with dust.
Other: Wear head, hand, and body protection when handling molten material.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance (physical state, color, etc.): Silver grey lump or granule.
Odor: No odor.

Odor threshold: Not applicable	**pH:** Not applicable
Melting point/Freezing Point: 2269.4°F (1243°C)	**Boiling Range:** Not available
Flash point: Not applicable	**Evaporation rate:** Not applicable
Flammability (solid, gas): Dust may be a combustible	
Flammable limits: LEL: Not applicable	**UEL:** Not applicable
Vapor pressure: Not applicable	**Vapor density:** Not applicable
Relative density: 4.5	**Solubility in Water:** Reacts with water
Partition coefficient: n-octanol/water: Not applicable	**Auto-ignition temperature:** Not applicable
Decomposition temperature: Not applicable	**Viscosity:** Not applicable

10. STABILITY AND REACTIVITY

Reactivity: Reacts with water and moisture to form flammable and toxic gases.
Chemical stability: Stable.
Possibility of hazardous reactions: Moisture, acids and alkalines may react to produce phosphine and arsine. Contact with acids may result in the generation of silane, a spontaneous combustible gas. Wet product added to molten metal will produce hydrogen gas.

Conditions to avoid: Avoid adding wet product to molten materials. Avoid generation of dust. Avoid sparks and ignition source in the presence of dust.
Incompatible materials: Avoid contact with acids, alkalines and water.
Hazardous decomposition products: Thermal decomposition may produce oxides of manganese, iron, carbon, silicon, chromium and nickel.

11. TOXICOLOGICAL INFORMATION

Inhalation: Inhalation of dust may cause nose, throat and upper respiratory tract irritation. Inhalation of fumes may cause metal fume fever with symptoms including fever, chills, nausea, headache, fatigue, muscle aches shortness of breath and pneumonia. Symptoms may disappear with 48 hours of exposure. Inhalation of dust may produce phosphine and/or arsine which may produce irritation of the mucous membranes, coughing, difficulty in breathing, flu-like symptoms, central nervous system depression and lung edema.
Ingestion: No adverse effects are expected. Ingestion of large amounts may cause gastrointestinal irritation and nausea.
Skin contact: Dust may cause mechanical abrasion or injury. Molten material may cause burns.
Eye Contact: Dust may cause mechanical abrasion or injury. Dust particles in eyes may produce phosphine and arsine with symptoms similar to those listed under inhalation. Molten material may cause burns.

Chronic effects: Long-term overexposure to respirable dust may cause lung damage (fibrosis) with symptoms of coughing, shortness of breath and diminished breathing capacity. Prolonged inhalation of nickel dust or fumes may cause perforation of the nasal septum and lung damage. Prolonged or repeated exposure to manganese

may cause damage to the brain and nervous system with symptoms of muscle stiffness, lack of coordination, tremors, and difficulties with breathing or swallowing.

Sensitization: Nickel has been shown to cause skin sensitization in human patch tests. Hexavalent chromium is known to cause sensitization in animal studies.

Carcinogenicity: Metallic nickel is classified by IARC as possibly carcinogenic to humans (Group 2B) and by NTP as reasonably anticipated to be a carcinogen. Hexavalent chromium compounds are listed by IARC as carcinogenic to human and as a known human carcinogen by NTP. None of the other components of this product are listed as a carcinogen by IARC, NTP or OSHA.

Germ Cell Mutagenicity: Hexavalent chromium has been shown to cause mutagenic activity in in-vitro and in vivo assays.

Reproductive Toxicity: Studies with hexavalent chromium with mice have shown significant developmental effects at levels that were not maternally toxic.

Acute Toxicity Data:
Manganese: Oral rat LD50 > 2000 mg/kg; Inhalation rat LC50 > 5.14 mg/L/4 hr
Iron: Oral rat LD50 98.6 g/kg
Carbon: Oral rat LD50 > 2000 mg/kg
Silicon: Oral rat LD50 >5000 mg/kg; Inhalation rat LC50 > 2.08 mg/L (highest attainable concentration); Dermal rabbit LD50 >5000 mg/kg (structurally similar chemical)
Chromium: Oral rat LD50 >5000 mg/kg; Inhalation rat LC50 > 5.41 mg/L (structurally similar chemical)
Nickel: Oral rat LD50 >9000 mg/kg; Inhalation rat LC50 >10.2 mg/L/1 hr

12. ECOLOGICAL INFORMATION

Ecotoxicity:
Manganese: 96 hr LC50 Oncorhynchus mykiss > 3.6 mg/L; 48 hr EC50 daphnia magna >1.6 mg/L; 72 hr EC50 desmodesmus subspicatus 4.5 mg/L
Iron: No data available
Carbon: 96 hr LL50 Danio rerio >100 mg/L, 48 hr EL50 daphnia magna >100 mg/L, 72 hr EL50 Pseudokirchnerella subcapitata >100 mg/L
Silicon: No data available
Chromium: No data available
Nickel: 96 hr LC50 Oncorhynchus mykiss 15.3 mg/L

Persistence and degradability: Bioaccumulation is not applicable to inorganic substances.
Bioaccumulative potential: No data available. Not expected to bioaccumulate in aquatic organisms.
Mobility in soil: Not data available.
Other adverse effects: None known.

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all local, state and federal regulations. It is the responsibility of the waste generator to determine the toxicity and physical characteristics of the material to determine the proper waste identification and disposal in compliance with applicable regulations.

14. TRANSPORT INFORMATION

	UN Number	Proper shipping name	Hazard Class	Packing Group	Environmental Hazard
DOT	None	Not Regulated			
TDG	None	Not Regulated			
IMDG	None	Not Regulated			

IATA	None	Not Regulated			

Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code): Not applicable

Special precautions: None known

15. REGULATORY INFORMATION

Safety, health, and environmental regulations specific for the product in question.

CERCLA Hazardous Substances (Section 103)/RQ: This product is not subject to CERCLA reporting requirements as it is sold. Many states have more stringent release reporting requirements. Report spills required under federal, state and local regulations.
SARA Hazard Category (311/312): Acute Health, Chronic Health, Reactive
EPA SARA 313 Chemicals: This product contain the following chemicals listed under SARA Title III, section 313:

Manganese	7439-95-6	>78
Chromium	7440-47-3	<0.5
Nickel	7440-02-0	<0.5

California Proposition 65: This product contains the following chemicals known to the State of California to cause cancer or reproductive toxicity:

Nickel	7440-02-0	<0.5	Cancer

Chemical Inventories:
EPA TSCA Inventory: All of the components of this product are listed on the TSCA inventory.
Canadian CEPA: All the components of this product are listed on the Canadian DSL.

16. OTHER INFORMATION

NFPA Rating: Health = 1 Flammability = 2 Instability = 2
HMIS Rating: Health = 1* Flammability = 2 Physical Hazard = 2
*Chronic Health Hazard

SDS Revision History: New SDS
Date of preparation: June 22, 2015
Date of last revision: New SDS

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/ UNDERTAKING

1.1 Product identifier

1.1.1 Commercial Product Name

ELECTROLYTIC NICKEL (US)

Identifier	Einecs 231-111-4
Substance name	Nickel

1.2 Relevant identified uses of the substance or mixture and uses advised against

1.2.1 Recommended use

S4A (stainless, special steels and special alloy custers) ;Integrated steel and iron; EAF carbon steel; Powder metallurgy; Metal surface treatment (Nickel electroplating and nickel electroforming technologies); Manufacturing of batteries using positive nickel electrodes; Ni catalyst production from NiO -containing catalyst precursor; Use pre -reduced nickel containing catalyst; Production of magnets ; Production of nickel containing products (e.g. Electronics);Production of brazing alloys; Production of contact materials; Sputter deposition ;Thin film deposition by evaporation techniques, etc.
All identified uses are listed in the attached GES.

Uses advised against
1.Nickel in articles intended for direct and prolonged skin -contact
2.Nickel -containing food contact materials for which migration into foodstuff would exceed more than mg/kg of nickel in accordance with the Council of Europe Guidelines on metals and alloys used as food contact materials (2002)
3.Nickel -containing HIGH SULPHUR stainless steel for surgical implants
4.Immersion -type kettles which would release more than 0.05 mg/l of nickel into the water in accordance with the Council of Europe Guidelines on metals and alloys used as food contact materials (2002)

1.3 Details of the supplier of the safety data sheet

1.3.1 Supplier

	Norilsk Nickel Harjavalta Oy
Street address	Teollisuuskatu 1
Postcode and post office	FIN 29200 Harjavalta
Telephone	+358 (0)2 53711
Telefax	+358 (0)2 5371 2250
Email	product.safety@nornik.fi

1.4 Emergency telephone number

1.4.1 Telephone number, name and address

Norilsk Nickel Harjavalta Oy +358 (0)2 537 11

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Skin Sens. 1
STOT RE 1
Carc. 2

2.2 Label elements

HazCom 2012 exemption on labelling massive metals

GHS07 - GHS08
Signal word **Danger**
Hazard Statements
May cause an allergic skin reaction.
Causes damage to lungs through prolonged or repeated exposure by inhalation.
Suspected of causing cancer via inhalation.

Precautionary Statements
Do not handle until all safety precautions have been read and understood.
Use personal protective equipment as required.
Avoid breathing dust/fume/gas/mist/vapours/spray.
If skin irritation or rash occurs: Get medical advice/attention.
Dispose of contents/container to in accordance with local/ regional/national regulation.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous components

CAS/EC and Reg.number	EINECS	Chemical name of the substance	Concentration	Classification
7440-02-0	231-111-4	Nickel	99,9%	See SECTION 2.1

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures

4.1.2 Inhalation
Remove affected person from the immediate area. Ensure supply of fresh air. If breathing is irregular or stopped, administer artificial respiration. Consult a physician.

4.1.3 Skin contact
Wash off with soap and plenty of water. Remove soiled or soaked clothing immediately. Wash contaminated clothing before re-use.

4.1.4 Eye contact
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. If eye irritation persists, consult a specialist.

4.1.5 Ingestion
Rinse mouth. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
Treat symptomatically.

4.3 Indication of immediate medical attention and special treatment needed
No hazards which require special first aid measures.

SECTION 5. FIREFIGHTING MEASURES

5.1 Extinguishing media

5.1.1 Suitable extinguishing media
The product itself does not burn. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment e.g.: Dry powder; Carbon dioxide (CO2); Water spray jet; Foam;

5.1.2 Extinguishing media which must not be used for safety reasons
Not applicable.

5.2 Special hazards arising from the substance or mixture
In the event of fire the following can be released: Metallic oxides;

5.3 Advice for firefighters
Wear self -contained breathing apparatus and protective suit.

5.4 Specific methods
Nickel is non -flammable, but very fine nickel particles can burn.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Refer to protective measures listed in sections 7 and 8.Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2 Environmental precautions
Do not discharge into the drains/surface waters/groundwater.

6.3 Methods and materials for containment and cleaning up
Pick up mechanically. Send in suitable containers for recovery or disposal. (Section 13)
The spill should be contained and the area should be cleaned by wet -sweeping or vacuum cleaning (HEPA - filter). Avoid dust formation. Send in suitable containers for recovery or disposal (See section 13). Do not discharge into the drains/surface waters/groundwater. The California Safe Drinking Water and Toxic Enforcement Act of 1986 (Prop 65) prohibits contaminating any known source of drinking water with substances known to cause cancer and/or reproductive toxicity.

6.4 Reference to other sections
See also section 8,13

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Do not breathe dust. Avoid repeated exposure. Wear suitable protective equipment (See section 8). If workplace exposure limits are exceeded, respiratory protection approved for this particular job must be worn. Provide good ventilation of working area (local exhaust ventilation if necessary). Ensure that eyewash stations and safety showers are close to the workstation location. Remove soiled or soaked clothing immediately. Clean skin thoroughly after work. At work do not eat, drink, smoke or take drugs. Keep away from food, drink and animal feeding stuffs. Keep working clothes separately.

7.2 Conditions for safe storage, including any incompatibilities
Always keep in containers of same material as the original one. Keep containers tightly closed in a dry, cool and well -ventilated place.

Oxidizing agents; Reacts with acids to form flammable/explosive hydrogen gases.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

8.1.1 National occupational exposure limits
Nickel OSHA PEL 1 mg/m ^{3} ACGIH TLV 1.5 mg/m ^{3}

8.2 Exposure controls

8.2.1 Appropriate engineering controls
Provide good ventilation of working area in order to maintain nickel concentration in the air below the occupational exposure limits (PEL, TLV). Use local exhaust ventilation if necessary. If workplace exposure limits are exceeded, use respiratory protection as specified below.

8.2.2.1 Respiratory protection
Use a respirator with filter model P3 (DIN 3181). Use NIOSH approved respiratory protection.

8.2.2.2 Hand protection
Protective gloves: Leather;

8.2.2.3 Eye/face protection
Face -shield;

8.2.2.4 Skin protection
Clothing as usual in the chemical industry.

8.2.3 Environmental exposure controls
The spill should be contained and the area should be cleaned by wet -sweeping or vacuum cleaning (HEPA - filter). Avoid dust formation. Send in suitable containers for recovery or disposal (See section 13). Do not discharge into the drains/surface waters/groundwater.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1	**Important Health Safety and Environmental Information**	
9.1.1	**Appearance**	Appearance: Solid Colour: Silver
	Odour	odourless
9.1.3	**Odour threshold**	Not applicable.
9.1.4	**pH**	insoluble
9.1.5	**Melting point/freezing point**	2651°F
9.1.6	**Initial boiling point and boiling range**	4946°F
9.1.7	**Flash point**	Not applicable. inorganic
9.1.9	**Flammability (solid, gas)**	The product is not flammable.
9.1.10	**Explosive properties**	
9.1.10.1	**Lower explosion limit**	Not explosive
9.1.10.2	**Upper explosion limit**	Not explosive
9.1.11	**Vapour pressure**	1 mmHg 3290°F
9.1.13	**Relative density**	8,9 g/cm3
9.1.14	**Solubility(ies)**	
9.1.14.1	**Water solubility**	Insoluble
9.1.15	**Partition coefficient: n-octanol/water**	Not applicable. inorganic
9.1.16	**Auto-ignition temperature**	The product is not flammable.
9.1.18	**Viscosity**	Not applicable. Solid
9.1.19	**Explosive properties**	Not explosive
9.1.20	**Oxidising properties**	no oxidizing
9.2	**Other information**	

SECTION 10. STABILITY AND REACTIVITY

10.1 **Reactivity**
No dangerous reaction known under conditions of normal use.

10.2 **Chemical stability**
Stable under recommended storage conditions.

10.3 **Possibility of hazardous reactions**
No dangerous reaction known under conditions of normal use.

10.4 **Conditions to avoid**
Avoid dust formation.

10.5 **Incompatible materials**
Oxidizing agents; Reacts with acids to form flammable/explosive hydrogen gases.

10.6 **Hazardous decomposition products**
Metallic oxides;

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 **Information on toxicological effects**

11.1.1 **Acute toxicity**
If swallowed: LD50/oral/rat = >9000 mg/kg
In case of skin contact: No studies have been found.
If inhaled: NOAEC (66 min) =10.2 mg/L

11.1.2 **Irritation and corrosion**

According to the classification criteria the product is not considered as being a skin irritant.
According to the classification criteria the product is not considered as being an eye irritant.

11.1.3 Sensitisation
Skin sensitizer Skin Sens 1 May cause an allergic skin reaction.
Not classified as Respiratory sensitizer.

11.1.4 Subacute, subchronic and prolonged toxicity
Not Rated mutagenic , Toxic to reproduction
Classification of the substance : Carc.2 Suspected of causing cancer if inhaled.

11.1.6 STOT-repeated exposure
STOT RE 1: H372 - Causes damage to organs through prolonged or repeated exposure. LOAEC = 0.1 mg Ni/m³
If inhaled
Target Organs : Lungs

11.1.7 Aspiration hazard
Not applicable.

11.1.8 Other information on acute toxicity
No studies have been found.

SECTION 12. ECOLOGICAL INFORMATION

12.1 Toxicity

12.1.1 Aquatic toxicity
Classification of the substance Not rated in massive form.

Ecotoxicity Reference Value (ERV) Nickel compounds
-acute 120 µg Ni/L (pH 6), 68 µg Ni/L (pH 8)
-chronic = 2.4 µg Ni/L

Short -term toxicity
Invertebrates 48h LC50
Fresh water 0.013 -4970 mg Ni/L
Marine 0.23 -415 mg Ni/L
Fish 96h LC50
Fresh water 0.23 -320 mg Ni/L
Marine 26.6 -350mg Ni/L

Long -term toxicity
Invertebrates
Fresh water 1.4 -1379 µg Ni/L
Marine 22.5 -335 µg Ni/L
Fish
Fresh water 40 -1548 µg Ni/L
Marine EC10 3599 -20760 µg Ni/L

12.2 Persistence and degradability

12.2.1 Biodegradation
Not applicable.

12.2.2 Chemical degradation
Not applicable.

12.3 Bioaccumulative potential
Bioconcentration factor (BCF) 270
Bioconcentration Terrestrial Compartment BSAF 0.013 -1.86

12.4 Mobility in soil
Kp-Soil: log $K_{p\,soil}$ 2.86

12.6 Other adverse effects
Not applicable.

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Contaminated packaging should be emptied as far as possible. Packaging that cannot be cleaned should be disposed as special waste in compliance with local and national regulations.

13.2 Waste from residues / unused products
Contact manufacturer. Dispose of as special waste in compliance with local and national regulations.

SECTION 14. TRANSPORT INFORMATION

14.1	**UN number**	Not classified as dangerous in the meaning of transport regulations.
14.2	**UN proper shipping name**	Not classified as dangerous in the meaning of transport regulations.
14.3	**Transport hazard class(es)**	Not classified as dangerous in the meaning of transport regulations.
14.4	**Packing group**	
14.5	**Environmental hazards**	
14.6	**Special precautions for users**	None.
	Further information	None.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not relevant

SECTION 15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
TSCA Status
This product is listed on the US TSCA Inventory.
TSCA 12(b) Export notification
No components of this product are subject to TSCA 12(b) export notification requirements.
California Proposition 65, Chemicals Known to the State to Cause Cancer or Reproductive Toxicity
Nickel and nickel compounds are listed.
SARA 302 extremely hazardous substance list
This product does not contain greater than 1.0% of any chemical substance on the SARA Extremely Hazardous Substance List.
Clean Air Act Section 112, Hazardous Air Pollutants
Nickel and nickel compounds are listed.
SARA (311, 312) hazard class
Chronic health hazard.
EPCRA (SARA Title III) Section 313 toxic chemical
Nickel and nickel compounds are listed.

SECTION 16. OTHER INFORMATION

16.1 Additions, Deletions, Revisions
Additions, Deletions, Revisions
Revision Date May 14th, 2014

16.3 **Key literature references and sources for data**

Finnish Environment Institute: Environmental Properties of Chemicals
Lewis, R. J. : Sax's Dangerous Properties of Industrial Materials

16.5 **List of relevant R phrases, hazard statements, safety phrases and/or precautionary statements**

May cause an allergic skin reaction.

Suspected of causing cancer via inhalation.
Causes damage to lungs through prolonged or repeated exposure by inhalation.

16.8 **Additional information available from:**

Disclaimer

The information in this document is believed to be correct as of the date issued. However, no warranty of merchantability, fitness for any particular purpose, or any other warranty is expressed or is to be implied regarding the accuracy or completeness of this information, the results to be obtained from the use of this information or the product, the safety of this product, or the hazards related to its use. This information and product are furnished on the condition that the person receiving them shall make his own determination as to the suitability of the product for his particular purpose and on the condition that he assume the risk of his use thereof.

* * *Section 1 – Identification* * *

Product Identifier: Ferrosilicon
Chemical Family: Metal Alloy
Recommended Use: Additive to steel, and to steel and iron foundry products
Restriction on Use: None identified

Manufacturer Information

The David J. Joseph Company
300 Pike Street
Cincinnati, OH 45202

Non-Emergency Contact: Safety Department
Non-Emergency Phone: 513-419-6200
Emergency Contact: DJJ
Emergency Phone: 513-562-1699

* * *Section 2 – Hazard(s) Identification

Classification

The product does not meet the criteria for hazard classification in accordance with directive 1999/45/ED (DPD) and Regulation (EC) No1272/2008 (CLP).

GHS Label Elements

Symbol(s)

N/A

Signal Word

N/A

Hazards Statement(s)

Flammable and noxious gases may be formed in contact with moisture, acids or bases.
Ferrosilicon dust suspended in air may under certain conditions cause dust explosions.

* * *Section 3 – Composition / Information on Ingredients* * *

CAS	Component	Percent
7440-21-3	Silicon	43-93%
7429-90-5	Aluminum	0% - 4%
7440-70-2	Calcium	0% - 2.5%
7439-96-5	Manganese	<0.2%
7440-32-6	Titanium	<0.15%
7440-50-8	Copper	<0.1%
7440-47-3	Chromium	<0.3%
7440-44-0	Carbon	<0.2%
7440-62-2	Vanadium	<0.1%
7439-89-6	Iron	Balance

* * *Section 4 – Fist Aid Measures* * *

Inhalation

Irritation caused by dust, move to fresh air. Seek medical attention if discomfort persists. Seek medical attention if Phosphine/Arsine intoxication is suspected. See section 11 for additional information.

Skin Contact

Wash skin with water and/or a mild detergent.

Eye Contact

Rinse eyes with water/saline solution. Seek medical assistance if discomfort persists.

Ingestion

Remove the person affected from dust exposed area. Seek medical attention if discomfort persists.

* * *Section 5 – Fire Fighting Measures* * *

Extinguishing Media

Dry sand, CO2 or dry powder.

Unsuitable Extinguishing Media

None identified.

Specific Hazards Arising from the Chemical

Dust particles suspended in air may cause dust explosion.

Special Protective Equipment and Precautions for Firefighters

None identified.

* * *Section 6 – Accidental Release Measures* * *

Personal Precautions, Protective Equipment and Emergency Procedures

None identified.

Methods and Materials for Containment and Cleaning Up

Material in the form of dust should be collected in suitable containers. Damp product should be kept away from dry, and must not be collected and stored in closed containers. Dry dust can be vacuumed or swept up.

* * *Section 7 – Handling and Storage* * *

Precautions for Safe Handling

Avoid handling that generates dust buildup. Avoid ignition sources in areas with high dust concentrations. Addition of wet materials to molten metal may cause explosion.

Conditions for Safe Storage

FeSi must be kept in a dry and well-ventilated place, and away from acids and bases.

Incompatibilities

Water/humidity, acids and bases.

* * *Section 8 – Exposure Controls / Personal Protection* * *

Exposure Limits

Inhalable Dust

8 hour TWA: 10 mg/m3.

Respirable Dust

8 hour TWA: 4 mg/m3.

Phosphine Gas (PH3)

8 hour TWA: 0.14 mg/m3; 0.1 ppm.
10 minute STEL: 0.28 mg/m3.
Indicative occupational exposure limit 8 hours: 0.14 mg/m3; 0.1 ppm.
Indicative occupational exposure limit 15 minutes: 0.28 mg/m3; 0.2 ppm.

Arsine Gas (AsH3)

8 hour TWA: 0.16 mg/m3; 0.05 ppm

Appropriate Engineering controls

Ensure good ventilation.

Individual Protection Measures

Eyes/Face Protection

Safety glasses.

Skin Protection

Protective gloves.

Respiration

Wear a particulate respirator in areas of poor ventilation. If exposure to phosphine and arsine is suspected in areas of poor ventilation, a self-contained breathing apparatus or an air fed respirator should be worn.

* * *Section 9 – Physical and Chemical Properties* * *

Appearance: Silvery grey, metallic surface, lump material, granulate, sieve fractions

Physical state: Solid
Melting Point: 1200-1400 C
Flash Point: N/A
UFL: Lowest explosive limit +/- 60 mg/m3
Vapor Pressure: N/A
Specific Gravity: 2.7-4.4
Auto Ignition: > 400 C

pH: 5.8
Boiling Point: N/A
Flammability Class: No ignition (Solid)
LFL: Lowest explosive limit +/- 60 mg/m3
Vapor Density: N/A
Solubility (H20): 0.015 mg Si/l at pH 5.8, diameter <1mm

* * *Section 10 – Chemical Stability & Reactivity* * *

Reactivity

Reacts with moisture, acids and bases.

Chemical Stability

Stable.

Possibility of Hazardous Reaction

Highly flammable and very toxic gases phosphine and arsine (garlic like smell) may be formed if Ferrosilicon gets in contact with moisture, acids or bases. A prerequisite for phosphine and arsine gas

formation is the presence of reactive phosphides or arsenides at the alloy phase-boundaries inside the alloy. Very low levels of Phosphorous (<0.02%) and Arsenic (< 0.0005% detection limit) in Ferrosilicon, in combination with rapid solidification that limits segregation of the alloying elements, effectively minimize the formation of such compounds and thus the probability of gas formation. Reaction with hydrofluoric acid or nitric acid leads to the formation of toxic gases such as silicon tetrafluoride or nitrous gases.

Conditions to Avoid

Avoid generating sparks and other ignition sources in areas with high dust concentrations. Ferrosilicon particles suspended in air at concentrations above 100-300 g/m3 can cause dust explosions. For a given particle size, the ignition sensitivity and the violence of explosion decrease with decreasing Si/Fe ratio. Dust with Si/Fe ratio ≤ 2 and particle diameter > 0.01 mm is considered not to represent any danger of explosion. Addition of wet material to molten metal may cause explosions.

Incompatible Materials

Water/humidity, acids and bases.

* * *Section 11 – Toxicological Information* * *

Ferrosilicon does not meet the criteria for hazard classification, and there is no information on its toxicological characteristics. Toxicological information on its components can be found at http://www.cdc.gov/niosh/rtecs/

Acute Dose Effects

Inhalation

Finely divided dust may irritate and dehydrate mucous membranes. Phosphine irritates exposed mucous membranes, depresses the central nervous system and can cause oedema of the lungs. Acute, non-fatal poisoning with phosphine gives temporary effects, among others: headaches malaise, vomiting, stomach pains, cough and difficulty breathing

Skin Contact

Dust may irritate skin

Eye Contact

Dust may irritate and lead to dryness

Chronic Effects

No adverse chronic effects of this product expected, based on both practical experience and review of available scientific literature.

* * *Section 12 – Ecological Information* * *

Ecotoxicity – Aquatic Toxicity

The product is not characterized as dangerous to the environment.

Persistence & Degradability

Not relevant for the elements in this alloy.

Bioaccumulation

Low mobility and non-dispersive use.

Mobility

Poor mobility under normal environmental conditions.

* * *Section 13 – Disposal Considerations* * *

Disposal Methods

The material should be recovered for recycling where possible. Prior to disposal of large quantities, seek advice from the nearest Environmental Agency.

US EPA Waste Number & Descriptions

Waste from the product is not considered as hazardous.

* * *Section 14 – Transportation Information* * *

Classifications

UN no. 1408
IMO/BC-Code (30-90)% Si. Class 4.3
BC-no. 022
IMO/BC-Code (25-30 and >90)% Si, Class MHB

Transportation Considerations

Material must be stored under cover but in open air. Material must be in the particle size in which it is to be shipped, for no less than three days prior to shipment.

Marine Pollutant Information

FeSi is not considered to cause harm to aquatic organisms (Lillicrap, 2011). FeSi is not a marine pollutant.

* * *Section 15 – Regulatory Information* * *

U.S. Federal Regulations

No information.

U.S. State Regulations

No information.

* * *Section 16 – Other Information* * *

Reasonable care has been taken in the preparation of this information, but the manufacturer makes no warranty of merchantability or any other warranty, expressed or implied, with respect to this information. The manufacturer makes no representations and assumes no liability for any direct, incidental or consequential damages resulting from its use.

The data on this sheet applies only to products sold by corporate subsidiaries of The David J. Joseph Company and may not apply to products sold by others.

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SILICON TITANIUM

宁夏铸峰特殊合金有限公司
ZHUFENG SPECIAL FERRO ALLOY CO., LTD

FERRO SILICON TITANIUM

SAFETY DATA SHEET

Manufacturer's REACH registration number:
ECHA-7b294347-7cbb-4761-a642-a7b2b1241b40

Substance identification

Product name: Ferro Silicon Titanium (FeSiTi)

Composition/Information on Ingredients

Chemical composition and CAS no(wt%):

Si (7440-21-3)	*48-52%*
Ti (7440-32-6)	*10-12%*
Al (7429-90-5)	*0.8-1.2%*
Ca (7440-70-2)	*0.8-1.2%*
Fe (7439-89-6)	*Bal*

Hazardous Ingredient(s):	None
Symbol:	None
R and S Phrases:	None

Health hazard

The cargo doesn't bring danger to health when it is properly handled and stored.

Flammable and noxious gases may be formed in contact with moisture,acids or bases.

FeSiTi -dust suspended in air may under certain conditions cause dust explosions.

First Aid Measures

Eye contact: Flush with water. For persistent irritation, contact a doctor/hospital.

Skin contact: Remove dust (dry) as much as possible and then wash with soap and water.

Inhalation: Irritation caused by observing dust, get fresh air immediately and contact a doctor on persistent feeling of discomfort.

Ingestion: Remove the person affected from dust-exposed area:See inhalation.

Fire extinguishing

ADD: DAWUKOU NEW MATERIAL INDUSTRIAL ZONE, SHIZUISHAN CITY, NINGXIA P C: 753001
TEL : 86—952—3961266 FAX: 86—952—3961269 WEB: www.china-zfa.com

Don't use compact water jet so as to avoid dispersion.

Usual means to extinguish fire

Extinguishing media: CO_2, dry powder or dry sand.

Dry FeSiTi in the form of lumps or granules is not combustible.

FeSiTi -dust suspended in air may under certain conditions cause dust explosions.

Handling and Storage

Handling: Avoid handling that generates dust build-up.Avoid inhalation of dust.

Avoid ignition sources (e.g.welding) in areas with high dust concentrations.

Apply inert atmosphere (e.g.N2) during crushing of FeSiTi.

Addition of wet material to molten metal may cause explosions.

Storage: FeSiTi must be kept in a dry and well-ventilated place,and away from acids and bases.

Accidental Release Measures

Material in the form of dust should be collected in suitable containers.Damp product must be kept away from dry,and must not be collected and stored in closed containers.Dry dust can be vacuumed or swept up.

Physical and Chemical Properties

Form:	Lump material.Sieve fractions.
Colour:	Silvery grey,metallic surface.
Odour:	Odourless.
Solubility(Water):	Insoluble/slightly soluble.
Melting point:	Approx 1300°C
Specific gravity:	Approx 4.3

Stability and Reactivity

Conditions to avoid:

Avoid generating sparks and other ignition sources (e.g.welding) in areas with high dust concentrations.MgFeSi-particles suspended in air at concentrations above 100 g/m3 can cause dust explosions.Deposits of FeSiTi dust can propagate flame.

Crushing of FeSiTi in air may cause powerful sparks that can initiate powder fires and dust explosions.For a given Si/Fe ratio and particle size,ignition sensitivity and the violence of the explosion increase with increasing content of Mg. Dust from FeSiTi alloys with Si/Fe ratio <1.25,where up to 30% of the dust has a particle diameter <0.05mm,the Mg content has to exceed 10% (w/w) if the dust is to be explosive.Finer dust has a lower limit for the critical content of Mg with regard to danger of explosion.

ADD: DAWUKOU NEW MATERIAL INDUSTRIAL ZONE, SHIZUISHAN CITY, NINGXIA P.C: 753001
TEL : 86-952-3961266 FAX: 86-952-3961269 WEB: www.china-zfa.com

Addition of wet material to molten metal may cause explosions.

Materials to avoid:

Water/humidity,acids and bases.

Hazardous decomposition products:

Highly flammable hydrogen gas and the highly flammable and very toxic gas phosphine and arsine (garlic-like smell),both heavier than air,may be formed if FeSiTi gets in contact with moisture,acids or bases.A reaction with hydrofluoric acid or nitric acid leads to the formation of toxic gas such as silicon tetrafluoride or nitrous gas.

Wet product will form highly flammable hydrogen gas if added to molten metal, due to decomposition of water.

Toxicological information

Acute effects:

Inhalation: Finely divided dust may irritate and dehydrate mucous membranes. Phosphine/arsine may be absorbed from dust deposited on mucous membranes..

The toxic mechanism for phosphine is not clear.Phosphine irritates exposed mucous membranes,depresses the central nervous system (CNS) and can cause edema of the lungs.Acute,non-fatal poisoning with phosphine gives temporary effects,among others headache,malaise,vomiting,stomach pains,cough,and difficulty in breathing. Symptomatic treatment: Corticosteroids,prophylactic for edema of the Lungs.

Skin contact: Dust may irritate the skin.

Eye contact: Dust may irritate and lead to dryness.

Ingestion: Dust may irritate and dehydrate mucous membranes.Possible phosPhine/arsine absorption.

Chronic effects:

Prolonged exposure (years) to phosphine may lead to chronic effects such as difficulty in movement and speech problems.

Ecological Information

The product is not characterized as dangerous for the environment.

Mobility: The alloy has poor mobility under normal environmental conditions.

Persistence: Not relevant for the elements in the alloy.

*Bioaccumulation:*Not relevant due to low mobility and non-dispersive use.

Eco-toxicity: LC50/LD50: Not determined.Hardly relevant for inorganic,insoluBle substances.

Disposal Considerations

The material should be recovered for recycling where possible.

Disposal of materials must conform with the requirements of Section 34 of the Environmental Protection Act 1990.This material is not classed as "Special Waste" under the Control of Pollution (Special Waste) Regulations 1996.Prior to disposal of large

quantities of this material, advice should be sought from the nearest Environment Agency.

Transportation information

Consignment with a chemical analysis as described above,is not dangerous cargo according to the IMDG-code,ICAO/IATA and ADR/RID-regulations when shipped in packaged form (1).

Regulatory information

Product classification and labeling:

Symbol: Not subject to classification.

R-phrases: None.

S-phrases: None

The text of this Safety Data Sheet is prepared in compliance with:

-Chemicals (Hazard information and Packaging)Regulations 1996.

-Commission Directives 91/155/EEC and 93/112/EEC.

Usage of the material

Application of FeSiTi: Additive to metal in Iron Foundries or in Steel.

Contacts:

Sales Department

Zhufeng Special Ferro Alloy Co.,Ltd.

Tel: 86-952-3961271 86-25-83176559

Fax: 86-952-3961269 86-25-83176568

Email: sales@china-zfa.com

Metalliage

Safety Data Sheet

Ferrotitanium, 70%, 2-10 mm, Std.Gr.

Date issued: October 30, 2015

SECTION 1: PRODUCT & COMPANY IDENTIFICATION

Product name:	**Ferrotitanium**	**Manufacturer:**	**Metalliage Inc.**
Chemical family:	Group 4 (IVB), transition metal	Address:	5335, Rue Ramsay Saint-Hubert, Quebec, J3Y 2S3 Canada Phone: +1 450 678 0007 Email: info@metalliage.ca
Recommended use:	Alloy additive for steel and iron		
Emergency number:	+1 888 677 0001, 24h, in case of accidents, spills or leaks		

SECTION 2: HAZARD IDENTIFICATION

Hazard classification:

GHS classification: None

HMIS rating: None

NFPA 704 rating: None

Label elements:

Signal word: None

Precautionary statements:

P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. NO SMOKING.

P264: Wash hands thoroughly after handling.

P280: Wear protective gloves/protective clothing/eye protection/face protection.

P370+378: In case of fire: Use table salt, dry sand, or Class D Fire Extinguisher to contain fire.

Health statements:

Medical condition aggravated by exposure
Powder or dust may aggravate preexisting respiratory conditions.
Potential health effects
Powder may irritate the respiratory tract, eyes, mucus membranes, or dermal surfaces.
Potential environmental effects
No Information Available.

Symptoms of exposure
May cause irritation of respiratory tract, skin, or eyes.
Target organs
Mucus membranes
Relevant route(s) of exposure
Inhalation: Yes; Skin contact: Yes
Ingestion: Yes; Eye contact: Yes

This material is considered **NOT HAZARDOUS** according to the criteria of Canada's federal Hazardous Products Act and the United States' OSHA Hazard Communication Standard. However, this SDS constitutes a primary source of information for safe handling, emergency response, and proper use of this product.

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

Chemical name: **Ferrotitanium (FeTi)**
CAS number: 12719-9
Common name: **70% ferrotitanium, 2-10 mm, standard grade**

Principal components	CAS number	Concentration (% by weight)	TLV * (ACGIH), mg/m^3	PEL * (OSHA) mg/m^3
Titanium, Ti	7440-32-6	70	10	15 (total) 5 (respiratory)
Aluminum, Al	7429-90-5	6	10 (total) 5 (respiratory)	15 (total) 5 (respiratory)
Vanadium, V	7440-62-2	2.5	N/A	0.5 (dust) 0.1 (fume)
Iron, Fe	7439-89-6	20.5	N/A	N/A

(*) See Section 8

SECTION 4: FIRST-AID MEASURES

Most important symptoms and effects (acute or delayed)

Inhalation: May irritate passages of nose and throat. Long term exposure to excessive dusts from this material may lead to fibrotic diseases of the lung.

Eye contact: May cause irritation through mechanical action

Skin contact: Not anticipated to have adverse effect but may cause slight Irritation

Ingestion: May cause gastro intestinal irritation. Very low toxicity.

First-aid measures by route of exposure

Inhalation: Remove patient to fresh air. Loosen tight clothing and allow to rest. Treat for shock if required. Rinse mouth and nose with water. Provide artificial respiration if breathing stops. Unless recovery is prompt, seek urgent medical advice

Eye contact: Hold eyelids open and flush eyes with water for 15 minutes. Ensure that the underside of the eyelids is carefully flushed clean. If symptoms persist, or if burns are present, seek urgent medical advice

Skin contact: Remove contaminated clothing (under deluge shower if necessary). Wash affected area for 5 minutes with soap and water. Do not rub hard. Rinse well and pat dry. If symptoms persist, or if burns are present, seek prompt medical advice

Ingestion: Rinse mouth out with water. Give water to drink. Allow to rest. If symptoms persist, seek medical assistance.

SECTION 5: FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use ONLY Class D fire extinguishers (NFPA-10 compliant); table salt; dry sand; dry ground dolomite, salt-based or graphite-based dry powder extinguishing agents.

Unsuitable extinguishing media
DO NOT SPRAY WATER ON BURNING FERROTITANIUM. Water on molten or burning ferrotitanium results in an explosion. Do NOT use carbon dioxide, as it is ineffective as an extinguisher. Do NOT use halogenated extinguishers. If moisture is present within burning metal fines, an explosion may occur. Personnel should evacuate and not attempt to extinguish the fire.

Specific hazards

Flammable properties:	Product in itself is stable. Lump stocks will eventually burn if introduced to fire. Fines and particulate matter can be easily ignited and may spontaneously combust. Poisonous gases are produced in fire. Containers may explode in fire. Fire may reignite after extinguishing. Fire may produce significant heat.
Decomposition by-products:	Small amounts of arsine, phosphine and hydrogen gases (toxic and flammable) may evolve in the presence of moisture. Reaction with acids can evolve silanes, which may spontaneously ignite.

Special protective equipment and precautions for fire-fighters

Precautions:	If caught by fire, lump stocks will not burn immediately unless moisture is introduced. Fight surrounding fires first. Small fires can be smothered with table salt, sand or by use of NFPA-10, class D, extinguishing material. DO NOT USE WATER directly on fires from this material. For large fires, it is advisable to allow the material, if contained, to burn out. If containment is not possible, call 911.
Protection:	Ferrotitanium fires have intense heat. Wear self-contained breathing apparatus in pressure-demand, MSHA/NIOSH, and full protective gear. Irritating and highly toxic gases may be generated in fire.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal precautions:	Use personal protective equipment recommended in Section VIII. Remove all ignition sources.	Environmental precautions:	Not thought to be an environmental threat unless large amounts are released at a single site. Dispose of in accordance to local, state, and federal regulations.
Methods for containment:	Keep fines from becoming airborne. DO NOT USE COMPRESSED AIR. If ferrotitanium fines become airborne, ventilate properly to reduce air density.	Methods for cleanup:	Use non-sparking tools. Do not push powder long distances across the floor. Keep in small piles away from each other. Place material into non-sparking or anti-static containers. Use only static-free vacuums for cleaning.

Spills of this material do not need to be reported to the Canadian Transport Emergency Centre (CANUTEC) or the United States' National Response Center (NRC).

SECTION 7: HANDLING & STORAGE

Precautions for safe handling
Mixing, blending, milling or grinding of dry powder should be performed under argon or helium.
Keep away from open flames and other sources of ignition.

Conditions for safe storage
Store indoors to maintain product integrity.
Store in a cool, dry, well-ventilated area.
Store away from excessive heat, welding, grinding, or torching operations.
Use non-sparking/anti-static containers, tools, and equipment.
Maintain a supply of table salt and/or Class D fire extinguisher near the processing and storage areas.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

Permissible Exposure Limits (PEL) according to the United States' Occupational Safety and Health Administration (OSHA), and Threshold Limit Values (TLV) according to the American Conference of Governmental Industrial Hygienists (ACGIH ®), have been set for ferrotitanium powder and dust only.

OSHA PEL is 15mg/m^3 (total dust) and 5 mg/m^3 (respiratory dust).

ACGIH TLV is 10 mg/m^3 (total dust).

Not listed by IARC, NIOSH, or NTP.

Appropriate Engineering Controls
Facility should be equipped with an eyewash and safety shower. Use adequate ventilation if grinding, cutting, welding, etc.

Personal Protective Equipment (PPE)

Skin protection:	Leather cut or puncture resistant gloves. Wear appropriate clothing to prevent skin exposure. Cotton coveralls fastened at the neck and wrists are recommended.	Respiratory protection:	Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN149. Use NIOSH approved respirator if exposure limits listed above are exceeded or if irritation or other symptoms are experienced.
General hygiene considerations:	Wash hands after handling. Wear recommended PPE. Avoid transfer of material from hands to mouth while eating, drinking, or smoking.	Eye/face protection:	Wear safety glasses with side shields or dust goggles as appropriate. Contact lenses may pose a hazard. Contact lenses may absorb irritants.

SECTION 9: PHYSICAL & CHEMICAL PROPERTIES

Appearance: Silver/gray metallic lumps (solid)	Flammability: Dust explosion hazard	Ignition temperature: 1200 °C (solid metal) 480 °C (powder/dust)
Odour/ Odour threshold: Odourless	Lower flammable/explosive limit: N/A	Partition coefficient n-octanol/water: N/A
pH: N/A	Upper flammable/explosive limit: N/A	Solubility: Insoluble
Melting point: 1135°C ± 10 °C	Vapour pressure: Not volatile	Decomposition temperature N/A
Initial boiling point: 3287 °C	Vapour density: N/A	Viscosity N/A
Flash point: Solid pieces will not flash	Relative density: 5.2	Evaporation rate N/A

SECTION 10: STABILITY & REACTIVITY

Chemical stability:	Stable
Possibility of hazardous reactions:	May react violently with interhalogens, oxidizing agents, strong acids or halogenated compounds. Reactions with incompatible materials may result in irritating or toxic gas.
Conditions to avoid:	Keep away from sparks and flames, incompatible materials, extremes of temperatures and direct sunlight.
Incompatible materials:	When heated, it reacts with strong acids, aluminum, halogens, interhalogens, oxygen, chlorinated solvents, carbon dioxide, oxidizing agents, bromine trifluoride, nitric acid, silver fluoride, sodium chlorate, halocarbons, and metal oxides.
Hazardous decomposition products:	When heated, it may react violently with interhalogens, oxidizing agents and mineral oxides, strong acids or halogenated compounds. Reactions with incompatible materials may result in irritating or toxic gas.

SECTION 11: TOXICOLOGICAL INFORMATION

Acute Effects

Oral:	May cause irritation of the digestive tract. Poorly absorbed from the alimentary tract.
Dermal:	Irritant to skin and mucous membranes.
Inhalation:	May cause irritation of the respiratory tract. May exacerbate preexisting conditions.
Eyes:	Dust or fines may cause irritation.
Other:	No other acute effects have been noted

Chronic Effects

Carcinogenicity:	Tumorigenic effects have been observed in experiments with laboratory animals.	Reproductive effects:	Reproductive effects have been observed in experiments with laboratory animals.
Mutagenicity:	Properties have not been thoroughly evaluated.	Developmental effects:	Properties have not been thoroughly evaluated.
		Sensitization:	Sensitization is not believed to occur.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity:
N/A

Persistence and degradability:
N/A

Bioaccumulative potential:
N/A

Mobility in soil:
N/A

Other adverse effects:
N/A

SECTION 13: DISPOSAL CONSIDERATIONS

Dispose according to local, state, and federal regulations.

SECTION 14: TRANSPORT INFORMATION

Ferrotitanium is not included by its nature or by the regulations in any of the classes listed in the schedule of the Canadian Transportation of Dangerous Goods Act of 1992, nor is it listed in the United States' Department of Transportation's Code of Federal Regulations, Title 49.

SECTION 15: REGULATORY INFORMATION

Canada

Components on the federal Hazardous Products Act's Ingredient Disclosure List: Aluminum, elemental; Chromium, elemental; Molybdenum, elemental; Tin, elemental; Vanadium, elemental; and Zirconium, elemental.

DSL/NDSL: Titanium is listed on Canada's DSL List

Workplace Hazardous Materials Information System (WHMIS): Classification B4, B6

Toxic Substances Control Act (TSCA): Components of this product listed on the TSCA Inventory are: Aluminum (C.A.S.# 7429-90-5); Chromium (C.A.S.# 7440-47-3); Molybdenum (CAS#7439-98-7); Silicon (C.A.S.# 7440-21-3); Tin (C.A.S.# 7440-31-5); Titanium (C.A.S.# 7440-32-6); Vanadium (C.A.S.# 7440-62-2); Zirconium (C.A.S.# 7440-67-7); Niobium (C.A.S.# 7440-03-1).

To the best of our knowledge, this product does not contain hazardous substances, priority pollutants, or toxic pollutants as defined by the federal Canada Water Act or the provincial Clean Water Act of Ontario.

United States

Section 313 Supplier Notification: This product contains the following chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right to Know Act of 1986 (40 CFR 372): Aluminum (dust/fume) C.A.S. 7429-90-5, Chromium C.A.S. 7440-47-3, and Vanadium (exempt when contained in alloy) C.A.S. 7440-62-2.

In addition to the ingredients listed, this product contains the following chemicals considered by the State of California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65) as causing cancer or reproductive toxicity and for which warnings are now required: To the best of our knowledge, this product does not contain materials listed under Proposition 65.

The Superfund Amendments and Reauthorization Act of 1986 (SARA) specifies certain emergency planning and notification requirements if these extremely hazardous substances are present in concentrations of greater than 1% at a facility in amounts greater than the threshold planning quantity: To the best of our knowledge, this product does not contain materials listed as EHS under SARA.

If this product is discarded as a waste, it would be identified with the following hazardous waste classification under the Resource Conservation and Recovery Act (RCRA). The act specifies requirements for the management and disposal of hazardous wastes: To the best of our knowledge, this product is not a RCRA regulated material.

SECTION 16: OTHER INFORMATION

Disclaimer

The information provided in this document is believed to be accurate, but does not purport to be all inclusive and shall be used for reference purposes only. We make no warranty of merchantability or any other warranty, expressed or implied, with respect to such information and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Metalliage Inc. be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential, or exemplary damages, howsoever arising, even if Metalliage Inc. has been advised of the possibility of such damages.

Document Revision

Date of the latest revision of this SDS: 30Oct2015.

Attachment D

Bunker Photos

MAUL FOSTER ALONGI