ADEQ CLASS I PERMIT APPLICATION

Aluminum Dynamics/ Benson, AZ

Prepared By:

TRINITY CONSULTANTS
702 E Osborn Road, Ste 160
Phoenix, AZ, 85014
(602) 274-2900

November 13, 2024

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. EXECUTIVE SUMMARY

Steel Dynamics, Inc. (SDI), doing business as Aluminum Dynamics, Inc. (Aluminum Dynamics) will construct and operate a new recycled aluminum ingot casting center as a satellite ingot supply facility for its low-carbon, recycled aluminum flat rolled mill currently being constructed in Columbus, MS. The proposed satellite casting center will be located on a currently undeveloped property near the city of Benson, AZ (here in referred to as the Benson plant). The Benson plant will be located in an area of Cochise County that is in attainment or unclassifiable for all criteria air pollutants. The Benson plant will receive aluminum scrap from the post-consumer and post-industrial supplier network and will support the manufacturing of aluminum ingots targeted downstream processing at rolling mill facilities serving the sustainable beverage packaging, automotive, and common alloy (e.g., building and construction materials) industrial sectors.

The Benson plant will be built with a roughly $190 million investment. This project will create at least 90 full-time, meaningful well-paying jobs and talent development opportunities in the operational phase. Steel Dynamics, Inc.'s (SDI) focus on decarbonization will also be applied to this aluminum operation, including plans to use a significant amount of pre- and post-consumer aluminum scrap in its production process, supported by the company's metals recycling platform, which is the largest nonferrous metals recycler in North America.

The Benson plant would use state-of-the-art technology for aluminum ingot casting and have a maximum production capacity of approximately 300,000 US tons per year, assuming continuous operation. With usage of the newest secondary aluminum processing equipment, Aluminum Dynamics will produce a low carbon aluminum from recycled material. ADI is seeking to construct and install the following primary process equipment (refer to the Emission Unit Index provided in **Appendix B**:

- One (1) scrap processing system consisting of various shredding, separation, and storage operations for processing the incoming scrap streams;
- One (1) rotary kiln-type decoater for drying and delacquering/decoating the shredded scrap supplied from the shred lines;
- Two (2) conventional sidewell-type aluminum melt furnaces capable of receiving both hot shreds from the decoater and loose scrap and hard charge from other sources;
- One (1) tilting-type aluminum holding furnaces operating via a batch operating cycle to feed a single casting pit; and
- One (1) in-line fluxer/degassing unit capable of using only non-reactive gaseous flux (argon gas) for final refining of the molten aluminum before feeding the metal to the casting pit.

Aluminum Dynamics also plans to install various ancillary equipment such as scrap storage and handling areas, a dross press, a dross house, a sow dryer, a lime silo for lime-injected baghouses, cooling tower, diesel and gasoline storage and mobile equipment refueling station, paved and unpaved plant roads, and paved and unpaved storage yards.

Based on an analysis of the potential emissions from the proposed project's emission sources, the Benson plant would be classified as a major source under the Title V (i.e., Class I) operating permit program and synthetic minor source under the Prevention of Significant Deterioration (PSD) pre-construction permitting program for regulated new source review (NSR) pollutants. **Table 1.1** summarizes the facility-wide PTE for the Benson plant.

Therefore, a Class I application is being submitted pursuant to Arizona Administrative Code (A.A.C.) R18-2-302, alongside a minor NSR demonstration meeting the requirements of A.A.C. R18-2-334. The enclosed permit application includes Arizona Department of Environmental Quality's (ADEQ's) standard Class I permit application form, all necessary documentation and analysis, and an air quality modeling report (under separate cover) demonstrating that the proposed Benson plant will not interfere with the attainment or maintenance of any National Ambient Air Quality Standards (NAAQS).

Table 1-1. Project – Potential to Emit

Pollutant	Regulated NSR Pollutant? [2]	Estimated Potential Emissions (tpy) [1,2]	Permit Applicability Evaluation							
		Non-Fugitive & Fugitive [3]	Class I PSD Major Thresholds (tpy)	Less than PSD Thresholds?	Class I Title V Major Source Thresholds (tpy) [2]	Less than Title V Thresholds?	Significant/Class II Thresholds [2]	Less than Class II Thresholds?	Permitting Exemption Thresholds [2]	Less than Registration/Permitting Exemption Thresholds?
PM	Yes	39.3	100	Yes	100	Yes	--	--	--	--
PM_{10}	Yes	61.7	100	Yes	100	Yes	15	No	7.5	No
$PM_{2.5}$	Yes	52.2	100	Yes	100	Yes	10	No	5	No
NOx	Yes	93.7	100	Yes	100	Yes	40	No	20	No
SO_2	Yes	0.3	100	Yes	100	Yes	40	Yes	20	Yes
CO	Yes	80.3	100	Yes	100	Yes	100	Yes	50	No
VOC	Yes	93.3	100	Yes	100	Yes	40	No	20	No
Lead	Yes	3.05×10^{-3}	100	Yes	10	Yes	0.6	Yes	0.3	Yes
Maximum Single HAP - HCl	No	92.3	--	--	10	No	--	--	--	--
Total HAPs	No	100.7	--	--	25	No	--	--	--	--
CO_2e[4]	-	86,398	100,000	--	--	--	--	--	--	--

1. PM, PM_{10}, and $PM_{2.5}$ include both filterable and condensable fractions, which conservatively overestimates PM emissions from an NSR perspective.
2. Per Arizona Administrative Code (A.A.C)
   R18-2-101.110 - For "Potential to Emit"
   R18-2-101.131 - For "Significant"
   R18-2-101.75 - For "Major Source"
   R18-2-101.101 - For "Permitting Exemption Thresholds"
3. Per A.A.C. R18-2-302.F "The fugitive emissions of a stationary source shall not be considered in determining whether the source requires a Class II permit under subsection (B)(2)(a) or (b) or a registration under subsection (B)(3)(a) or (d), unless the source belongs to a section 302(j) category." ADI Benson is categorized as a Clean Air Act Section 302(j) source. Hence, non-fugitive and fugitive emissions are used for permit applicability evaluation. This is also in accordance with R18-2-101.75(c).
4. Sources exceeding 100,000 tons of CO_2e are only subject to PSD if they also trigger PSD for another regulated NSR pollutant. The Benson Facility does not trigger PSD for any other NSR pollutant. While CO_2e is not included under the definition of "regulated NSR pollutant" at A.A.C. R18-2-101.124, GHGs are considered a "regulated NSR pollutant" under the federal Prevention of Significant Deterioration (PSD) program at 40 C.F.R. § 52.21(b)(50). ADI is therefore providing estimates of GHG (i.e., CO_2e) emissions for purposes of demonstrating non-applicability of the federal PSD program for GHGs, which ADEQ implements via a delegation agreement with EPA.

2. ADEQ CLASS I APPLICATION FORM

Pursuant to A.A.C R18-2-304.B, to apply for any permit required by A.A.C. Title 18, Chapter 2, applicants must complete the applicable standard application form provided by ADEQ and supply all information required by the form's filing instructions. This section includes a completed ADEQ Standard Permit Application Form and an administrative completeness checklist identifying the location of the information required by the associated filing instructions in ADEQ's Application Packet for a Class I Permit.

SECTION 2.1

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Air Quality Division

1110 West Washington • Phoenix, AZ 85007 • Phone: (602) 771-2338

STANDARD CLASS I PERMIT APPLICATION FORM

(As required by A.R.S. § 49-426, and Chapter 2, Article 3, Arizona Administrative Code)

1. Permit to be issued to (Business license name of organization that is to receive permit): Aluminum Dynamics, Inc.

2. Mailing Address: 7575 West Jefferson Blvd
   City: Fort Wayne State: IN ZIP: 46804

3. Name (or names) of Owners/ Principals: Steel Dynamics, Inc.
   Phone: (260) 469-4394 Fax: ______ Email: Bill.Kautz@steeldynamics.com

4. Name of Owner's Agent: Bill Kautz
   Phone: (260) 469-4394 Fax: ______ Email: Bill.Kautz@steeldynamics.com

5. Plant/Site Manager/ Contact Person and Title: Bill Glaser
   Phone: (870) 776-0849 Fax: ______ Email: Bill.Glaser@aluminumdynamicsllc.com

6. Plant Site Name: Aluminum Dynamics, Inc.

7. Plant Site Location Address: TBD
   City: Benson County: Cochise Zip Code: 85602
   Indian Reservation (if applicable, which one): ______
   Latitude/ Longitude, Elevation: 31° 57' 33.8" N 110° 16' 56.4" W
   Section/ Township/ Range: 17S 20E 15

8. General Nature of Business: Used Beverage Can (UBC) Recycling (Secondary Aluminum Production)

9. Type of Organization:
   ☒ Corporation ☐ Individual Owner ☐ Partnership ☐ Government Entity (Government Facility Code---------------)
   ☐ Other ______

8. Permit Application Basis: ☒ New Source ☐ Revision ☐ Renewal of Existing Permit
   (Check all that apply.)

   For renewal or modification, include existing permit number (and exp. date): ______

   Date of Commencement of Construction or Modification: TBD

   Primary Standard Industrial Classification Code: 3411

9. I certify that I have knowledge of the facts herein set forth, that the same are true, accurate and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by ADEQ as public record. I also attest that I am in compliance with the applicable requirements of the Permit and will continue to comply with such requirements and any future requirements that become effective during the life of the Permit. I will present a certification of compliance to ADEQ no less than annually and more frequently if specified by ADEQ. I further state that I will assume responsibility for the construction, modification,

or operation of the source in accordance with Arizona Administrative Code, Title 18, Chapter 2 and any permit issued thereof.

Signature of Responsible Official: Bill Glaser Digitally signed by Bill Glaser Date: 2024.11.16 22:55:14 -07'00'

Official Title of Signer: Operations Manager

Typed or Printed Name of Signer: Bill Glaser

Date: 11/16/24 Telephone Number: (870)-776-0849

SECTION 2.2 - EMISSION SOURCES

PAGE_______OF _______
DATE _________________

Estimated "Potential to Emit" per A.A.C. R18-2-101.
Review of applications and issuance of permits will be expedited by supplying all necessary information on this Table.

REGULATED AIR POLLUTANT DATA					EMISSION POINT DISCHARGE PARAMETERS									
EMISSION POINT [1]		CHEMICAL COMPOSITION OF TOTAL STREAM	AIR POLLUTANT EMISSION RATE		UTM COORDINATES OF EMISSION POINT [5]			STACK SOURCES [6]					NONPOINT	
										EXIT DATA			SOURCES [7]	
NUMBER	NAME	REGULATED AIR POLLUTANT NAME [2]	#/ HR. [3]	TONS/ YEAR [4]	ZONE	EAST (Mtrs)	NORTH (Mtrs)	HEIGHT ABOVE GROUND (feet)	HEIGHT ABOVE STRUC. (feet)	DIA (ft.)	VEL. (fps)	TEMP. (°F)	LENGTH (ft.)	WIDTH (ft.)
Refer to EU	Index in Appendix B	Refer to Detailed Potential Emission Calculations in Sections 1-14			Source Locations, Stack Parameters, Dimensions for Non-Stack Sources, and Plant Grade									
					Elevation will be provided under separate cover			as Appendices to the mNSR Modeling Report being submitted						

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL__________feet
ADEQ STANDARD CONDITIONS ARE 293K AND 101.3 KILOPASCALS (A.A.C. R18-2-101)

****Submit emission calculations spreadsheet with your application****

General Instructions:

1. Identify each emission point with a unique number for this plant site, consistent with emission point identification used on plot plan, previous permits, and Emissions Inventory Questionnaire. Include fugitive emissions. Limit emission point number to eight (8) character spaces. For each emission point use as many lines as necessary to list regulated air pollutant data. Typical emission point names are: heater, vent, boiler, tank, reactor, separator, baghouse, fugitive, etc. Abbreviations are O.K.

2. Components to be listed include regulated air pollutants as defined in A.A.C. R18-2-101. Examples of typical component names are: Carbon Monoxide (CO), Nitrogen Oxides (NO_X), Sulfur Dioxide (SO_2), Volatile Organic Compounds (VOC), particulate matter (PM), particulate less than 10 microns (PM_{10}), etc. Abbreviations are O.K.

3. Pounds per hour (#/HR) is maximum potential emission rate expected by applicant.

4. Tons per year is annual maximum potential emission expected by applicant, which takes into account process operating schedule.

5. As a minimum applicant shall furnish a facility plot plan as described in the filing instructions. UTM coordinates are required only if the source is a major source or is required to perform refined modeling for the purposes of demonstrating compliance with ambient air quality guidelines.

6. Supply additional information as follows if appropriate:
   (a) Stack exit configuration other than a round vertical stack. Show length and width for a rectangular stack. Indicate if horizontal discharge with a note.
   (b) Stack's height above supporting or adjacent structures if structure is within 3 "stack height above the ground" of stack.

7. Dimensions of nonpoint sources as defined in A.A.C. R18-2-101.

Section 2.3 Equipment List							
Type of Equipment	**Maximum Rated Capacity**	**Units**	**Make**	**Model**	**Serial Number**	**Date of Manufacture**	**Equipment ID Number**
Scrap Processing							
Scrap Processing System #1	33	ton/hr	TBD	TBD	TBD	TBD	001-1
Melting and Casting							
Decoater Furnace #1	27.6	ton/hr	G&P	TBD	TBD	TBD	002-1 through 002-2
	30.2	MMBtu/hr					
Melting Furnace #1	14.3	ton/hr	G&P	TBD	TBD	TBD	003-1 through 003-2
	38.0	MMBtu/hr					
Melting Furnace #2	14.3	ton/hr	G&P	TBD	TBD	TBD	004-1 through 004-2
	38.0	MMBtu/hr					
Holding Furnace #1	34.4	ton/hr	G&P	TBD	TBD	TBD	005-1 & 005-2
	30.0	MMBtu/hr					
In-Line Degasser #1	34.4	ton/hr	TBD	TBD	TBD	TBD	006-1
Sow Dryer	4.8	ton/hr	G&P	TBD	TBD	TBD	007-1
Filter Box Preheater	0.18	MMBTU/hr	TBD	TBD	TBD	TBD	010-1
Dross House	1.4	ton/hr	TBD	TBD	TBD	TBD	008-1 & 008-2
Dross Press	1.4	ton/hr	TBD	TBD	TBD	TBD	009-1
Baghouses							
Cold Baghouse #1	90,885	scfm	ETA Engineering	TBD	TBD	TBD	BH1
Hot Baghouse #1	71,704	scfm	ETA Engineering	TBD	TBD	TBD	BH2
Hot Baghouse #2	69,474	scfm	ETA Engineering	TBD	TBD	TBD	BH3
Hot Baghouse #3	104,211	scfm	ETA Engineering	TBD	TBD	TBD	BH4
Dross House Baghouse	64,918	scfm	ETA Engineering	TBD	TBD	TBD	BH5
Cooling Towers							
Cooling Tower 1	3,500	gpm	TBD	TBD	TBD	TBD	011-1
Cooling Tower 2	1,500	gpm	TBD	TBD	TBD	TBD	012-1
Emergency Generator Engines - Insignificant Activity							
Emergency Generator 1	26	kW	Kohler	CH 1006 4-Cycle	TBD	TBD	N/A
Silos and Storage Bins							
Lime Silo	0.075	ton/hr	APC Systems	TBD	TBD	TBD	013-1
Fuel Tanks - Insignificant Activities							
Diesel Storage Tank	1,000	gal	Convault	TBD	TBD	TBD	N/A
Gasoline Storage Tank	500	gal	Convault	TBD	TBD	TBD	N/A
Gasoline Dispensing Facilities - Insignificant Activities							
Diesel Dispensing Facility	5,209	gal/hr	TBD	TBD	TBD	TBD	N/A
Gasoline Dispensing Facility	417	gal/hr	TBD	TBD	TBD	TBD	N/A

All relevant equipment utilized at the facility should be included in the equipment list. Please complete all fields.

The date of manufacture must be included in order to determine applicability of regulations.

Indicate the units (tons/hour, horsepower, etc.) when recording the maximum rated capacity.

Make additional copies of this form if necessary.

SECTION 4.0 - APPLICATION ADMINISTRATIVE COMPLETENESS CHECKLIST

	REQUIREMENT	MEETS REQUIREMENTS			COMMENT
		YES	NO	N/A	
1	Has the standard application form been completed?	X			Section 2.1 of this form
2	Has the responsible official signed the standard application form?				
3	Has a process description been provided?	X			Section 4 of the application
4	Are the facility's emissions documented with all appropriate supporting information?	X			Appendix A of the application
5	Is the facility subject to Minor NSR requirements? If the answer is "YES", answer 6a, 6b and 6c as applicable. If the answer is "NO", skip to 7.	X			Section 9 of the application
6.a	If the facility chooses to implement RACT, is the RACT determination included for the affected pollutants for all affected emission units?			X	Facility will perform modeling in lieu of RACT
6.b	If the facility chooses to demonstrate compliance with NAAQS by screen modeling, is the modeling analysis included?			X	
6.c	If refined modeling has been conducted, is a comprehensive modeling report along with all modeling files included?	X			Provided under separate cover
7	Does the application include an equipment list with the type, name, make, model, serial number, maximum rated capacity, and date of manufacture?	X			Appendix A
8	Does the application include an identification and description of Pollution Controls? (if applicable)	X			Section 8 of application
9	For any application component claimed as confidential, are the requirements of AR.S. 49-432 and A.A.C. R18-2-305 addressed?			X	
10	For any current non-compliance issue, is a compliance schedule attached?			X	
11	For minor permit revision that will make a modification upon submittal of application, has a suggested draft permit been attached?			X	
12	For major sources, have all applicable requirements been identified?	X			Section 9 of application
13	For major sources, has a CAM applicability analysis been provided? For CAM applicable units, have CAM plans been provided?	X			Section 9 of application
14	For major sources subject to requirements under Article 4 of the A.A.C., have all necessary New Source Review analyses identified in the application been presented?	X			Section 9 of application

3. APPLICATION ADMINISTRATIVE COMPLETENESS

Table 3-1 provides a list of the permit application components required by Section 2.4 of ADEQ's Application Packet for a Class I Permit along with a reference to where the information is located in this application.

Table 3-1. Application Completeness Summary

Section 2.4 of Class I Application[1]	Information Required	Permit Application Section
1,2	Process/Product Description including Standard Industrial Classification (SIC) code	Section 4
3,4	Description of Alternate Operating Scenarios	N/A[2]
5	Process Flow Diagram	Section 5
6	Material Balance Calculations	N/A[3]
7	Emission Calculations	Section 6 and Appendix A
8	Applicable Requirements	Section 9
9	Proposed Exemptions from Applicable Requirements	N/A[4]
10(a)-(f), (h)	Annual & Hourly Process Rates, Fuel Usage, Raw Material Information	Included in Section 6 and Appendix A
10(g)	Operating Schedule	Section 4
11	Equipment and Control Device List	Section 8
12	Stack Information	N/A[5]
13	Site Diagram	Section 5
14	Air Pollution Control Information	Section 2 and Section 8
15	Acceptable Documentation for Equipment	Appendix B
16	Compliance Plan	Section 11
17	Compliance Certification	Section 11
18	Acid Rain Information	N/A[6]
19	Major Source Requirements – BACT & Ambient Impact Analysis	N/A[7]
20	Emission Calculations	Section 6 and Appendix A

[1] https://static.azdeq.gov/forms/classI_app.pdf

[2] ADI is not proposing any alternate operating scenarios for the plant.

[3] With the exception of quantifying HCl emissions from Holding Furnace #1 based on chlorine usage as documented in Section 4.2.2 of **Appendix C**, none of the other emission calculations are based on a material balance. Material balances will not be used to calculate emission rates at the plant, with the exception of estimate HCl emissions from Holding Furnace #1.

[4] ADI is not proposing to be exempt from any otherwise applicable requirements.

[5] Information will be provided with the ambient dispersion modeling anaylsis which will be submitted under separate cover.

[6] Acid rain information is only required for facilities subject to federal acid rain regulations. ADI is not subject to acid rain regulation.

[7] With this application, ADI is applying for a synthetic minor permit under PSD, and these components will not be needed.

4. PROCESS DESCRIPTION

4.1 Process Description

The proposed Benson plant will include a new recycled aluminum ingot casting center incorporating the latest aluminum scrap processing, decoating, melting, and casting technology available to produce a low-carbon aluminum product from recycled material.

The main raw material, pre- and post-consumer aluminum, will be shipped to the plant as scrap bales. The bales will be broken and go through a process of shredding, cleaning, and separation in the scrap processing system. After going through the scrap processing system, aluminum will be sent to the decoater. The decoater will heat the aluminum and remove coatings of various organic contaminants from the metal. Decoated aluminum will be transported to the two (2) sidewell furnaces where aluminum will be melted to assist in further processing and purifying. Molten aluminum will travel through troughs to the holding furnace where solid salt flux will be added to assist in purifying the aluminum. Purified aluminum will travel to the in-line degasser where hydrogen will be removed from the aluminum. The purified aluminum will be cooled and formed into ingots. The final aluminum product will be loaded onto train cars and shipped to the ADI aluminum rolling mill in Columbus, MS, or other aluminum rolling mills.

The primary operations at the facility can be segregated into the following categories, each of which is represented in more detail in the relevant process flow diagrams presented in Section 6 to this application:

- Scrap Processing,
- Melting & Casting, and
- Auxiliary Systems.

4.1.1 Scrap Processing System

The Scrap Processing System serves as a material handling process to convert incoming scrap bales into shredded scrap with a target material size and bulk density. The Scrap Processing System also removes unwanted contaminants and tramp ferrous metals prior to entering the Decoater kilns feed air locks. As shown in the pictures and drawings provided in **Figure 4-3**. The below equipment is designed to take bails of used beverage containers (UBC) and other baled scrap inputs, break them, remove nonferrous contaminants, and otherwise sort them to provide a near homogenous stream of coated aluminum shreds for feed to the Decoater kiln:

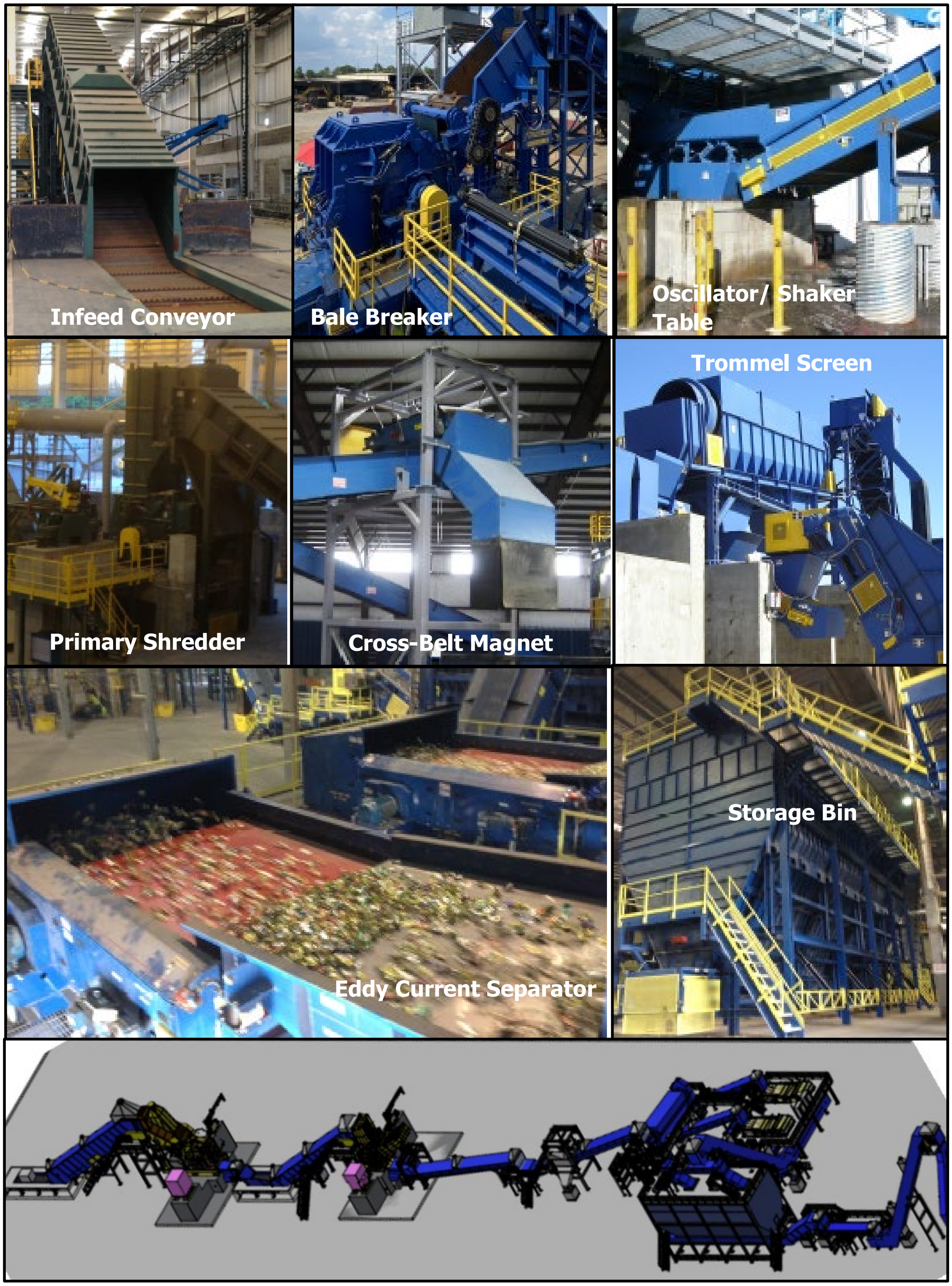
- Various infeed, connecting, and discharge conveyors for moving materials into and out of the processing stages of the overall Scrap Processing System.[8]
- "Bale breaker" type front feed shredder to initially break up the baled aluminum scrap for further processing.
- Heavy-duty oscillator (i.e., shaker table) for distributing the discharge from the bale breaker-type shredder into a more homogenous feed stream for downstream processes.
- Primary scrap shredder for obtaining the desired size range (5 to 75 mm) and bulk density (10 to 15 lb/ft^3) of the shredded scrap product.

[8] Conveyors will be covered and equipped with duct connections to the Scrap Processing System's capture and collection system and cold baghouse.

- Suspended overhead, cross-belt electromagnet for removing ferrous metals from the shredded scrap stream.
- Trommel screen for removing and separating dirt, paper, refuse and other contaminants from the aluminum scrap.
- Eddy current separator (ECS) for separating materials by electric conductivities to separate non-ferrous metals from any remaining non-metallic contaminants.
- Storage bin acting as a surge hopper and weigh feeder for the downstream Decoater.

This Scrap Processing System will be classified as a new *aluminum scrap shredder* as defined under the *National Emission Standards for Hazardous Air Pollutants (NESHAP) for Secondary Aluminum Production* (40 CFR 63, Subpart RRR, herein referred to as the "SMACT") and will be accomplished through the use of several discrete unit operations that will operate in a continuous manner. The Scrap Processing System feeds the Decoater via a direct conveyor connection with a weigh hopper/feeder-type storage bin supplying the inter-connecting conveyors at the product discharge end of the Scrap Processing System and feed end of the Decoater. Use of the storage bin enables short periods of Scrap Processing System downtime or variable process rates between the scrap processing and decoating sections of the overall, continuous scrap recycling process. PM, PM_{10}, and $PM_{2.5}$ are the only regulated pollutants expected to be emitted by each unit operation associated with Scrap Processing System. Various hood connections and duct pick-up points collect emissions generated by the stages of the Scrap Processing System, where all of these connections are ducted to Cold Baghouse #1.

Figure 4-1. Pictures/Drawings of Representative Scrap Processing System

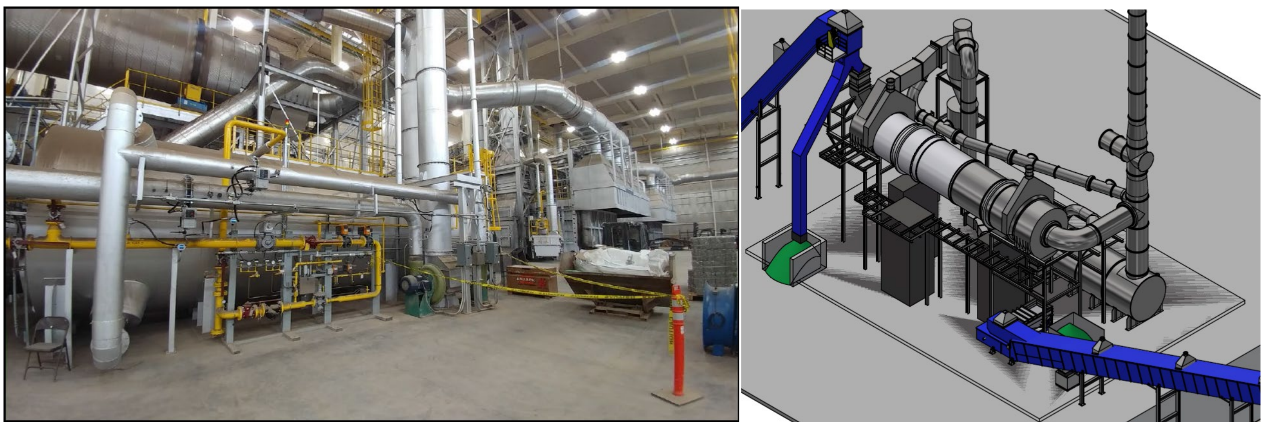


4.1.2 Melting and Casting Area

4.1.2.1 Decoater #1

One (1) new natural gas-fired rotary decoating kiln (herein referred to as the "Decoater") used to remove lacquers, oils, water, dust, and fines from aluminum scrap will be installed as part of the new casting line. The Decoater will have the capability to charge decoated and preheated aluminum shreds to two (2) new sidewell melting furnaces. As a "unit used primarily to remove various organic contaminants such as oil, paint, lacquer, ink, plastic, and/or rubber from aluminum scrap (including used beverage containers) prior to melting," the Decoater will be classified as a new *scrap dryer/delacquering kiln/decoating kiln* as defined under SMACT. A representative set of images depicting the Decoater are provided in **Figure 4-4**.

Figure 4-2. Pictures/Drawings of Representative Decoater



The Decoater manufactured by Gillespie & Powers, Inc. (G&P) adopts the "Mass Flow Delacquering System" technology comprised of a unique arrangement of equipment that produces ideal decoating and production of scrap aluminum over a wide variety of process conditions. The special features of this system are the automatic change in volume (or mass) of conditioned gases in response to changes in product feed characteristics and load. The primary process control loops respond continuously to maintain ideal temperature and oxygen content conditions within the rotary kiln environment and hot process gas circulation loop by changing a range of key process variables. As shown in **Figure 4-5**, the Decoater's hot process gas circulation loop is comprised of a variable speed circulation blower, cyclone unit, hot gas generator (a.k.a, integral afterburner), and all necessary interconnected ducting. Inlet and discharge airlocks provide a continuing charge and discharge of material while maintaining the process environment, by not allowing outside air to influence the process. Process gas containing circulated gases and generated contaminants pass from the hot gas generator through the kiln material discharge section and up the kiln to the material inlet feed end of the kiln. As the gases move up the kiln towards the material inlet section, they drop in temperature. From the feed section, the process gas is drawn out of the kiln into the hot gas generator through a cyclone unit and the hot gas circulation blower.

The hot gas circulation blower discharges process gases into the hot gas generator designed to burn volatiles in the recirculating process exhaust gas stream. The hot gas generator is equipped with two (2) natural gas-fired low NO_X burners to provide supplemental fuel to the system as a means to impart additional thermal energy to the recirculating gases beyond the exothermic combustion reactions associated with destruction of volatiles. The maximum hourly heat input rating for the decoater's combustion system is 30.2 MMBtu/hr. A combustion air blower supplies ambient air for the natural gas-fired burners, and a secondary air blower supplies ambient air for the combustion of the volatiles.

The refractory lined horizontal hot gas generator incorporates a process gas inlet, a gas outlet, and access facilities for cleaning. The natural gas-fired combustion system uses nozzle mix burners with all necessary air and fuel ratio controls and safety elements in compliance with current U.S. engineering standards. Hot gases from the hot gas generator are then passed either back into the kiln or exhausted to the air pollution control system. A pressure-controlled damper valve in the hot gas generator process gas outlet is used to maintain system pressure.

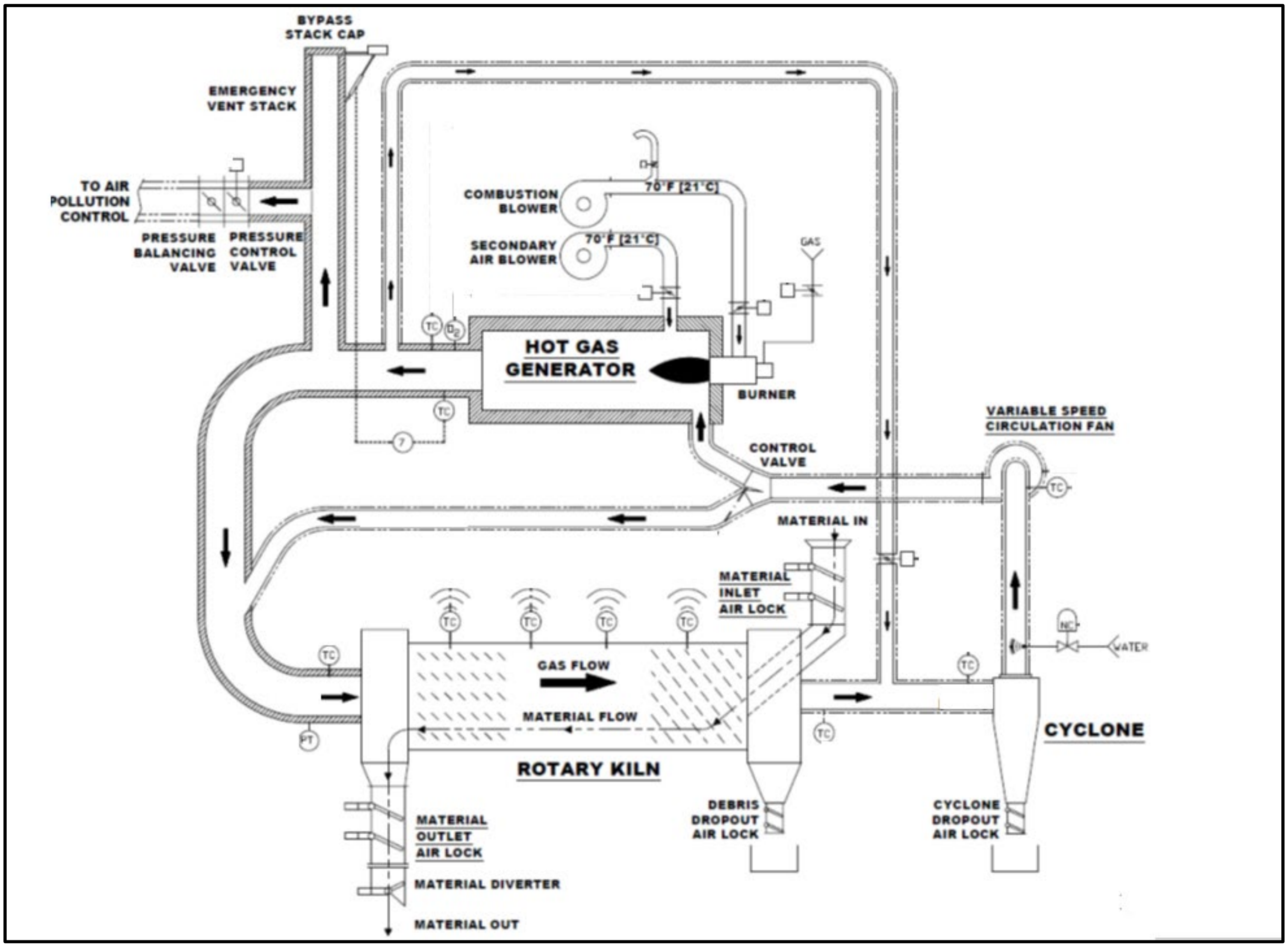
The kiln barrel consists of a rotary drum externally insulated and equipped with a cover to prevent any excessive heat loss. The internal flights inside the kiln are designed to give more lift and better mixing of the scrap and the process gases. The motor drive and support system allows the kiln to be tilted at a slight angle. The supports are mounted on a fixed, adjustable structural frame. The rotating kiln barrel is connected to the stationary entry and exit/discharge air locks via rotary seals.

The hot process gas circulation blower is sized to provide sufficient exhaust flow to capture the Decoater's emissions and remove the hot gas generator volume additions, together with sufficient pressure to offset system losses and pressure drops in clean/unclean conditions. Access to the circulation blower will be provided to allow for periodic cleaning and inspection. The circulation blower is controlled by the primary process control loops for the Decoater. Incorporated in the ductwork upstream of the circulation blower is an automatic water dilution system, where system protection is provided in the event a process gas over-temperature condition arises. Temperature-controlled bypass ducts for process gas are also provided to maintain proper gas temperatures entering the kiln and cyclone.

Between the kiln hot process gas exhaust duct and the circulation blower, a high-efficiency cyclone collector is installed in the ductwork for the removal of large size fraction ash, tramp materials, and other particulate from the circulating hot process gas stream. This cyclone is considered integral to the operation of the hot process gas circulation loop and the Decoater's associated mass flow delacquering system. Therefore, the cyclone is not designated as part of the air pollution control device train for the Decoater.

The primary exhaust outlet, entry/inlet and exit/discharge air lock hoods, hot shred conveyor cover hoods, and rotary kiln seal hoods from the Decoater are all routed to the Hot Baghouse #1 for additional waste gas treatment. PM, NO_X, CO, VOC, SO_2, and GHG are the primary pollutants expected to be emitted from the Decoater. Emissions of each will be generated from natural gas combustion as well as from the actual scrap decoating process as various contaminants present on the coated aluminum scrap are volatilized.

Figure 4-3. Rotary Decoater – Simplified Schematic



4.1.2.2 Sidewell Melting Furnaces #1 and #2

Two (2) new sidewell-type melt furnaces will be installed, which support solid reactive fluxing and have the capability of receiving and processing aluminum charge materials that contain "paint, lubricants, coatings, or other foreign materials" not classified as "clean charge." For these reasons, Sidewell Melting Furnaces #1 and #2 will be classified as *Group 1 furnaces* under SMACT. Each sidewell furnace can accept a constant supply of decoated aluminum scrap via conveyor into the charge well for submergence and melting and/or can receive runaround scrap or external scrap directly into the charge well. Both furnaces will have the flexibility on a short-term basis to process a charge mix ranging from 100 percent shredded and decoated scrap continuously fed from the Decoater to 100 percent loose scrap manually charged to the furnace's charge well.

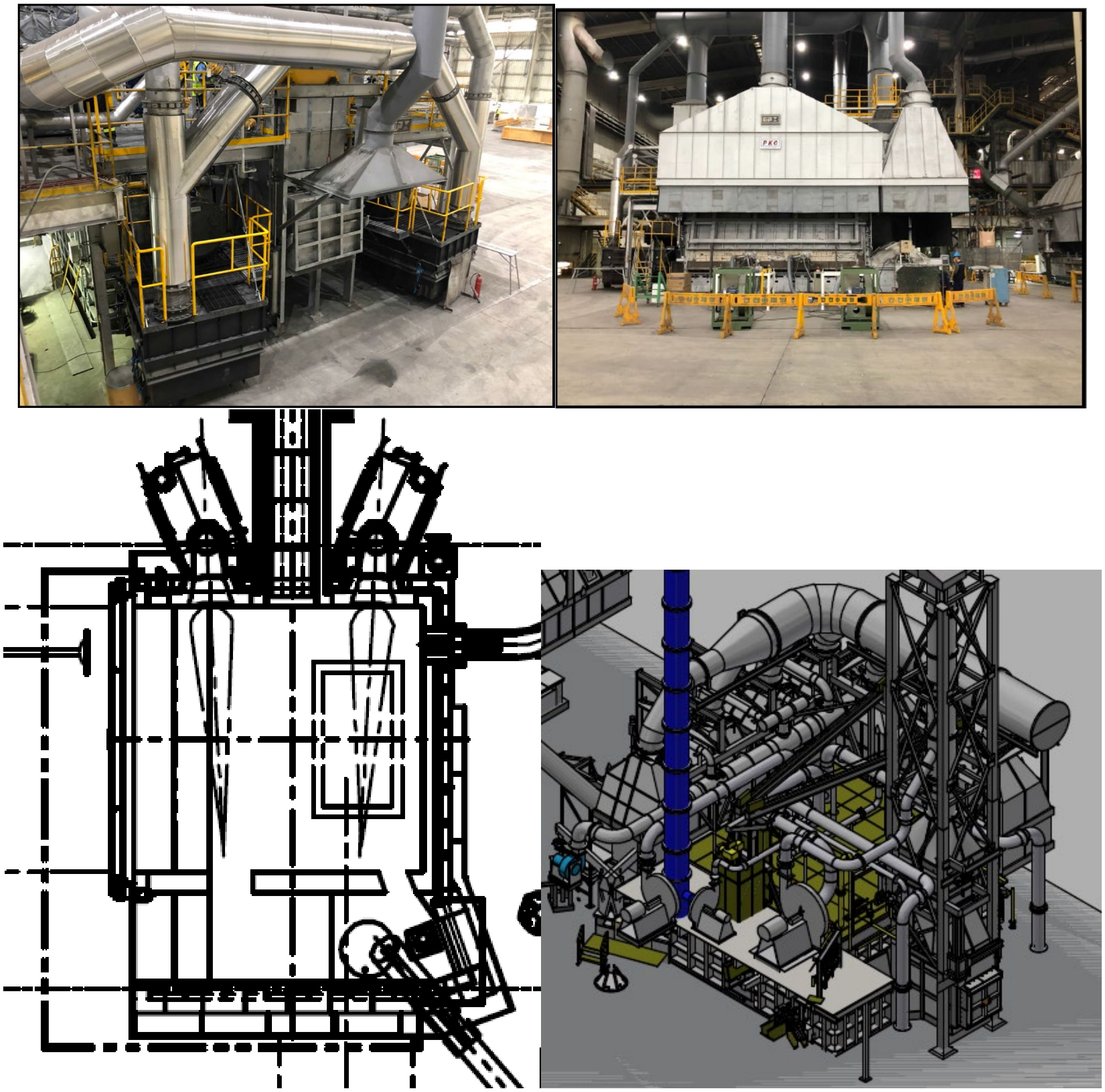
As shown in **Figure 4-6**, each sidewell melt furnace has two (2) main compartments: the furnace charge well (known as the "sidewell") and the furnace main hearth. The two (2) compartments are separated by refractory-lined walls with archways below the molten metal level to allow for thermal distribution and metal circulation between compartments. Molten aluminum is circulated by a metal circulation pump in the sidewell. An electromagnetic stirrer (EMS) will be underfloor mounted and provide enhanced molten aluminum bath circulation in support of the main metal circulation pump. Scrap melting in the sidewell occurs due to transfer of heat between the molten aluminum present in the sidewell and the aluminum scrap charged to the furnace without the use of any natural gas-fired burner systems located directly within the sidewell. Molten aluminum from the sidewell of each furnace is circulated into the main hearth chamber of the sidewell furnace through the use of the metal circulation pump and EMS. The combined use of the molten metal circulation pump and EMS provides temperature homogeneity to ensure maximum metal turnover and high heat transfer to the molten bath. The heat for metal melting in the main hearth of each sidewell is provided by high-efficiency low NO_X regenerative burners located within the walls of the main hearth chamber. Only one burner and regenerator within the regenerative burner system pair will ever operate at a single time. While one burner head in a regenerative burner pair is operating to melt aluminum, the other burner head will gain heat to start combustion for the next cycle. Therefore, the maximum heat input rate for the furnace is equivalent to a single burner head rating of 38 MMBtu/hr.

In addition to decoater scrap and loose scrap, aluminum sows (a form of clean charge under SMACT) can be charged into the main hearth flue via a hydraulicly operated sow indexer. The sow indexer is a hydraulically powered walking-beam style conveyor that moves stacks of sow into the flue of the sidewell furnace for slow melting. Hot process gas produced in the main hearth of the furnace is passed over the aluminum charge prior to being ducted out of the sidewell furnace main hearth flue, which is subsequently ducted into the associated hot baghouse for each furnace. This effectively dries and preheats aluminum charge materials before contact with the molten aluminum bath present in the furnace main hearth. The sow indexer moves the aluminum charge materials through the furnace flue hearth until reaching a sloped charging ramp, where aluminum hard charge is introduced into the main hearth molten bath.

Throughout an operating cycle and simultaneous with the addition of charge materials, solid reactive chloride salt flux is added to help purify the metal. The salt fluxing agent combines with impurities present in the molten metal and rises to the surface of the metal as dross. The dross is manually skimmed from the surface of the molten metal on a periodic basis in both the charge well and the main hearth. To skim dross from the main hearth, a door on the main hearth chamber is opened and skimming booms are used to physically pull dross out and transfer it into dross holding pans sitting under the door lip which are subsequently transferred to the dross press or directly to the dross house.

Hoods are located over each charge well, main hearth door, and furnace flue, where emissions are routed to a dedicated baghouse for sidewell Melting Furnace #2 (designated as Hot Baghouse #2) and a shared baghouse with the holding furnace for sidewell Melting Furnace #1 (designated as Hot Baghouse #3). $PM/PM_{10}/PM_{2.5}$, NO_X, CO, VOC, SO_2, and GHG are the primary pollutants expected to be emitted from the sidewell furnaces. Emissions of each will be generated from natural gas combustion as well as from the actual melting process as various contaminants present on the aluminum scrap are volatilized as well as from dross formation associated with the salt fluxing.

Figure 4-4. Pictures/Drawings of Representative Sidewell Melting Furnace



4.1.2.3 Holding Furnace #1

One (1) new holding furnace will be installed to receive molten metal from the melting furnaces and clean charge materials during startup and other non-routine operating periods. The holding furnace supports solid reactive fluxing. Therefore, Holding Furnace #1 will be classified as a *Group 1 furnace* under SMACT.

The natural gas-fired tilting holding furnace will have a rectangular shape resembling the unit in **Figure 4-7** and will serve as the second step in the casting line. Once the melting cycle is complete, molten metal will flow from either of the melting furnaces through an interconnecting transfer system (i.e., trough) to the holding furnace. The holding furnace will be designed to accommodate approximately 125 metric tons (138 tons) of material per batch. Heat will be provided by two (2) natural gas-fired cold air burners with a total heat input rating of 30 MMBtu/hr.

Figure 4-5. Pictures of Representative Tilting Holding Furnace

After the holding furnace is filled up with molten metal, alloy composition correction will be done. Although the alloying process will primarily occur in the melting furnaces, sampling will be conducted and small corrections to the alloy composition will be made in the holding furnace. After composition adjustment has been done, the metal treatment process will begin. The holding furnace will be equipped with a dedicated rotary flux injector (RFI). The dedicated RFI will serve to inject solid salt flux refining agents and to circulate/mix the molten metal in the holding furnace. Solid salt flux will be added to help purify the metal product by removing alkali metals (e.g., sodium, calcium, and lithium), nonmetallic inclusions (e.g., oxides, borides and carbides), and dissolved hydrogen gas. Specifically, the refining agents will combine with impurities present in the molten metal and rise to the surface of the metal as dross. Dross generated during the holding furnace operating cycle will be removed through the main door, placed in dross pans, and transferred to the Dross House for further processing.

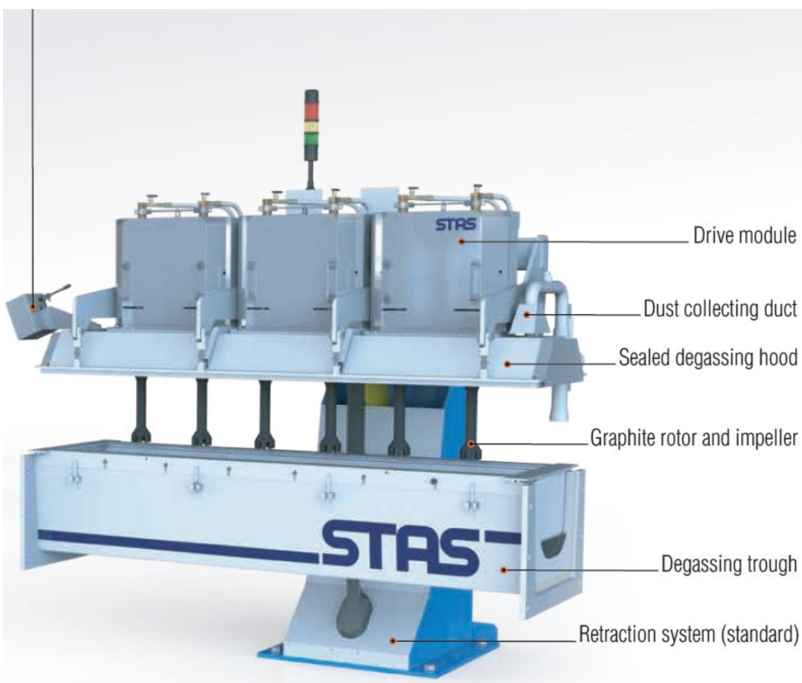
Once alloying, fluxing, and drossing activities are complete, the molten metal will be allowed to settle for a fixed duration to allow the inclusions to settle to the bottom. After settling has been completed, the holding furnace will be tilted to allow molten metal to flow through an interconnecting transfer system (i.e., trough) to the associated casting machine. During the process of transferring material from the holding furnace to the casting machine, the molten metal will also pass through a dedicated grain refiner rod feeder unit, an in-line degasser, and a filter box (either deep bed filter or ceramic foam filter). To maintain the molten metal's temperature during this transfer process, an electric powered preheating arrangement will be provided to heat the troughs to prevent heat loss in contact with molten metal.

Hoods are located over the holding furnace door and flue, where emissions are routed to a shared baghouse for sidewell Melting Furnace #1 and Holding Furnace #1 (designated as Hot Baghouse #3). PM/PM_{10}/$PM_{2.5}$, NO_X, CO, VOC, SO_2, and GHG are the primary pollutants expected to be emitted from the holding furnaces. Emissions of each will be generated from natural gas combustion as well as from flux addition and dross formation from the salt fluxing.

4.1.2.4 In-Line Degasser #1

As a "device exterior to a furnace, located in a transfer line from a furnace, used to refine (flux) molten aluminum," the in-line degasser will be classified as a new *in-line fluxer* per SMACT. The casting line will be equipped with a dedicated in-line aluminum compact degasser (i.e., In-line Degasser) resembling the unit in **Figure 4-8**. The associated in-line degasser will be used for treatment of metal, to remove dissolved hydrogen, while it is flowing from the holding furnace to the casting machine, as hydrogen removal must take place in-line with negligible time gap between degassing and casting; otherwise, re-entrainment of hydrogen can occur. In addition, if additional treatment is required for alkaline elements (e.g., sodium, calcium, and lithium) removal, an alkali metal removal process will be targeted in this in-line degasser, as a final metal conditioning step prior to casting. The in-line degasser will inject a small quantity of argon gas serving as a non-reactive gaseous fluxing agent (in the context of SMACT emissions standard applicability to in-line fluxers).

Figure 4-6. Picture of Representative In-Line Degasser



The degasser trough will generally not require preheating in normal operating conditions. In exceptional cases of cold start up, some preheating will be required, and this will be accomplished with electrical heat or using the portable trough heaters. Based on the sealed degasser hood design planned for these systems, dross generation is expected to be negligible, as the sealed design prevents ingress of ambient air/ oxygen and negligible opportunity to form oxides (i.e., dross).

The very small amount of PM generated as process emissions attributable to metal treatment in the in-line degasser will be discharged into main chamber of Holding Furnace #1 or into the flue of the holding furnace where either discharge location will ultimately route In-Line Degasser #1 PM emissions to Hot Baghouse #3.

4.1.2.5 Sow Dryer

To support the melting furnaces, Aluminum Dynamics plans to install one (1) natural gas-fired sow dryer/preheater for drying and preheating aluminum sows and other forms of hard charge prior to feeding to the melting furnaces. The primary function of this equipment is to dry and remove water from stacks of sows, pigs, or ingots before charging. A side benefit will increase the melt rate of the melting furnace if used while the sows are hot. The oven will be charged with cold sows via a fork-truck through a main vertical lift door. The opening and load area is at floor level and does not have a sill or threshold to hinder loading operations. Once the oven is fully charged, the combustion system will follow a recipe selected by the operator to bring the load up to the desired temperature in a stated time frame. The sow dryer uses two (2) side-mounted low NO_X burners for the semi-indirect heat source with a total heat input rating of 4.8 MMBtu/hr. A large roof-mounted fan provides the needed air circulation for the unified forced convection heating. The sow dryer can also be used to pre-heat sows for faster melting in the furnace with a target temperature of 350 °C or as desired.

The sow dryer is only a source of normal combustion byproduct emissions from the natural gas-fired combustion system with no expected process contribution from aluminum hard charge drying and preheating. Potential emissions of NO_X and CO are calculated using the pollutant concentrations provided by prospective burner vendors currently being evaluated by Aluminum Dynamics. Potential emissions of all other regulated pollutants are calculated based on EPA reference emission factors from AP-42 and from 40 CFR 98 Subpart C for greenhouse gases (GHG).

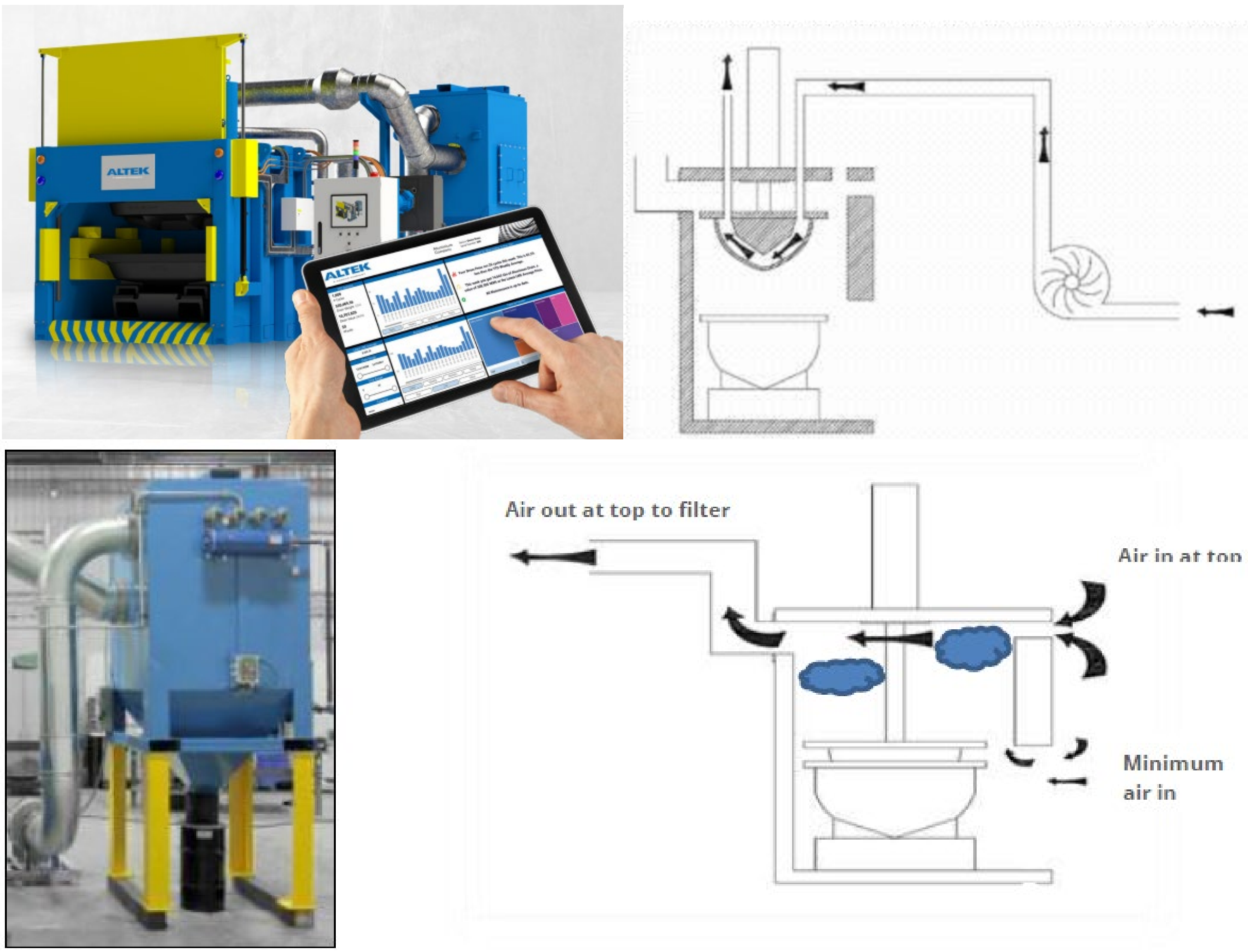
4.1.2.6 Dross Press and Dross House

Dross produced during aluminum melting and casting activities in each of the two (2) melting furnaces, one (1) holding furnace, and ingot casting process will be removed from each unit, collected in dross pans, pressed to remove aluminum, and transported to a dross house. The dross press can be used to extract molten metal from the dross prior to routing it to the dross house. The pressing cycle commences with a forklift truck positioning the two-piece dross pan within the dross press chamber through the hydraulically operated front door. As shown in the example dross press pictures and drawings provided in **Figure 4-9**, the pressing sequence begins as the specially designed air-cooled ram head is lowered into the surface of the dross. This press head is designed to squeeze aluminum out of the dross to maximize the in-house recovery while at the same time cooling the dross. The press head does not disturb the dross surface or promote formation of dross particles. The plug of dross in the pan is simply compressed to separate molten aluminum from the semisolid impurities and flux materials using the two-piece dross pan.

Once the pressing cycle is complete, the dross pan can be removed from the press. The system is then ready for the next pan to be positioned in the press. The pressed dross "skull" remaining in the skim pan is routed to the dross house, and the recovered metal is used as a charge material for the melt furnaces. The dross press will be equipped with an integral exhaust collection system, used primarily for nuisance fume/dust control to prevent worker exposure at the opening of the equipment. In this manner, Aluminum Dynamics will ensure any PM/PM_{10}/$PM_{2.5}$/HAP emissions that are associated with the operation of the dross press are captured and controlled.

Once dross pans are moved to the dross house either directly from the furnaces/ingot casting process or from the dross press, dross will be cooled, stored, and eventually shipped off-site for third-party processing and metal reclamation. A dedicated baghouse is used to control PM emissions associated with the dross house and collects any $PM/PM_{10}/PM_{2.5}$ generated by the dross handling, storage, and truck loading operations.

Figure 4-7. Pictures/Drawings of Representative Dross Press



4.1.2.7 Casting Machines

As the final step in the single casting line, Aluminum Dynamics will install a Vertical Direct Chill (VDC) casting machine or similar model. In this type of casting machine, only a fraction of the cooling is accomplished through the mold wall. After the outer layer of the ingot solidifies, the ingot begins to exit the mold, and the remainder of cooling is accomplished by directly spraying the ingot with water. This casting method reduces internal stresses in the metal relative to a traditional trough mold by allowing contraction on all sides.

Aluminum Dynamics anticipates that a vegetable oil-based lubricant (or similar) will be used to facilitate the casting process; however, emissions from the application and evaporation of this lubricant are considered negligible. After the rectangular ingots are produced by the casting machines, they will be shipped off-site to the Aluminum Dynamics Columbus, MS rolling mill and other aluminum rolling mill customers.

4.1.3 Auxiliary Systems

Auxiliary Systems at the plant will not directly be a part of the aluminum ingot production process but will provide essential utilities and support for the production process. The following auxiliary systems will be incorporated at the plant.

4.1.3.1 Cooling Towers

Two (2) single cell mechanical draft wet cooling towers will be installed to support the cooling water needs of the casting machine and other ancillary equipment requiring cooling water (e.g., HVAC systems). The larger cast house cooling tower (Cooling Tower #1) will have a maximum recirculating water flow rate of 3,500 gal/min, and the smaller general plant cooling tower (Cooling Tower #2) will have a maximum recirculating water flow rate of 1,500 gal/min.

4.1.3.2 Lime Silo

An alkaline reagent storage silo is planned to supply alkaline reagent (lime) to the Hot Baghouses #1-#3. The silo will be pneumatically loaded via truck on a periodic basis. Integral bin vent filters will be used to discharge air from the pneumatic silo loading process. PM, PM_{10}, and $PM_{2.5}$ emissions are expected.

4.1.3.3 Diesel and Gasoline Fuel Storage and Refueling Station

Diesel fuel stored in a 1,000-gallon horizontal fixed roof tank will be used as fuel for various on-site material transport vehicles (e.g., large capacity fork trucks for ingot movements, smaller fork trucks for baled scrap movements, and other vehicles) operated in and around the Benson plant. Gasoline stored in a 500-gallon horizontal fixed roof tank will be used as fuel for on-site fleet trucks used by various on-site personnel to travel within the plant boundary. VOC emissions are expected from breathing and working losses from the tanks. Also, VOC emissions are expected from vehicle refueling (i.e., loading losses).

4.1.3.4 Vehicle Movement on Paved Plant Roads and Unpaved Storage Yards

When a vehicle travels on a plant road or storage yard, the vehicle's tires agitate silt on the roadway or storage yard surface while the air currents created by the turbulent vehicle wake can further entrain silt on the road surface, thereby generating PM emissions. Various paved haul roads will be constructed at the Benson plant to allow Aluminum Dynamics to transport its raw materials, products, and chemical deliveries by truck. In order to minimize emissions of uncaptured dust associated with the operation of these trucks, Aluminum Dynamics will pave each of these roadways and implement good housekeeping practices such as sweeping to further mitigate fugitive dust emissions. The outdoor storage yards for scrap storage at the South end of the Benson plant and for ingots at the North end will be unpaved. In order to minimize fugitive dust emissions, Aluminum Dynamics will implement various work practice standards for these unpaved storage yards including limiting traffic to only required vehicles for process material movements, periodic watering and/or surfactant application, and yard surface maintenance to avoid excessive yard surface silt content.

To quantify particulate emissions from paved roadways, Aluminum Dynamics used information about anticipated truck traffic and meteorological conditions, along with the emission calculation methodologies established by Section 13.2.1 of EPA's AP-42. Specifically, Equations 1 and 2 from this section of AP-42 Chapter 13.2.1 were used to derive emission factors for PM, PM_{10}, and $PM_{2.5}$ in terms of pounds (lbs) of emissions per vehicle mile traveled (VMT) for paved haul roads. To quantify particulate emissions from unpaved storage yards, Aluminum Dynamics used information about anticipated vehicle traffic volume from the number of vehicles and the expected speed of travel, expected yard surface silt content, meteorological conditions, along with the emission calculation methodologies established by Section 13.2.2 of EPA's AP-42. Specifically, Equations 1a and 2 from this section of AP-42 Chapter 13.2.2 were used to derive emission factors for PM,

PM_{10}, and $PM_{2.5}$ in terms of pounds (lbs) of emissions per vehicle mile traveled (VMT) for the unpaved storage yards.

4.2 Product Description

The Benson plant will produce high quality aluminum ingots from recycled aluminum scrap and primary aluminum (e.g., P1020 aluminum alloys in various "hard charge" forms such as sows or small form ingots) and secondary aluminum [e.g., remelt secondary ingot (RSI)] inputs. Aluminum ingots created at the plant will be loaded onto rail cars and shipped to the ADI Columbus, MS rolling mill or other aluminum rolling mill customers. The targeted aluminum ingot markets currently include food and beverage containers, building and construction materials, and other 3XXX alloy series industrial products.

4.3 SIC Code

The Benson Plant will be classified under Standard Industrial Classification (SIC) code 3341, "Secondary Smelting and Refining of Nonferrous Metals", which covers establishments primarily engaged in recovering nonferrous metals and alloys from new and used scrap and dross or in producing alloys from purchased refined metals.

4.4 Operating Schedule

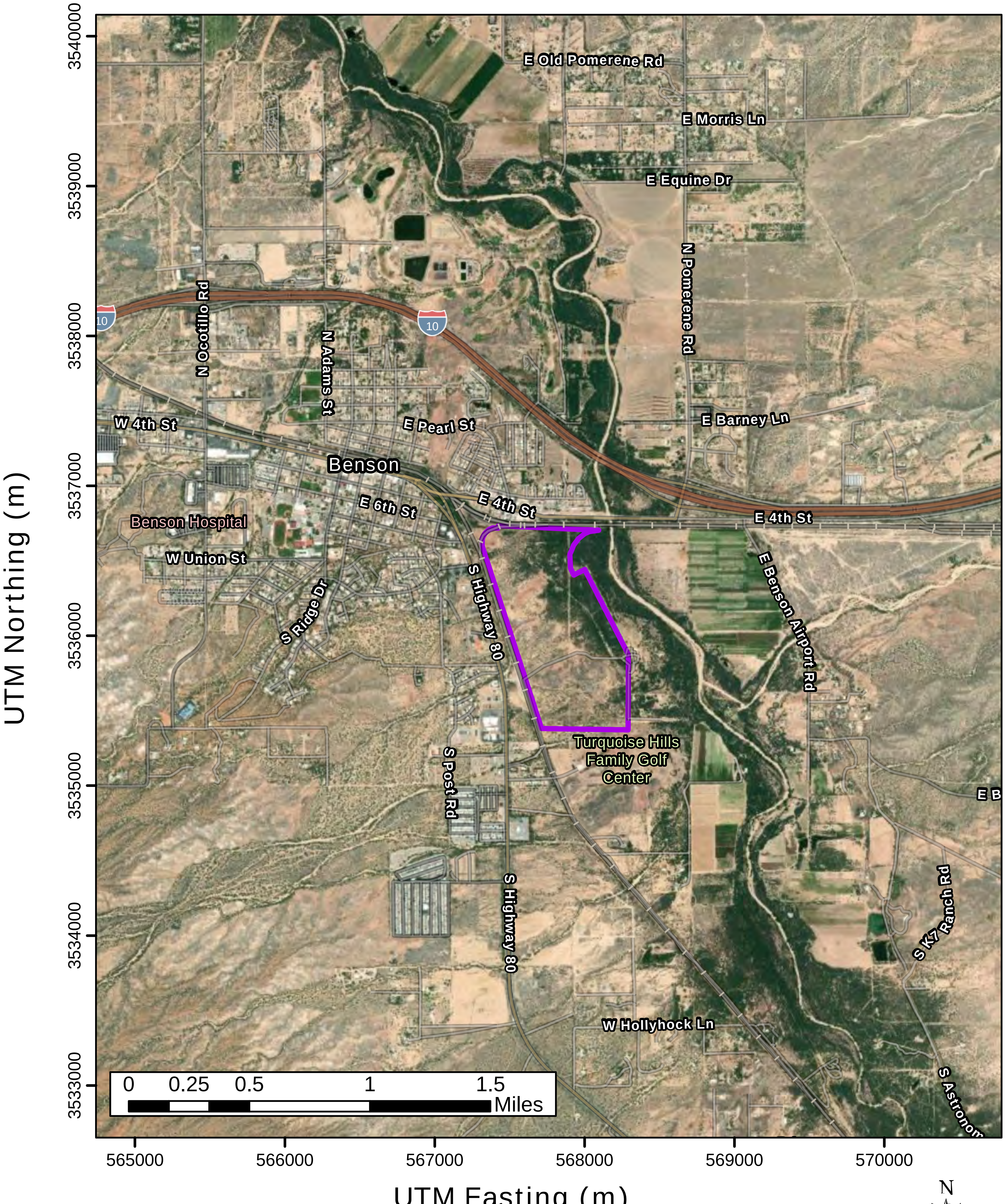
The Benson plant will operate continuously allowing for operation 24 hours a day, 7 days a week, for 365 days in the year. With this continuous operation, the plant will operate a maximum of 8,760 hours annually. With continuous operation, the potential maximum aluminum process rate will be roughly 300,000 US tons/yr.

4.5 Voluntary Limits

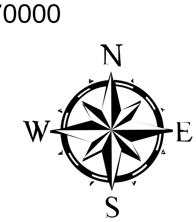
Pursuant to A.A.C. R18-2-304.F.5, ADI may elect to accept voluntary limits in accordance with R18-2-306.01. ADI is proposing voluntary limits for NO_x and VOC emissions to remain below PSD thresholds. Additional details of the proposed voluntary limits are discussed in the air dispersion modeling report which have been submitted under separate cover.

5. SITE & PROCESS FLOW DIAGRAMS

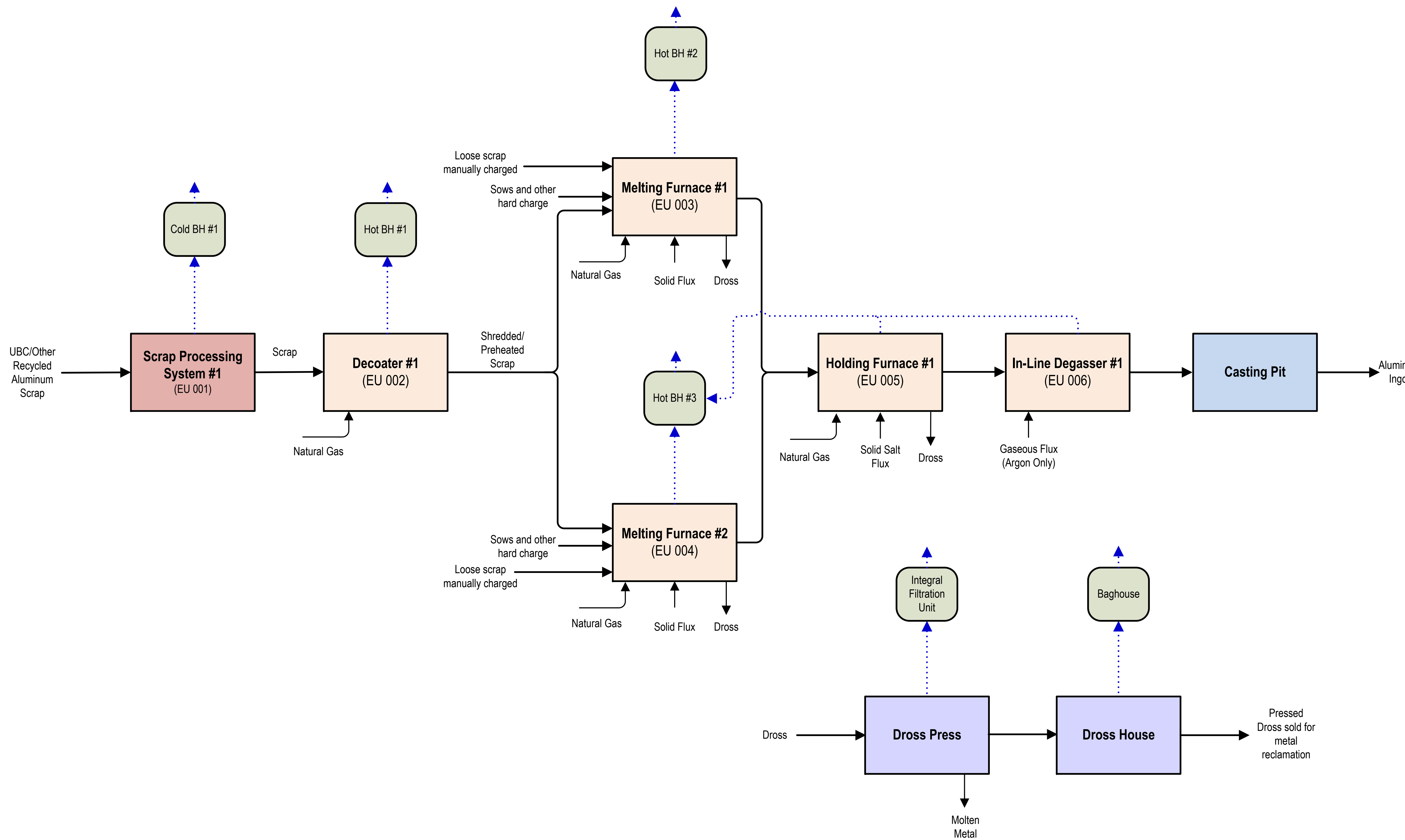
Figure 1. ADI Proposed Project Area Map



All Coordinates shown in UTM Coordinates,
Zone 12, NAD 1983



Facility Operations Overview – Aluminum Dynamics Casting Plant Configuration



Flow Legend

Process Flow

Gaseous or Emissions Flow

Aluminum Dynamics Flat Roll Group

Aluminum Dynamics, LLC

Facility Overview Diagram- Plant Configuration

Trinity Consultants

October 2024

* Process flow diagram is not comprehensive of the entire proposed equipment scope and excludes auxiliary equipment.

6. EMISSION CALCULATIONS

The proposed operations at the Benson plant have the potential to emit filterable particulate matter (PM), particulate matter of less than 10 microns (PM_{10}), particulate matter of less than 2.5 microns ($PM_{2.5}$), nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2), volatile organic compounds (VOC), Lead (Pb), hazardous air pollutants (HAPs), and greenhouse gasses (GHGs)[9]. Hourly and annual emissions of these pollutants are calculated using emission unit process rates, emissions factors, engineering judgement, and pollutant control efficiencies (if applicable).

The following sections contain a detailed description of the methodology used to calculate emissions from the proposed operations. Detailed emission calculations are included in **Appendix A** and select references to supporting documentation for emissions factors and emissions estimating methodologies are included in **Appendix B**.

6.1 Scrap Processing System

Particulate matter emissions, including PM, PM_{10},$PM_{2.5}$, and metal HAPs are generated from the scrap processing line. Scrap processing emissions were based on material throughput, emission factors, and control efficiencies. Emissions from the scrap processing system are routed to the baghouse, where emissions will be controlled.

6.1.1 Material Throughput

Material through the scrap processing system will consist of scrap aluminum. The material throughput for the scrap processing system was found based on the maximum designed aluminum processing capacity.

6.1.2 Emission Factor

Emission factors for the scrap processing system were calculated from various parameters including the baghouse air flow capacity, grain loading basis, and ratios for PM to PM_{10} and $PM_{2.5}$. The grain loading basis and baghouse air flow capacity were obtained from the vendor design of the baghouse. Ratios for PM_{10} and $PM_{2.5}$ to filterable PM were found from the EPA's PM calculator[10] for appropriate Source Classification Code (SCC). HAP emission factors based on assumed alloys being processed and the composition from "International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys" from the Aluminum Association in August 2018 (a.k.a, "Teal Sheet").[11]

6.1.3 Control Efficiency

Control efficiency was used to find the controlled emission factor for the baghouse. A PM control efficiency of 90% was assumed for all particulate matter species. This efficiency was reflective of control efficiency typically achieved by a high air flow rate and moderate inlet loading dust collectors serving aluminum scrap processing systems.

---

[9] While GHGs are not included under the definition of "regulated air pollutant" at A.A.C. R18-2-101.122, they are considered a "regulated NSR pollutant" under the federal Prevention of Significant Deterioration (PSD) program at 40 C.F.R. § 52.21(b)(50). ADI is therefore providing estimates of GHG emissions for purposes of demonstrating non-applicability of the federal PSD program for GHGs, which ADEQ implements via a delegation agreement with EPA.

[10] EPA PM Calculator Database.

[11] "International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys", The Aluminum Associatation https://www.aluminum.org/teal-sheets.

6.1.4 Equations Used for Emissions Estimations

The following equations were used to calculate the PTE from the scrap processing system using the parameters discussed in the previous sections.

$$Hourly\ Emissions\ \left(\frac{lb}{hr}\right) = Max.Hourly\ Throughput\ \left(\frac{ton}{hr}\right) \cdot EF\ (\frac{lb}{ton})$$
$$Annual\ Emissions\ \left(\frac{ton}{yr}\right) = Max.Annual\ Throughput\ \left(\frac{ton}{yr}\right) \cdot EF\ \left(\frac{lb}{ton}\right) \cdot \frac{ton}{2{,}000\ lb}$$

6.2 Decoater #1

The rotary decoater is a source of regulated pollutants tied to both aluminum processing/production and natural gas combustion. Pollutants emitted from this process include PM, PM_{10}, $PM_{2.5}$, NO_x, CO, SO_2, VOC, lead, both metal and organic HAPs, dioxins & furans (D/F), and GHGs.

6.2.1 Material Throughput

Material through the decoater will consist of "other than clean charge" aluminum scrap. The estimated maximum hourly aluminum throughput for the decoater will be 27.6 ton/hr with an estimated maximum of 241,000 ton/yr of annual throughput.

For emissions from natural gas combustion, throughput for the maximum natural gas usage was used. This value was found using the maximum burner heat capacity and the heating value of natural gas at the plant.

6.2.2 Emission Factor

Emission factors for PM_{10}, $PM_{2.5}$, NO_x, CO, and VOC were derived from similar source Best Available Control Technology (BACT) limits. Emission factors for lead, D/F, and other HAPs (both metal and organic) were obtained from the RTR modeling SMACT docket[12]. HCl HAPs were found from an upper prediction limit (UPL) analysis of representative test data for decoaters in the SMACT testing database. Finally, PM emissions were estimated based on design factors.

Emission factors for natural gas combustion were obtained from a variety of sources. For CO emissions, a vendor estimate was used as the basis. VOC and SO_2 factors were taken from AP-42 Section 1.4 Natural Gas Combustion, Table 1.4-2. Lead and other HAP factors were also found in that section, in Tables 1.4-3 and 1.4-4. For GHG emission factors, values were derived from 40 CFR 98 Subpart C, Tables C-1 and C-2.

6.2.3 Control Efficiency

The decoater will have a hood capture system that will capture all air pollutants from aluminum processing/production when in operation. However, to account for brief shutdowns and intermittent periods a removal efficiency of 98% was assumed. In addition, for periods when the capture hood is not fully operational, building removal efficiency was assumed for particulate emissions.

Emissions from natural gas combustion will not be controlled, and thus will not have any control efficiencies.

[12] Development of the RTR Supplemental Proposal Risk Modeling Dataset for the Secondary Aluminum Production Source Category, RTI International, November 12, 2014.

6.2.4 Equations Used for Emissions Estimations

The following equations were used to calculate the total PTE from the decoater. These equations use the parameters discussed in the previous sections.

$$Hourly\ Emissions\ \left(\frac{lb}{hr}\right) = Max. Hourly\ Throughput\ \left(\frac{ton}{hr}\right) \cdot EF\ (\frac{lb}{ton})$$

$$Annual\ Emissions\ \left(\frac{ton}{yr}\right) = Max. Annual\ Throughput\ \left(\frac{ton}{yr}\right) \cdot EF\ \left(\frac{lb}{ton}\right) \cdot \frac{ton}{2{,}000\ lb}$$

Equations for emissions from natural gas combustion differed as units for the throughput and emission factors changed. The following equations were used to quantify emissions from natural gas combustion.

$$Hourly\ Emissions\ \left(\frac{lb}{hr}\right) = Max. Hourly\ Throughput\ \left(\frac{MMscf}{hr}\right) \cdot E.F.\left(\frac{lb}{MMscf}\right)$$

$$Annual\ Emissions\ \left(\frac{ton}{yr}\right) = Max. Annual\ Throughput\ \left(\frac{MMscf}{yr}\right) \cdot EF\ \left(\frac{lb}{ton}\right) \cdot \frac{ton}{2{,}000\ lb}$$

6.3 Sidewell Melting Furnaces #1 and #2

The sidewell melting furnaces are a source of regulated pollutants tied to both aluminum processing/production and natural gas combustion. Pollutants emitted from this process include PM, PM_{10}, $PM_{2.5}$, NO_x, CO, SO_2, VOC, lead, both metal and organic HAPs, D/F, and GHGs.

6.3.1 Material Throughput

Decoated aluminum from the decoater is split between the two sidewell melting furnaces. All of the aluminum from the decoater will go through the sidewell furnaces, meaning the maximum throughput for the furnaces is half of the maximum decoater throughput.

For emissions from natural gas combustion, throughput for the maximum natural gas usage was used. This value was found using the maximum burner heat capacity and the heating value of natural gas at the plant.

6.3.2 Emission Factor

The NO_x and CO emission factors were found from a similar source BACT limit. VOC emissions were obtained from the candidate vendor for the furnaces. This estimate accounts for VOC emissions from both aluminum processing/production and natural gas fuel combustion. HCl HAPs were found from a UPL analysis of representative test data for sidewell melting furnaces in the SMACT testing database. Emission factors for lead, D/F, and metal HAPs were obtained from the RTR modeling SMACT docket. PM, PM_{10}, and $PM_{2.5}$ emission factors were found using engineering estimates. These estimates took into account factors such as ventilation parameters, baghouse controls, gas throughputs, and filterable particulate matter outlet grain loading. In addition, particle size ratios were used.

For the remaining pollutants (NO_X, CO, SO_2, GHG, lead, and HAPs) with a contribution to overall sidewell melting furnace potential emissions from natural gas combustion, potential emissions estimates rely on a combination of vendor-supplied data (for NO_X and CO), EPA reference emission factors from AP-42 Chapter 1.4 for natural gas combustion (SO_2, lead, and HAPs), and GHG reporting emission factors included in 40 CFR 98 (CO_2, CH_4, and N_2O). The vendor estimates for NO_X and CO emissions performance of the low NO_X regenerative burner system are provided on the basis of peak hourly and "cycle average" averaging times that account for the variations in burner firing rates over the course of a typical "tap-to-tap" batch operating cycle of a sidewell melting furnace. Although Aluminum Dynamics' Melting Furnaces #1 and #2 are designated as continuous operations due to the ability to receive hot shredded scrap from the Decoater at all times, the cycle average emission factor would still be representative of long-term annual operation of the sidewell melting furnaces because the same profile of burner firing rates and associated emissions performance within a typical batch operating cycle would occur over any given furnace operating day/week/month.

6.3.3 Control Efficiency

Like the decoater, the sidewell furnaces will have a hood capture system that will capture all air pollutants when operation. However, to account for brief shutdowns and intermittent periods a removal efficiency of 98% was assumed. In addition, for periods of time when the capture hood is not fully operational a building removal efficiency was assumed for particulate emissions.

6.3.4 Equations Used for Emissions Estimations

The following equations were used to find the total PTE from the aluminum metal processing and production in the sidewell melting furnaces. These equations use the parameters discussed in the previous sections.

$$Hourly\ Emissions\ \left(\frac{lb}{hr}\right) = Max.Hourly\ Throughput\ \left(\frac{ton}{hr}\right) \cdot EF\ \left(\frac{lb}{ton}\right)$$

$$Annual\ Emissions\ \left(\frac{ton}{hr}\right) = Max.Annual\ Throughput\ \left(\frac{ton}{yr}\right) \cdot EF\ \left(\frac{lb}{ton}\right) \cdot \frac{ton}{2{,}000\ lb}$$

In addition, to find annual PTE from the natural gas combustion for both furnaces the following equation was used.

$$Hourly\ Emissions\ \left(\frac{lb}{hr}\right) = Max.Hourly\ Process\ Rate\ \left(\frac{MMscf}{hr}\right) \cdot EF\ \left(\frac{lb}{MMscf}\right)$$

$$Annual\ Emissions\ \left(\frac{ton}{yr}\right) = Max.Annual\ Throughput\ \left(\frac{MMscf}{yr}\right) \cdot EF\ \left(\frac{lb}{MMscf}\right)\ \cdot Number\ of\ Furnaces \cdot \frac{ton}{2{,}000\ lb}$$

6.4 Holding Furnace #1

The tilting holding furnace is a source of regulated pollutant emissions both from aluminum processing/production and natural gas combustion. The tilting holding furnace will have the potential to emit PM, PM_{10}, $PM_{2.5}$, NO_x, CO, SO_2, VOC, lead, metal and organic HAPs, and GHGs.

Natural gas combustion emissions use the throughput for maximum natural gas usage. This value was found using the maximum burner heat capacity and the heating value of natural gas at the plant.

6.4.1 Material Throughput

All molten aluminum from the sidewell furnaces will be combined and sent to the holding furnace. Throughput for the holding furnace represents the maximum potential throughput that may go through the previous sidewell furnaces and decoater.

Natural gas combustion emissions use the throughput for maximum natural gas usage. This value was found using the maximum burner heat capacity and the heating value of natural gas at the plant.

6.4.2 Emission Factor

HCl emissions from aluminum processing/production at the holding furnace were found using the same UPL-based statistical analysis. Emission factors for lead and metal HAPs were obtained from the RTR modeling SMACT docket. No NO_x or CO emissions will be emitted from the holding furnace as a result of aluminum processing/production because the furnace receives only molten aluminum from the sidewell melting furnaces or direct addition of aluminum "hard charge" meeting the definition of clean charge in SMACT. Aluminum Dynamics has conservatively chosen to apply the same vendor-supplied VOC exhaust concentration used for the sidewell melting furnaces to account for any potential for the molten bath to contain organic compounds from the flux injection process and any trace levels of residual contaminants present on the otherwise clean charge that can be supplied to the holding furnace.

For the pollutant emissions resulting from natural gas combustion that are not already accounted for in emission factors tied to aluminum production (NO_X, CO, SO_2, GHG, lead, andHAPs), the potential emissions estimates rely on a combination of vendor-supplied data (for NO_X and CO), EPA reference emission factors from AP-42 Chapter 1.4 for natural gas combustion (SO_2, lead, and HAPs), and GHG reporting program emission factors contained in 40 CFR 98 (CO_2, CH_4, and N_2O). The vendor estimates for CO emissions performance of the low NO_X cold air burner system are provided on the basis of peak hourly and "cycle average" averaging times that account for the variations in burner firing rates over the course of a typical batch operating cycle of the holding furnace (i.e., first metal transfer to final return to level position after completing full casting process). The cycle average emission factor is representative of the long-term annual operation of the holding furnace.

6.4.3 Control Efficiency

The holding furnace will have a capture system that will capture all air pollutants from the aluminum processing/production when in operation. However, to account for possible inefficiencies, a 98% control efficiency was assumed on the basis of an American Conference of Governmental Industrial Hygienists (ACGIH) compliant capture and collection system for the door holds. In addition, building removal efficiency was assumed for uncaptured PM emissions.

Emissions from natural gas combustion are uncontrolled.

6.4.4 Equations Used for Emissions Estimations

The following equations were used to find the total PTE from the holding furnace for emissions tied to aluminum metal production. These equations use the parameters discussed in the previous sections.

$$Hourly\ Emissions\ \left(\frac{lb}{hr}\right) = Max.Hourly\ Throughput\ \left(\frac{ton}{hr}\right) \cdot EF\ (\frac{lb}{ton})$$

$$Annual\ Emissions\ \left(\frac{ton}{hr}\right) = Max.Annual\ Throughput\ \left(\frac{ton}{hr}\right) \cdot EF\ \left(\frac{lb}{ton}\right) \cdot \frac{ton}{2{,}000\ lb}$$

In addition, to find hourly and annual PTE from natural gas combustion for both furnaces the following equation was used.

$$Hourly\ Emissions\ \left(\frac{lb}{hr}\right) = Max.Hourly\ Process\ Rate\ \left(\frac{MMscf}{hr}\right) \cdot EF\ \left(\frac{lb}{MMscf}\right)$$

$$Annual\ Emissions\left(\frac{ton}{yr}\right) = Max.Annual\ Throughput\left(\frac{MMscf}{yr}\right)\cdot EF\left(\frac{lb}{MMscf}\right)\cdot Number\ of\ Furnaces\cdot\frac{ton}{2{,}000\ lb}$$

6.5 In-Line Degasser #1

The in-line degasser #1 is expected to be a very small source of PM, PM_{10}, $PM_{2.5}$, and metal HAPs emissions associated with the use of argon gas as a non-reactive gaseous fluxing agent.

6.5.1 Material Throughput

All of the aluminum from the holding furnace will be sent through the degasser. Because of this, the maximum hourly and yearly throughput for the degasser will remain the same as the previous process equipment such as the holding furnace.

6.5.2 Emission Factor

Pursuant to 40 CFR 63.1512(h)(2), compliance with the SMACT in-line fluxer PM emissions standard may be assumed when a facility complies with the HCl emission standard on the basis of a mass balance. Aluminum Dynamics will not use reactive chlorine flux in the in-line degasser and would not be expected to emit HCl. Therefore, the same approach for presumed compliance with the applicable PM emissions standard would form a reasonable basis for the potential emission factor for this source. Because of presumed compliance with the SMACT emission standard, the PM emission factor was obtained from the limit in 40 CFR 63.1505(j)(2). For PM_{10} and $PM_{2.5}$ emissions, ratios were obtained from the PM calculator for secondary metal production. Emission factors for lead, and metal HAPs were obtained from the RTR modeling SMACT docket.

6.5.3 Control Efficiency

The in-line degasser, like the previous process equipment, will utilize a capture system. Emissions generated from the degasser will be discharged to the holding furnace main chamber or flue. As used for the previous equipment using the capture system, an efficiency of 98% was used to account for periods of brief downtime in the control system. In addition, PM emissions accounted for a building control efficiency when the capture system is down.

6.5.4 Equations used for Emissions Estimations

The following equations were used to find the total PTE from the holding furnace. These equations use the parameters discussed in the previous sections.

$$Hourly\ Emissions\left(\frac{lb}{hr}\right) = Max.Hourly\ Throughput\left(\frac{ton}{hr}\right)\cdot EF\ (\frac{lb}{ton})$$

$$Annual\ Emissions\left(\frac{ton}{yr}\right) = Max.Annual\ Throughput\left(\frac{ton}{yr}\right)\cdot EF\left(\frac{lb}{ton}\right)\cdot\frac{ton}{2{,}000\ lb}$$

6.6 Sow Dryer

The natural gas-fired sow dryer is a source of regulated pollutant emissions formed solely as normal combustion byproducts of natural gas fuel consumption in the low-NO_X burner system. The sow dryer has the potential to emit NO_x, CO, PM, PM_{10}, $PM_{2.5}$, VOC, SO_2, lead, metal and organic HAPs, and GHGs.

6.6.1 Material Throughput

For emissions from natural gas combustion, throughput for the maximum natural gas usage was used. This value was found using the maximum burner heat capacity and the heating value of natural gas at the plant.

6.6.2 Emission Factor

Emission factors for NO_X and CO are calculated based on burner systems performance specifications (expressed as pollutant concentration) for the planned equipment. Total PM_{10} and $PM_{2.5}$ emissions are calculated by applying a filterable to total PM ratio to the AP-42 Chapter 1.4 Table 1.4-2 value for filterable PM. The ratio was calculated using data from EPA's SPECIATE database for Natural Gas Combustion - Composite with no controls. All other emission factors are based on reference literature (e.g., EPA's AP-42 and 40 CFR 98).

6.6.3 Control Efficiency

No control efficiencies were assumed for the sow dryer as there will be no controls on the unit.

6.6.4 Equations Used for Emissions Estimations

Hourly and annual emission calculations will follow the same methodology as previous calculations for natural gas combustion emissions. The following equations were used to determine emissions from the sow dryer.

$$Hourly\ Emissions\ \left(\frac{lb}{hr}\right) = Max.Hourly\ Process\ Rate\ \left(\frac{MMscf}{hr}\right) \cdot EF\ \left(\frac{lb}{MMscf}\right)$$

$$Annual\ Emissions\ \left(\frac{ton}{yr}\right) = Max.Annual\ Throughput\ \left(\frac{MMscf}{yr}\right) \cdot EF\ \left(\frac{lb}{MMscf}\right) \cdot \frac{ton}{2{,}000\ lb}$$

6.7 Filter Box Preheater #1

A small 0.18 MMBtu/hr natural gas combustion system is used to supply direct fired process heat to the filter box as a preheating mechanism associated with the aluminum casting procedure. This filter preheater will emit regulated pollutants from the combustion of natural gas. Combustion will cause NO_x, CO, PM, PM_{10}, $PM_{2.5}$, VOC, SO_2, lead, metal and organic HAPs, and GHGs.

6.7.1 Material Throughput

For emissions from natural gas combustion, throughput for the maximum natural gas usage was used. This value was found using the maximum burner heat capacity and the heating value of natural gas at the plant.

6.7.2 Emission Factor

The same total $PM_{10}/PM_{2.5}$ emission factor derived for the Sow Dryer is applied to the Filter Box Preheater #1. All other emission factors are based on reference literature (e.g., EPA's AP-42 and 40 CFR 98).

6.7.3 Control Efficiency

Because of the small size of the equipment, the emissions from the Filter Box Preheater will be uncontrolled. Thus, no control efficiency is used in the calculations.

6.7.4 Equations Used for Emissions Estimations

Hourly and annual emission calculations will follow the same methodology as previous calculations for natural gas combustion emissions. The following equations will be used to find emissions from natural gas combustion.

$$Hourly\ Emissions\ \left(\frac{lb}{hr}\right) = Max.Hourly\ Process\ Rate\ \left(\frac{MMscf}{hr}\right) \cdot EF\ \left(\frac{lb}{MMscf}\right)$$

$$Annual\ Emissions\ \left(\frac{ton}{yr}\right) = Max.Annual\ Throughput\ \left(\frac{MMscf}{yr}\right) \cdot EF\ \left(\frac{lb}{MMscf}\right) \cdot \frac{ton}{2{,}000\ lb}$$

6.8 Dross House

The dross house is a source of baghouse stack and uncaptured/fugitive emissions from dross storage and handling. A control system will be in place to capture emissions from dross handling, storage, and truck loading operations. These captured emissions will be sent to the baghouse and pass through the baghouse stack as non-fugitive emissions. Because not all PM emissions will be captured by the control system, fugitive emissions will also be emitted from the dross house. Potential emissions of filterable PM, PM_{10}, $PM_{2.5}$, and HAPs will be emitted from this process.

6.8.1 Material Throughput

All dross produced during aluminum melting and molten aluminum processing at the site will be collected and transported to the dross house. The total combined dross generation from each furnace and aluminum processing equipment was used for the material throughput.

6.8.2 Emission Factor

Uncontrolled PM emission factors for dross handling are estimated using emission factors from AP-42 11.17 for Lime Manufacturing. As a conservative estimate, dross is assumed to be particulate matter resembling a “salt cake” that is typical of lime product from a lime manufacturing operation. To find speciated PM emission factors between PM, PM_{10}, and $PM_{2.5}$, the EPA PM calculator. Emission factors for metal HAPs were obtained from the RTR modeling SMACT docket[13].

6.8.3 Control Efficiency

Based on the dimensions of the Dross House and flow capacity of the baghouse, candidate vendors have indicated an achievable capture efficiency for the Dross House in the range of 90% to 95%. Aluminum Dynamics has applied the minimum capture efficiency estimate (90%) to ensure the conservatism of the resulting potential emissions assigned to the Dross House for assessing the Benson facility's air permitting source classification.

For emissions that have been captured by the baghouse control system, a separate control efficiency of 78% was used. This control efficiency was calculated by finding the ratio between the controlled PM emission factor, obtained from the equipment design specification, and the uncontrolled PM emission factor which was obtained in AP-42 Section 11.17-4 for Transfer and Conveying.

[13] Development of the RTR Supplemental Proposal Risk Modeling Dataset for the Secondary Aluminum Production Source Category, RTI International, November 12, 2014.

6.8.4 Equations Used for Emissions Estimations

Equations for calculating the hourly and annual emission rates of PM from dross were similar to calculations performed for the previous process equipment. The following equations were used to find the hourly and annual emissions from the dross house.

$$Hourly\ Emissions\ \left(\frac{lb}{hr}\right) = Max.Hourly\ Throughput\ \left(\frac{ton}{hr}\right) \cdot EF\ (\frac{lb}{ton})$$

$$Annual\ Emissions\ \left(\frac{ton}{yr}\right) = Max.Annual\ Throughput\ \left(\frac{ton}{yr}\right) \cdot EF\ \left(\frac{lb}{ton}\right) \cdot \frac{ton}{2{,}000\ lb}$$

6.9 Dross Press

The Dross Press is a source of PM, PM_{10}, $PM_{2.5}$, and HAPs emissions from the interior venting discharge of the integral filtration unit associated with the dross press operation.

6.9.1 Material Throughput

The throughput for the dross press was assumed to be equivalent to the dross generation rate at the facility for both hourly and annual values.

6.9.2 Emission Factor

Emission factors of filterable PM, PM_{10}, and $PM_{2.5}$ from the Dross Press' integral filtration unit (no condensable PM expected from dross processing) are estimated using the filterable PM engineering design basis for the performance of the filtration unit (0.002 gr/dscf), the filtration unit's flow capacity (1,500 acfm which is nominally equivalent to dscfm based on operating temperature and minimal moisture content), and PM_{10}/$PM_{2.5}$ particle size ratios from the EPA PM calculator. Emission factors for metal HAPs were obtained from the RTR modeling SMACT docket[14].

6.9.3 Control Efficiency

There will be no controls on the dross press, thus there will be no control efficiencies used in the calculations.

6.9.4 Equations Used for Emissions Estimations

Equations for hourly and annual emissions from the dross press follow similar methodologies to the previous process equipment. Equations used to find emissions can be referenced above.

6.10 Cooling Towers

The two (2) cooling towers at the plant will have the potential to emit PM, PM_{10}, and $PM_{2.5}$ emissions.

6.10.1 Material Throughput

The maximum cooling water flow in a year for each cooling tower was used as a throughput.

[14] Development of the RTR Supplemental Proposal Risk Modeling Dataset for the Secondary Aluminum Production Source Category, RTI International, November 12, 2014.

6.10.2 Emission Factor

The maximum cooling water flow rate (gal/min), maximum total dissolved solids (TDS), and drift loss percentage were used to determine the PM emission factor for the cooling towers. Water flow rate and drift loss percentages were found from design specification of the cooling towers. The maximum TDS content was estimated using a conservative engineering estimate seen for other cooling tower systems.

The PM_{10} and $PM_{2.5}$ emission factors were calculated by multiplying the PM emission factor by the PM_{10} and $PM_{2.5}$ particle size factor calculated using the methodology presented in "Calculating Realistic PM_{10} Emissions from Cooling Towers" by Joe Reisman and Gordon Frisbie, Environmental Progress, Volume 21, Issue 2 (April 20, 2004) (commonly referred to as Reisman Frisbie).[15]

6.10.3 Control Efficiency

There will be no add-on controls applied to the cooling towers at the site, thus no control efficiency is used in the PTE calculations.

6.10.4 Equations Used for Emissions Estimations

Unlike previous process equipment, emission factors for the cooling tower were calculated based off of the system design and not obtained from a reference. Emission factors for the cooling towers were calculated using the following equation:

$$E.F.\left(\frac{lb}{MMgal}\right) = Water\ Circulation\ Rate\ \left(\frac{gal}{\min}\right) \cdot TDS\ \left(lb\frac{solid}{lb\ water}\right) \cdot Drift\ Percentage\ (\%) \cdot 60\frac{min}{hr} \cdot 8.34\frac{lb}{gal} \cdot \frac{hr}{0.21\ MMgal}$$

The hourly and annual PTE for PM emissions were found with the following equations:

$$Hourly\ Emissions\ \left(\frac{lb}{hr}\right) = Max.Hourly\ Throughput\ \left(\frac{MMgal}{hr}\right) \cdot EF\ (\frac{lb}{MMgal})$$

$$Annual\ Emissions\ \left(\frac{ton}{yr}\right) = Max.Annual\ Throughput\ \left(\frac{MMgal}{yr}\right) \cdot EF\ \left(\frac{lb}{MMgal}\right) \cdot \frac{ton}{2{,}000\ lb}$$

6.11 Lime Silo

A free-standing lime silo used to supply alkaline reagent to the three (3) hot baghouses will be a source of PM, PM_{10}, and $PM_{2.5}$ emissions from periods of pneumatically loading the silo from trucks via an integral bin vent filter discharge.

6.11.1 Material Throughput

Maximum hourly and annual lime usage rates were estimated for the process and used to find the PTE from the silo.

[15] https://www.nrc.gov/docs/ML1232/ML12325A097.pdf

6.11.2 Emission Factor

Emission factors for the lime silo were calculated using parameters such as the performance of the bin vent filter, the bin vent filter flow capacity, and the maximum annual truck loading time. Bin vent performance was estimated based off of the design of the system. The maximum annual truck loading time was calculated using the maximum annual throughput of reagent used in the process.

6.11.3 Control Efficiency

The silo will have a bin vent filter controlling particulate emissions. This control efficiency was applied by using a controlled filterable PM emission factor from the equipment specification.

6.11.4 Equations Used for Emissions Estimations

Unlike previous process equipment, emission factors for the lime silo were calculated based off of the system design and not obtained from a reference. Emission factors for the lime silo were calculated using the following equation:

$$E.F.(lb/ton) = \frac{loading\ time\ \left(\frac{hr}{yr}\right) \cdot filter\ flow\ capacity\ (dscfm) \cdot PM\ emission\ factor\ \left(\frac{gr}{dscf}\right) \cdot 60\frac{min}{hr} \cdot \frac{lb}{7{,}000\ gr}}{Max\ Reagent\ Usage\ \left(\frac{ton}{yr}\right)}$$

The hourly and annual emission rates were found using the following equations:

$$Hourly\ Emissions\ \left(\frac{lb}{hr}\right) = Max.\,Hourly\ Throughput\ \left(\frac{ton}{hr}\right) \cdot EF\ (\frac{lb}{ton})$$

$$Annual\ Emissions\ \left(\frac{ton}{yr}\right) = Max.\,Annual\ Throughput\ \left(\frac{ton}{yr}\right) \cdot EF\ \left(\frac{lb}{ton}\right) \cdot \frac{ton}{2{,}000\ lb}$$

6.12 Paved Plant Roads and Unpaved Storage Yards

Emissions of PM, PM_{10}, and $PM_{2.5}$ are generated from vehicular and mobile equipment traffic on plant roads and storage yards. Road and storage yard emissions are calculated based on vehicle miles travelled (VMT), emission factors, and control efficiencies.

6.12.1 Material Throughput

The effective throughput for the roads will be the VMT. For the paved plant roads, the VMT is calculated by multiplying number of trips and round-trip distance. The number of trips is estimated based on process knowledge or material throughput with vehicle capacity. For the unpaved plant storage yards, the VMT is calculated assuming mobile equipment travels continuously at a fixed speed based on the anticipation of fork trucks continuously traversing the storage yard for material movements.

6.12.2 Emission Factor

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emission factors for vehicles traveling on paved roads are calculated using the following equation from AP-42, Chapter 13.2.1 (January 2011).

$$EF\ \left(\frac{lb}{VMT}\right) = k\left(\frac{lb}{VMT}\right)x\ \left(sL\ \left(\frac{g}{m^2}\right)\right)^{0.91}\ x\ W\ (tons)^{\ 1.02}$$

Where:

K = particle size multiplier
sL = road surface silt loading
W = average weight of the vehicles traveling on the road

Uncontrolled PM, PM_{10}, and $PM_{2.5}$ emission factors for vehicles traveling on unpaved storage yards are calculated using the following equations from AP-42, Chapter 13.2.2 (November 2006).

$$EF = k\ x\ \left(\frac{s}{12}\right)^a \left(\frac{W}{3}\right)^b$$

Where:

k,a, and b are empirical constants defined in Table 13.2.2
s = surface material silt content (%)
W = mean vehicle weight (tons)

The unpaved road surface silt loading is set to the mean silt content from AP-42 Table 13.2.2-1 for the iron and steel production industry. An industry category for secondary aluminum is not available in AP-42 Table 13.2.2-1 providing the typical silt content value of surface material on industrial unpaved roads, so the iron and steel industry was selected as a conservative basis for the Benson facility's unpaved roads based on the expectation of material handling activities at iron and steel facilities contributing more significantly to the overall road surface silt loading.

6.12.3 Control Efficiency

Occasional sweeping will occur to control emissions from the paved roads. Per the Air Pollution Engineering Manual, Chapter 4, AWMA, 1992, a control credit for periodic sweeping of 50% control efficiency is applied to the uncontrolled emission factors from AP-42 Chapter 13.2.1.

Unpaved roads will be controlled with periodic watering. Per the Air Pollution Engineering Manual, Chapter 4, AWMA, 1992, Figure 6, a control credit for periodic watering of 80% control efficiency is applied to the uncontrolled emission factors from AP-42 Chapter 13.2.2.

6.12.4 Equations Used for Emissions Estimations

The following equations were used to find the hourly and annual emissions from road travel:

$$Hourly\ Emissions\ \left(\frac{lb}{hr}\right) = E.F.\left(\frac{lb}{VMT}\right) \cdot Total\ Miles\ Traveled\ \left(\frac{VMT}{hr}\right)$$

$$Annual\ Emissions\ (tpy) = E.F.\left(\frac{lb}{VMT}\right) \cdot Total\ Miles\ Traveled\ \left(\frac{VMT}{yr}\right) \cdot \frac{1}{2000}\left(\frac{ton}{lbs}\right)$$

6.13 Emergency Generator Engine

One (1) emergency generator equipped with a 26-kW Kohler natural gas/propane engine will provide standby service to the Facility. The emergency generator engine classifies as an insignificant activity pursuant to R18-2-101(68)(b) as the engine will operate an engine-driven generator set for less than 500 hours per year and for standby or emergency replacement. Therefore, emissions from the engine are excluded from the facility-wide PTE.

6.14 Site-Wide HAP Emissions

Metal HAP emissions were calculated based on the mass fraction of metal HAPs present in PM emissions. Metal HAP emissions emanate from any part of the process that includes PM emissions due to the scrap processing system, melting furnaces, holding furnace, and in-line degasser. To simplify presentation, metal HAP emissions calculations are not shown; however, metal HAP emissions are calculated by the following equation.

$$\begin{aligned} &Metal\ HAP\ emissions\ (hourly, daily, monthly, or\ annual) \\ &\quad = Metal\ HAP\ Percentage\ (\%) \times PM\ Emissions\ (hourly, daily, monthly, or\ annual) \end{aligned}$$

7. LIST OF INSIGNIFICANT AND TRIVIAL ACTIVITIES

Activities which are considered "insignificant" pursuant to A.A.C. R18-2-101.68 and associated with the Benson plant are presented in this Section. Pursuant to A.A.C. R18-2-304. F.8, insignificant activities shall be listed in a permit application, but the application need not provide emissions data, except as requested by ADEQ following submittal of the application. Therefore, any emissions from these equipment and activities are not considered in this application.

Similarly, proposed activities which are considered "trivial" pursuant to A.A.C. R18-2-101.146 and associated with the Benson plant are presented in this Section. Although trivial activities can be omitted from permit applications, ADI is identifying them in this application for ADEQ's concurrence and future reference purposes. This list is not intended to be an exhaustive list of all the equipment and activities at the Benson plant that meet the trivial activities classification.

7.1 Insignificant Activities

- Liquid Storage and Piping
  - Petroleum product storage tanks containing the following substances, provided ADI lists and identifies the contents of each tank with a volume of 350 gallons or more and provides threshold values for throughput or capacity or both for each such tank: diesel fuels and fuel oil in storage tanks with capacity of 40,000 gallons or less, lubricating oil, transformer oil, and used oil.
    - See equipment list in Section 9 for full list of insignificant tanks
  - Gasoline storage tanks with capacity of 10,000 gallons or less.
  - Storage and piping of natural gas, butane, propane, or liquified petroleum gas, provided the applicant lists and identifies the contents of each stationary storage vessel with a volume of 350 gallons or more and provides threshold values for throughput or capacity or both for each such vessel.
  - Storage and handling of drums or other transportable containers where the containers are sealed during storage, and covered during loading and unloading, including containers of waste and used oil regulated under the federal Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6901-6992(k). Permit applicants must provide a description of the material in the containers and the approximate amount stored.
- Internal combustion engine-driven compressors, internal combustion engine-driven electrical generator sets, and internal combustion engine-driven water pumps used for less than 500 hours per calendar year for emergency replacement or standby service, provided the permittee keeps records documenting the hours of operation of this equipment.
- Low Emitting Processes
  - Equipment using water, water and soap or detergent, or a suspension of abrasives in water for purposes of cleaning or finishing.
  - Blast-cleaning equipment using a suspension of abrasive in water and any exhaust system or collector serving them exclusively.
  - Blast-cleaning equipment using a suspension of abrasive in water and any exhaust system or collector serving them exclusively.
  - Plastic pipe welding.
- Site Maintenance
  - Housekeeping activities and associated products used for cleaning purposes, including collecting spilled and accumulated materials at the source, including operation of fixed vacuum cleaning systems specifically for such purposes.

- Architectural painting and associated surface preparation for maintenance purposes at industrial or commercial facilities.

- Sampling and Testing
  - Noncommercial (in-house) experimental, analytical laboratory equipment, which is bench scale in nature, including quality control/quality assurance laboratories supporting a stationary source and research and development laboratories.
  - Individual sampling points, analyzers, and process instrumentation, whose operation may result in emissions but that are not regulated as emission units.
- Ancillary Non-Industrial Activities
  - General office activities, such as paper shredding, copying, photographic activities, and blueprinting, but not to include incineration.
  - Use of consumer products, including hazardous substances as that term is defined in the Federal Hazardous Substances Act (15 U.S.C. 1261 et seq.) where the product is used at a source in the same manner as normal consumer use.

7.2 Trivial Activities

- Low-Emitting Combustion
  - Combustion emission from propulsion of mobile sources.
  - Portable electrical that can be moved by hand from one location to another. "Moved by hand" means capable of being moved without assistance of any motorized or non-motorized vehicle, conveyance, or device.
- Low- Or Non-Emitting Industrial Activities
  - Hand-held or manually operated equipment used for buffing, polishing, carving, cutting, drilling, sawing, grinding, turning, routing or machining of ceramic artwork, precision parts, leather, metals, plastics, fiberboard, masonry, carbon, glass, or wood;
  - Brazing, soldering, and welding equipment, and cutting torches related to manufacturing and construction activities that do not result in emission of HAP metals;
  - Brazing, soldering, and welding equipment, and cutting torches directly related to plant maintenance and upkeep and repair or maintenance shop activities that emit HAP metals;
  - Drop hammers or hydraulic presses for forging or metalworking;
  - Air compressors and pneumatically operated equipment, including hand tools;
  - Batteries and battery charging stations, except at battery manufacturing plants;
  - Process water filtration systems and demineralizers;
  - Demineralized water tanks and demineralizer vents;
  - Oxygen scavenging or de-aeration of water;
  - Steam vents and safety relief valves;
  - Steam leaks
  - Equipment using water, water and soap, or detergent, or a suspension of abrasives in water for purposes of cleaning or finishing
  - Electric Motors
- Building and Site Maintenance Activities
  - Plant and building maintenance and upkeep activities, including grounds-keeping, general repairs, cleaning, painting, welding, plumbing, re-tarring roofs, installing insulation and paving parking lots.
  - Repair or maintenance shop activities not related to the source's primary business activity, not including emissions from surface coating, de-greasing, or solvent metal cleaning activities, and not otherwise triggering a permit revision.
  - Janitorial services.

- Routine calibration and maintenance of laboratory equipment or other analytical instruments.

- Incidental, Non-Industrial Activities
  - Air-conditioning units used for human comfort that do not have applicable requirements under Title VI of the Clean Air Act.
  - Ventilating units used for human comfort that do not exhaust air pollutants into the ambient air from any manufacturing, industrial or commercial process.
  - General office activities, such as paper shredding, copying, photographic activities, pencil sharpening and blueprinting, but not including incineration.
  - Fugitive emissions related to movement of passenger vehicles, if the emissions are not counted for applicability purposes under subsection (146)(c) of the definition of major source in this Section and any required fugitive dust control plan or its equivalent is submitted with the application.
  - Adhesive use which is not related to production.
- Storage, Piping and Packaging
  - Storage tanks, vessels, and containers holding or storing liquid substances that will not emit any VOC or HAP.
  - Natural gas pressure regulator vents, excluding venting at oil and gas production facilities.
- Sampling and Testing
  - Vents from continuous emissions monitors and other analyzers.
  - Bench-scale laboratory equipment used for physical or inspection purposes, including sampling equipment used to withdraw materials for analysis.
  - Equipment used for quality control, quality assurance, or inspection purposes, including sampling equipment used to withdraw materials for analysis.
  - Individual sampling points, analyzers, and process instrumentation, whose operation may result in emissions but that are not regulated as emission units.
- Safety Activities
  - Fire suppression systems

8. LIST OF EQUIPMENT AND CONTROL DEVICES

A list of equipment has been provided in Section 2 with the associated ADEQ Equipment List form.

Control devices at the facility will be used to primarily control particulate matter emissions. Melting and casting process equipment at the facility will use control systems consisting of hood capture systems routed to baghouses. The five (5) baghouses at the Benson plant will be the only emission control devices at the Benson plant. More information regarding the baghouses can be found in Section 2.

9. REGULATORY APPLICABILITY

The Project will be subject to certain federal and state air regulations. This section summarizes the key air quality regulations that will apply under both federal and state programs.

9.1 Permit Applicability Analysis

9.1.1 Title V Applicability

ADEQ is the permitting authority for the federal Title V operating permit program approved under 40 CFR Part 70. Per A.A.C. R18-2-302.B.1, a Class I (i.e., Title V) permit shall be required for a person to begin actual construction of or operate a major source. For purposes of Class I permitting, a "major source" includes a source that directly emits or has the potential to emit, 100 tpy or more of any regulated air pollutant (see A.A.C. R18-2-101.75.c), 10 tons per year (tpy) or more of any hazardous air pollutant or 25 tpy or more of any combination of hazardous air pollutants (see A.A.C. R18-2-101.75.b). Additionally, since the proposed Benson facility is listed in listed in section 302(j) of the Clean Air Act (CAA) in the "secondary metal production plants" category, both fugitive and non-fugitive emissions are considered in determining applicability.

The proposed Benson facility PTE will exceed the single HAP threshold of 10 tpy for HCl and the total HAP threshold of 25 tpy. As such, the Facility will be subject to Title V program requirements and is applying for a Class I permit.

9.1.2 New Source Review Applicability

The New Source Review (NSR) permitting program generally requires that a stationary source obtain a permit and undertake other obligations prior to construction of any facility if the proposed project results in the potential to emit air pollution in excess of certain threshold levels. The following NSR programs were analyzed for their applicability to the Benson plant.

9.1.2.1 Major NSR Applicability

Two distinct major NSR permitting programs potentially apply depending on whether a source is located in an "attainment/unclassifiable" or "nonattainment" area for a particular regulated NSR pollutant. The PSD program provisions govern potential major NSR actions in areas which are designated to be in attainment or unclassifiable status. The Nonattainment NSR (NA-NSR) program governs potential major NSR actions in areas which are nonattainment for one or more regulated pollutants.

Aluminum Dynamics will be located in an area of Cochise County that has been classified as attainment or unclassified for all pollutants. Therefore, with respect to the federal NSR permitting program, only the PSD requirements are considered to be potentially applicable.

Because the proposed process is considered to be "secondary metal production," which is a listed source pursuant to 40 CFR §52.21(b)(1)(i)(a), the PSD applicability threshold for each regulated NSR pollutant is 100 tons per year, which Aluminum Dynamics will not exceed. Therefore, Aluminum Dynamics is not subject to major NSR permitting requirements. For the Benson plant, Aluminum Dynamics is proposing source-wide emission limits for nitrogen oxides (NO_X) and volatile organic compounds (VOC) to ensure synthetic minor status of the facility and thereby avoid PSD review for the proposed project. Source-wide potential emissions of all other regulated NSR pollutants fall below the PSD major source thresholds with no further need to impose synthetic minor emission limitations beyond the individual source limits derived from applicable local and federal air regulations.

9.1.2.2 Minor New Source Review Applicability

Per A.A.C §R18-2-334.A, minor New Source Review (mNSR) requirements shall apply when the project involves:

- Construction of any new Class I or Class II source, including the construction of any source requiring a Class II permit under §R18-2-302.01(C)(4); or
- any minor NSR modification to a Class I or Class II source.

The Facility will be classified as a new Class I source, therefore minor NSR requirements will apply.

- *A regulated minor NSR pollutant emitted by a new stationary source subject to this Section if the source will have the potential to emit that pollutant at an amount equal to or greater than the permitting exemption threshold.*

The potential to emit all regulated minor NSR pollutants except for SO_2 are above the permitting exemption threshold, therefore minor NSR requirements will apply to the Project for all regulated minor NSR pollutants, except for SO_2.

The proposed Project will trigger minor NSR requirements under A.A.C R18-2-334. Pursuant to A.A.C. R18-2-334.C, ADI must submit either a RACT demonstration pursuant to R18-2-334.C.1 and D or an ambient air quality assessment pursuant to R18-2-334.C.2. ADI has elected to submit an ambient air quality assessment meeting R18-2-334.C.2 requirements that demonstrates the Project will not interfere with attainment or maintenance of any NAAQS under separate cover. A Modeled Emission Rates for Precursors (MERPs) evaluation is included in the Air Dispersion Modeling Report which demonstrates that this Project will not cause or contribute to an exceedance of the ozone or secondary $PM_{2.5}$ NAAQS.

9.1.2.3 Part 63 Review Applicability

Per A.A.C §R18-2-1101.B, this application constitutes an application for preconstruction review and approval of a major source of HAPs pursuant to 40 C.F.R. § 63.5. The information required by § 63.5(d) is set forth in this application.

9.2 Federal and State Applicability Analysis

This section provides an applicability analysis of federal and state requirements for the Benson plant, including the following:

- New Source Performance Standards (NSPS)
  - NSPS Subpart IIII – Stationary Compression Ignition
- National Emission Standards for Hazardous Air Pollutants (NESHAP)
  - NESHAP Subpart RRR – Secondary Aluminum Production
  - NESHAP Subpart ZZZZ – Stationary Reciprocating Internal Combustion
- Compliance Assurance Monitoring
- Chemical Accident Prevention
- Strategic Ozone Protection

- Arizona Administrative Code

9.2.1 New Source Performance Standards

New Source Performance Standards (NSPS), located in 40 CFR Part 60, set performance standards for new, modified, or reconstructed sources of the regulated pollutant. The following section details the applicability of NSPS regulations to the Project's proposed operations.

9.2.1.1 NSPS Subpart Kc – Volatile Organic Liquid Storage Vessels

The NSPS Subpart Kc applicability definition in 40 CFR 60.110c(a) provides the following:

> *"…the affected facility to which this subpart applies is each storage vessel with a capacity greater than or equal to 20,000 gallons (gal) (75.7 cubic meters (m^3)) that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after October 4, 2023."*

To trigger applicability for NSPS Subpart Kc, the planned diesel and gasoline tank maximum storage capacity would need to be greater than 20,000 gallons (75.7 m^3). The proposed tanks will have a capacity below 20,000 gallons and will therefore not be subject to NSPS Subpart Kc.

9.2.1.2 NSPS Subpart LL – Metallic Mineral Processing Plants

NSPS Subpart LL applies to metallic mineral processing plants and their respective equipment. As defined in 40 CFR 60.381, a metallic mineral processing plant is considered the following:

> *any combination of equipment that produces metallic mineral concentrates from ore. Metallic mineral processing commences with the mining of ore and includes all operations either up to and including the loading of wet or dry concentrates or solutions of metallic minerals for transfer to facilities at non-adjacent locations that will subsequently process metallic concentrates into purified metals (or other products), or up to and including all material transfer and storage operations that precede the operations that produce refined metals (or other products) from metallic mineral concentrates at facilities adjacent to the metallic mineral processing plant. This definition shall not be construed as requiring that mining of ore be conducted in order for the combination of equipment to be considered a metallic mineral processing plant. (See also the definition of metallic mineral concentrate.)*

As seen in the above definition, metallic mineral processing plants are defined as pieces of equipment that produce metallic mineral concentrate from ore. The Benson plant will not receive ore for processing in the facility as only pre- and post-consumer aluminum will be received. Because the plant doesn't receive metallic ore, the facility will not be subject to NSPS Subpart LL.

9.2.1.3 NSPS Subpart JJJJ – Stationary Spark Ignition Internal Combustion Engines

NSPS Subpart JJJJ applies to manufacturers, owners, and operators of stationary spark-ignition (CI) internal combustion engines (ICE) as specified in 40 CFR 60.4200(a) through (e). NSPS Subpart JJJJ sets emission standards for NO_X, CO, PM, and hydrocarbons (HC) for certain types of SI ICE. Pursuant to 40 CFR 60.4230, Subpart JJJJ applies to owners and operators of stationary SI ICE manufactured on or after January 1, 2009 for emergency engines with a maximum engine power greater than 19 kW.

The proposed Kohler emergency generator engine will be used for back-up power and is rated at 26 kW. This unit will have a manufacturer date after 2009 thus, this SI ICE is subject to NSPS Subpart JJJJ. Pursuant to 40 CFR 60.4233(d), emergency engines rated greater than 19 kW but less than 75 kW, the engine purchased by Aluminum Dynamics must be certified by the manufacturer to meet the emissions standards for emergency engines in Table 1 of the subpart. The engines must be installed and configured according to the manufacturer's emission-related specifications.

Owners and operators of emergency engines must comply with the emissions limitations of NSPS Subpart JJJJ by purchasing certified engines with non-resettable hour meters, performing maintenance on the engines according to the manufacturer's written instructions, and keeping records of maintenance and engine certifications on-site. Additionally, pursuant to 60.4243(d), emergency engines cannot operate for more than 50 hours for non-emergency use and 100 total hours for non-emergency use, maintenance, and testing.

9.2.2 National Emission Standards for Hazardous Air Pollutants for Source Categories

National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories, located in 40 CFR Part 63, have been promulgated for source categories that emit hazardous air pollutants (HAP). A facility that is a major source of HAP is defined as having potential emissions greater than 25 tpy of total HAPs and/or 10 tpy of a single HAP. Facilities with a potential to emit HAP at an amount less than the major source thresholds are otherwise considered an "area source." The NESHAP allowable emission limits are most often established on the basis of a maximum achievable control technology (MACT) determination for the particular source. The NESHAP apply to sources in specifically regulated industrial source categories (Clean Air Act [CAA] Section 112(d)) or on a case-by-case basis (CAA Section 112(g)) for facilities not regulated as a specific industrial source type.

The Benson plant will be classified as major source of HAP because it will have potential HAP emissions greater than the major source thresholds. The determination of applicability for NESHAP requirements for major sources of HAP are detailed in the following sections. Pursuant to the requirements of 40 CFR § 63.1(a)(2), all affected sources subject to source-specific NESHAP are subject to the general provisions of NESHAP Subpart A unless specifically excluded by the source-specific NESHAP.

9.2.2.1 NESHAP Subpart Q – Industrial Process Cooling Towers

Pursuant to 40 CFR 63.400(a), since Aluminum Dynamics will not operate the cooling tower with chromium-based water treatment chemicals, the Cooling Tower is not an affected source under this standard.

9.2.2.2 NESHAP Subpart RRR – Secondary Aluminum Production

The NESHAP for Secondary Aluminum Production at 40 CFR Subpart RRR (SMACT) applies to numerous new and existing equipment types that are commonly used for secondary aluminum production and that are located at a major source of HAP emissions. General requirements to comply with SMACT include the following:

- Preparing a written Operation, Maintenance, and Monitoring Plan (OMMP) within 90 days after a successful initial performance test
- Preparing a site-specific test plan prior to conducting any SMACT performance test
- Demonstrate initial compliance with each applicable emission, equipment, work practice, or operational standard for each affected source and report the results in a Notification of Compliance Status Report (NOCSR) to be submitted within 90 days after conducting the initial performance test
- Conduct an initial performance test within 180 days after startup and every 5 years following

- ► Inspect labels for each Group 1 furnace, Group 2 furnace, in-line fluxer, and scrap dryer/delacquering kiln/decoating kiln at least monthly
- ► Inspect each capture and collection system at least once each calendar year
- ► Submit semiannual reports within 60 days after the end of each 6-month period including when no deviations of parameters have occurred
- ► Submit results of any performance test within 60 days after completing each test

As a unit that "crush, grind, granulate, shear, or break aluminum scrap into a more uniform size prior to processing or charging to a *scrap dryer/delacquering kiln/decoating kiln*, or furnace," the Scrap Processing System is considered to be an *aluminum scrap shredder* under SMACT. Requirements from SMACT for aluminum scrap shredders include:

- ► As an aluminum scrap shredder with emissions controlled by a fabric filter, Cold Baghouse #1, Aluminum Dynamics must operate a bag leak detection system, a continuous opacity monitor, or conduct visible emissions observations to comply with 40 CFR 1506(e).
- ► The shredder cannot discharge emissions in excess of 0.010 grain (gr) of PM per dry standard cubic foot (dscf).
- ► The capture and collection systems (CCS) associated with the new scrap shredder will need to be designed to meet the engineering standards published by the American Conference of Governmental and Industrial Hygienists (ACGIH) in Chapters 3 and 5 of *Industrial Ventilation: A Manual of Recommended Practice* (herein referred to as the ACGIH Manual) pursuant to 40 CFR 63.1506(c).

The Decoater will be classified as new *scrap dryers/delacquering kilns/decoating kiln* where the scrap decoating kiln will be used to remove various organic contaminants such as oils, paints, lacquers, and inks from aluminum scrap prior to melting. Requirements from SMACT for scrap dryers/delacquering kilns/decoating kilns include:

- ► Total hydrocarbon (THC), PM, hydrogen chloride (HCl), and dioxin/furan (D/F) emissions standards.
- ► Complying with relevant operating limitations outlined in the SMACT such as proper unit labeling, general work practice standards, feed/charge weight tracking, afterburner operating temperature requirements, etc.
- ► Comply with relevant control device operating limitations outlined in the SMACT including CCS design requirements, baghouse inlet temperature, lime injection rate, and the same bag leak provisions noted for the cold baghouse serving the Scrap Processing System.

As furnaces that receive feedstocks other than clean charge and utilize reactive solid salt reactive chlorine flux injection, the sidewell Melting Furnaces #1 and #2 will be classified as new Group 1 Furnaces with add-on pollution control devices under the SMACT. Pursuant to 40 CFR 63.1505(i), controlled Group 1 Furnaces are subject to PM, D/F, and HCl emissions standards and are also required to comply with relevant operating limitations as outlined in the SMACT. Pursuant to 40 CFR 63.1506(c), all capture and collection systems associated with the sidewell melting furnaces (i.e., Hot Baghouses #2 and #3) must be designed to meet the relevant design standards found in the ACGIH Manual.[16] Monitoring requirements are specified in 40 CFR 63.1506(m) and 40 CFR 63.1510. Pursuant to 40 CFR 63.1510(h), Aluminum Dynamics must install, calibrate, maintain, and operate a device to continuously monitor and record the temperature of the fabric filter inlet gases, and pursuant to 40 CFR 63.1506(d), the owner or operator must install and operate a device that measures and records or otherwise determine the weight of feed/charge (or throughput) for each operating cycle or time period used in the performance test.

[16] Industrial Ventilation: A Manual of Recommended Practice, 23rd edition or appropriate chapters of the 27th edition.

As a furnace that utilizes reactive solid salt reactive chlorine flux injection, the Holding Furnace #1 will be classified as a new Group 1 Furnace with add-on pollution control devices under the SMACT. Pursuant to 40 CFR 63.1505(i), controlled Group 1 Furnaces that only process clean charge are subject to PM and HCl emissions standards and are also required to comply with relevant operating limitations as outlined in the SMACT. The same basic SMACT operating limitations and monitoring requirements described previously for the Group 1 sidewell melting furnaces and their associated lime-injected baghouses generally apply to the Holding Furnace #1 and its associated lime-injected baghouse, Hot Baghouse #3.

The new In-Line Degasser is used to refine molten aluminum prior to casting through the use of non-reactive gaseous fluxing with argon gas. Pursuant to 40 CFR 63.1505(j)(3), the otherwise applicable PM and HCl emissions standards for in-line fluxers in 40 CFR 63.1505(j)(1) and (2) do not apply to an in-line fluxer that uses no reactive flux materials. This no reactive flux material usage operating status must be certified on a semiannual basis in accordance with 40 CFR 63.1510(m) and 40 CFR 63.1516(b)(2)(vi).

9.2.2.3 NESHAP Subpart ZZZZ – Stationary Reciprocating Internal Combustion

Pursuant to 40 CFR 63.6585, RICE MACT applies to stationary reciprocating internal combustion engines (RICE) located at facilities that are classified as either major or area sources of HAP emissions. The Emergency Generator Engine #1 will be installed after the relevant classification date for new stationary RICE of June 12, 2006, for RICE less than 500 hp and December 19, 2002, for RICE greater than 500 hp. Therefore, the new diesel-driven emergency generators will be classified as new sources under RICE MACT. Pursuant to 40 CFR 63.6590(b) an initial notification must be submitted after startup of the emergency generator; however, the emergency generator is otherwise exempt from any further requirements in RICE MACT.

9.2.3 Compliance Assurance Monitoring

The Compliance Assurance Monitoring (CAM) Rule under 40 CFR Part 64 applies to each pollutant specific emission unit that satisfies all of the following criteria:

- 1. Is subject to an emission limitation or standard for the applicable regulated air pollutant;
- 2. Uses a control device to achieve compliance with any such emission limitation or standard;
- 3. Has potential pre-control emissions of the applicable regulated air pollutant that are equal to or greater than the applicable major source threshold under 40 CFR 70; and
- 4. Is not otherwise exempt.

Both the decoater and holding furnace will have pre-control emissions of HCl above the single-largest HAP major source threshold. However, because both emission units are subject to SMACT regulations, the decoater and holding furnace will be exempt from CAM requirements under the list provided in 40 CFR 64.2(b)(1)(i). As such, no individual emission unit at the Benson facility will be subject to CAM rules.

9.2.4 Chemical Accident Prevention

CAA Section 112(r). The applicability of this subpart is determined based on the type and quantity of the chemicals stored at the facility.

This list of regulated substances does not include ultra-low sulfur diesel fuel, kerosene or gasoline, which will be stored on-site for equipment and maintenance vehicles.

Aluminum Dynamics will not store any RMP chemicals in quantities greater than the RMP trigger thresholds at the Benson facility. Therefore, the requirements of 40 CFR Part 68 are not applicable to ADI. However, the facility will be subject to the provisions of the CAA General Duty Clause, Section 112, as it pertains to accidental releases of hazardous materials.

9.2.5 Stratospheric Ozone Protection Regulations

The requirements originating from Title VI of the Clean Air Act, Protection of Stratospheric Ozone, are contained in 40 CFR Part 82. Subparts A through E, Subpart G, Subpart H, and Subpart I of 40 CFR Part 82 will not be applicable to the Benson facility.

40 CFR Part 82 Subpart F, Recycling and Emissions Reduction, potentially applies if the facility maintains, repairs, services, or disposes of appliances that utilize Class I or Class II ozone depleting substances. Subpart F generally requires persons completing the repairs, service, or disposal to be properly certified. An appropriately certified technician will complete all repairs, service, and disposal of ozone depleting substances from the comfort cooling components at the facility.

9.2.6 Arizona Administrative Code (A.A.C.)

The Project is subject to regulations contained in A.A.C. R18 Chapter 2 (Air Pollution Control). Table 9-1 through Table 9-4 contain summaries of the applicable ADEQ requirements for the Project. Additional details regarding methods used for determining compliance are contained in Table 9-5 through Table 9-7.

Table 9-1. Project – State Regulatory Applicability Analysis – Article 3

Potentially Applicable Regulation		Equipment Potentially Applicable To	Comments
ID	Title		
A.A.C. R18-2-302	Applicability; Registration; Classes of Permit	Facility-wide	Site-wide non-fugitive source emissions are expected to be greater than the permitting exemption thresholds and will also be greater than the major source thresholds. As such, ADI will obtain an ADEQ Class I permit prior to actual construction or operation of the Project.
A.A.C R18-2-304	Permit Application Processing Procedures	Facility-wide	ADI will complete the Class I standard application form and submit the form with required information outlined in part B.
A.A.C. R18-2-307.A.1	Permit Review by the EPA and Affected States	Facility-wide	ADI will submit a copy of the completed application to the Administrator.
A.A.C. R18-2-309	Compliance Plan; Certification	Facility-wide	ADI will submit an annual compliance certification in accordance with the timelines and procedures specified in this section.
A.A.C. R18-2-310.01	Reporting Requirements	Facility-wide	ADI will report any emission in excess of the limits established in the permit to the Director in an excess emission report.
A.A.C R18-2-311	Test Methods and Procedures	Facility-wide	ADI will utilize test methods and procedures outlined in this rule.
A.A.C. R18-2-312	Performance Tests	Facility-wide	ADI will perform performance tests on the timeline presented in the rule. Performance tests will perform based off timeline outlined in the rule.
A.A.C. R18-2-315	Posting of Permit	Facility-wide	ADI will post the permit in a location where it will be clearly visible and accessible.
A.A.C. R18-2-327	Annual Emissions Inventory Questionnaire	Facility-wide	ADI will complete and submit to the Director an annual emissions inventory questionnaire.
A.A.C. R18-2-330.F	Public Participation	Facility-wide	ADI will post a notice containing the information required in R18-2-330.D at where the Project is located.
A.A.C. R18-2-334	Minor New Source Review	Facility-wide	ADI will comply with the requirements of this rule by implementing RACT and/or performing an ambient air quality assessment for each regulated minor NSR pollutant subject to this section.

Table 9-2. Project – State Regulatory Applicability Analysis – Article 6

Potentially Applicable Regulation		Equipment Potentially Applicable To	Comments
ID	**Title**		
A.A.C. R18-2-602	Open Burning	▶ Facility-wide	ADI will not engage in any open burning without first obtaining a permit from the appropriate authority, except for those open outdoor fires exempt from a permit.
A.A.C. R18-2-604	Open Areas, Dry Washes, or Riverbeds	▶ Facility-wide construction	ADI will utilize good modern practices (e.g., dust suppressants, paving, covering, or other acceptable means) to keep dust at a minimum when constructing or modifying the site.
A.A.C. R18-2-605	Roadways and Streets	▶ Roadways. ▶ Material transportation.	ADI will utilize good modern practices (e.g., temporary paving, dust suppressants, wetting down, detouring or by other reasonable means) to keep dust and other particulates to a minimum.
A.A.C. R18-2-606	Material Handling	▶ Scrap Processing System and Lime Silo	ADI will take reasonable precautions such as covering loads, dust suppressants and hoods to prevent excessive emission of particulate matter.
A.A.C. R18-2-614	Evaluation of Nonpoint Source Emissions	▶ Roadways ▶ Material transportation ▶ Scrap Processing System ▶ Lime Silo	ADI will comply with the 40% opacity requirement for all non-point sources. ADI will conduct an initial visual assessment, and if any visible emissions are detected, will follow-up with an EPA Method 9 evaluation.

Table 9-3. Project – State Regulatory Applicability Analysis – Article 7

Potentially Applicable Regulation		Equipment Potentially Applicable To	Comments
ID	**Title**		
A.A.C. R18-2-702	General Visible Emissions Standard	► Facility-wide	ADI will comply with the 20% opacity requirement for all existing point sources. ADI will conduct an initial visual assessment, and if any visible emissions are detected, will follow-up with an EPA Method 9 evaluation.
A.A.C. R18-2-703	Existing Fossil-fuel Fired Steam Generators and General Fuel-burning Equipment	► Sow Dryer and Filter Preheater Box	Not applicable as these heaters operate as direct-fired process heaters, which are exempt from the rule.
A.A.C. R18-2-704	Incinerators	► Facility-wide	ADI will not utilize incinerators. Therefore, rule is not applicable.
A.A.C. R18-2-710	Existing Storage Vessels for Petroleum Liquids	► Gasoline and Diesel Storage Tanks and Refueling Station	Not applicable, since the tanks are subject to R18-2-905 and not "existing" per definition of "existing source" pursuant to A.A.C. §R18-2-701(16).
A.A.C. R18-2-719	Existing Stationary Rotating Machinery	► Emergency Generator Engine #1	Not applicable, since the emergency generator will be subject to NSPS JJJJ (R18-2-901), therefore is not "existing" per definition of "existing emissions unit" pursuant to A.A.C. §R18-2-701(16).
A.A.C. R18-2-721	Existing Nonferrous Metals Industry Sources	► Decoater #1, Sidewell Metling Furnaces #1 and #2, Holding Furnace #1, In-Line Degasser #1, Sow Dryer, Dross House, Dross Press	ADI will operate metal processing equipment in a way to meet the emission limitations in the rule. Test methods and procedures as required in the rule will be followed.
A.A.C. R18-2-722	Existing Gravel or Crushed Stone Processing Plants	► Facility-wide	Not applicable, ADI will not utilize any combination of equipment or machinery to mine, excavate, separate, combine, crush, or grind any nonmetallic mineral. Therefore, rule is not applicable.

Potentially Applicable Regulation		Equipment Potentially Applicable To	Comments
ID	Title		
A.A.C. R18-2-724	Fossil-fuel Fired Industrial and Commercial Equipment	► Sow Dryer and Filter Preheater Box	Not applicable, as the Sow Dryer and Filter Preheater box operate as direct-fired process heaters, which are exempt from the rule.
A.A.C. R18-2-726	Sandblasting Operations	► Facility-wide	ADI will comply with all the requirements of this rule.
A.A.C. R18-2-727	Spray Painting Operations	► Facility-wide	ADI will perform spray coating inside an appropriate enclosure with controls to contain 96% of overspray.
A.A.C. R18-2-730	Unclassified Sources	► Cooling Towers 1 and 2	ADI will comply with the particulate matter emission standards set in this rule

Table 9-4. Project – State Regulatory Applicability Analysis – Article 9 and 11

Potentially Applicable Regulation		Equipment Potentially Applicable To	Comments
ID	Title		
A.A.C. R18-2-901	Standards of Performance for New Stationary Sources	Various	ADI will comply with the requirements of this section by complying with applicable NSPS described in Section 1.2.2 above, including R18-2-901.1 (A), and 85 (JJJJ).
A.A.C. R18-2-905	Standards of Performance for Storage Vessels for Petroleum Liquids	Diesel and Gasoline Tanks	ADI will comply with the requirements of this section by equipping any petroleum liquid storage tank of less than 40,000 gallons with a submerged filling device or acceptable equivalent for the control of hydrocarbon emissions. All pumps and compressors which handle volatile organic compounds shall be equipped with mechanical seals or other equipment of equal efficiency to prevent the release of organic contaminants into the atmosphere.
A.A.C. R18-2-1101	National Emission Standards for Hazardous Air Pollutants (NESHAPs)	Various	ADI will comply with the requirements of this section by complying with applicable NESHAP described in Section 1.2.1 above, including R18-2-1101.B.1 (A), 53 (RRR), and 81 (ZZZZ).

Table 9-5. Project Applicable Regulatory Requirements of A.A.C. R18-2-700 and Methods for Determining Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used for Determining Compliance
A.A.C. R18-2-702.B.3.	For all sources described in A.A.C. R18-2-702.A (except as otherwise provided in Title 18, Chapter 2 of the A.A.C. relating to specific types of sources): • Opacity ≤ 20% If the presence of uncombined water is the only reason for an exceedance of the opacity limit, the exceedance shall not constitute a violation.	Facility procedure; records of monthly visual surveys; records of Method 9 observations.
A.A.C. R18-2-721	For all sources described in A.A.C. R18-2-721.A: Reference Methods in 40 CFR 60 Appendix A will be used to determine compliance. These methods include: Method 5 for the concentration of particulate matter and the associated moisture content; Method 1 for sample and velocity traverses; Method 2 for velocity and volumetric flow rate; Method 3 for gas analysis and calculation of excess air, using the integrated sample technique; Method 6 for concentration of SO_2. Additional requirements listed in R18-2-721.H	Facility procedure;

Table 9-6. Project Applicable Regulatory Requirements of A.A.C. R18-2-900 and Methods for Determining Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used for Determining Compliance
40 CFR 60.7(a)(1) A.A.C R18-2-901.1	Provide notification of the date construction (or reconstruction as defined under 40 CFR 60.15) commenced postmarked no later than 30 days after such date. This requirement does not apply in the case of mass-produced facilities which are purchased in completed form.	Facility procedure, submittal of notifications, maintenance of records.
40 CFR 60.7(a)(3) A.A.C. R18-2-901.1	Provide notification of the actual date of initial startup postmarked within 15 days after such date.	Facility procedure, submittal of notifications, maintenance of records.
40 CFR 60.7(a)(4) A.A.C. R18-2-901.1	Submit a notification of any physical or operational change to an existing facility which may increase the emission rate of any air pollutant to which a standard applies, unless that change is specifically exempted under an applicable subpart or in 40 CFR 60.14(e). This notice shall be postmarked 60 days or as soon as practicable before the change is commenced and shall include information describing the precise nature of the change, present and proposed emission control systems, productive capacity of the facility before and after the change, and the expected completion date of the change.	Submittal of notifications, maintenance of records
40 CFR 60.7(a)(6) A.A.C. R18-2-901.1	Submit a notification of the anticipated date for conducting the opacity observations required by 40 CFR 60.11(e)(1). The notification must also include, if appropriate, a request for the Administrator to provide a visible emissions reader during a performance test. The notification must be postmarked not less than 30 days prior to such date.	Submittal of notifications, maintenance of records
40 CFR 60.7(b) A.A.C. R18-2-901.1	Maintain records of: • The occurrence and duration of any startup, shutdown, or malfunction in the operation of an affected facility; • Any malfunction of the air pollution control equipment; and • Any periods during which a continuous monitoring system or monitoring device is inoperative.	Facility procedure; maintenance of records

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used for Determining Compliance
40 CFR 60.7(c) A.A.C. R18-2-901.1	Submit excess emissions and monitoring systems performance report and/or summary report form to the Administrator semiannually, except when more frequent reporting is specifically required by an applicable subpart; or the Administrator, on a case-by-case basis, determines that more frequent reporting is necessary to accurately assess the compliance status of the source. All reports shall be postmarked by the 30th day following the end of each six-month period.	Submittal of report, maintenance of records
40 CFR 60.7(f) A.A.C. R18-2-901.1	Maintain a file of all measurements in a permanent form suitable for inspection. Retain the file for at least two years following the date of such measurements.	Facility procedure; maintenance of records
40 CFR 60.8(a) A.A.C. R18-2-901.1	Completion of performance test in accordance with 40 CFR 60.8 demonstrating compliance with applicable limits within 60 days after achieving the maximum production rate, but no later than 180 days after initial startup. Submittal of written report of the results of the performance tests to the Director and Administrator.	Performance of EPA Reference Method Tests
40 CFR 60.11(d) A.A.C. R18-2-901.1	At all times, including periods of startup, shutdown, and malfunction, maintain, and operate, to the extent practicable, any affected facility including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions.	Facility procedure; maintenance of records
40 CFR 60.11(e) A.A.C. R18-2-901.1	If no performance test under 40 CFR 60.8 is required, completion of opacity observations demonstrating compliance with applicable limits within 60 days after achieving the maximum production rate, but no later than 180 days after initial startup.	Performance of EPA Reference Method 9 Tests.
A.A.C. R18-2-905	Equip petroleum liquid storage tanks of <40,000 gallons with a submerged filling device Equip all facilities for dock loading of petroleum products with a vapor pressure of >2.0 pounds per square inch with submerged filling or other equivalent for the control of hydrocarbon emissions Equip all pumps and compressors which handle volatile organic compounds with mechanical seals or other equipment of equal efficiency to prevent the release of organic contaminants into the atmosphere	Facility procedure; maintenance of records

Table 9-7. Project Applicable Regulatory Requirements of NSPS and NESHAP and Methods for Demonstrating Compliance

Regulatory Citation for Applicable Requirements	Description of Requirements	Methods Used to Demonstrate Compliance
40 CFR 60 Subpart A A.A.C. R18-2-902	Comply with 40 CFR 60 Subpart A requirements of initial notification, performance testing, recordkeeping and monitoring, and mandates general control device requirements for all other subparts as applicable.	Facility procedure; maintenance of records
40 CFR 63 Subpart A A.A.C. R18-2-902	Comply with 40 CFR 63 Subpart A requirements of initial notification, performance testing, recordkeeping and monitoring, etc.	Facility procedure; maintenance of records
40 CFR 60 Subpart IIII A.A.C. R18-2-901.	Comply with 40 CFR Subpart IIII requirements for stationary compression ignition (CI) internal combustion engine (ICE) with model year of 2007 or later	Facility procedure; maintenance of records
40 CFR 63 Subpart RRR A.A.C. R18-2-901.53	Comply with 40 CFR Subpart RRR requirements for all affected sources	Facility procedure; maintenance of records
40 CFR 63 Subpart ZZZZ A.A.C. R18-2-901.81	Comply with 40 CFR Subpart ZZZZ requirements for emergency stationary reciprocating internal combustion engines located at a major HAP source	Facility procedure; maintenance of records

10. PERMIT PROCESSING FEE

In accordance with A.A.C R18-2-326, Fees Related to Individual Permits, and the ADEQ Permit Fee Schedule[17] (effective November 1, 2024), no fee is being submitted with this Class I permit application. However, ADI agrees to pay the $202.60 per hour processing fee required based on the total actual time spent by ADEQ staff on processing this application as well as any fees associated with public notice.

[17] https://static.azdeq.gov/aqd/aqd_class_fees.pdf

11. COMPLIANCE PLAN AND CERTIFICATION

As required by A.A.C. R18-2-304(B)(8)(b) and ADEQ's Instructions in Section 2-4, Item 16 and 17 of ADEQ's Application Packet for a Class I Permit, ADI is committed to maintaining compliance as follows:

- Compliance certification.

  The Project is in compliance with all applicable requirements noted as applicable to the Project in Tables 9-1 through 9-7 of this application. ADI determined compliance using the methods described in each of the tables for the applicable requirements identified therein or, for unconstructed units and activities, by knowledge that the affected equipment or activity triggering an applicable requirement is not yet constructed or occurring.

- For applicable requirements with which the source is in compliance at the time of permit issuance.

  The Project source will continue to comply with applicable requirements.

- For applicable requirements that will become effective during the permit term.

  The Project will meet in a timely manner applicable requirements that become effective during the permit term. ADI is not presently aware of any particular applicable requirements requiring a more specific future schedule. Furthermore, ADI shall submit a compliance certification annually which describes the compliance status of the Project with respect to each permit condition.

- A schedule of compliance for sources that are not in compliance with all applicable requirements at the time of permit issuance. Such a schedule shall include a schedule of remedial measures, including an enforceable sequence of actions with milestones, leading to compliance with any applicable requirements for which the source will be in noncompliance at the time of permit issuance. This compliance schedule shall resemble and be at least as stringent as that contained in any judicial consent decree or administrative order to which the source is subject. Any such schedule of compliance shall be supplemental to, and shall not sanction noncompliance with, the applicable requirements on which it is based.

  The Project is not out of compliance with any applicable requirements. Therefore, no compliance schedule is required.

- A schedule for the submission of certified progress reports no less frequently than every 6 months for sources required to have a schedule of compliance to remedy a violation.

  The Project is not subject to a compliance schedule and therefore is not subject to a requirement to schedule certified progress reports.

12. ENVIRONMENTAL JUSTICE

For many years, it has been federal policy that environmental actions, including permit issuance, ensure "the fair treatment and meaningful involvement of all people regardless of race, color, national origin or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies." In more recent years, the focus has become stronger on identifying underserved and overburdened communities, particularly those that have historically been marginalized, to ensure that they do not suffer from a disproportionate additional impact from a proposed environmental action. ADI shares these concerns and is committed to minimizing adverse impacts on all communities.

ADI has reviewed EPA's EJ Screen 2.1 tool to help it understand the communities in which it is located. This review indicated that the area around the proposed Project is fairly representative of the state as a whole. Relevant demographic indicators include:

Table 12-1. Relative Demographic Indicators

Demographic Indicator	Value	State Average	State Percentile
People of color	26%	44%	31%
Low-income population	39%	31%	67%
Linguistically isolated population	2%	4%	61%
Population < high school education	9%	12%	55%
Population > 64 years of age	31%	21%	80%
EPA calculated Demographic Index	1.39	1.53	52%

EPA's "Interim Environmental Justice and Civil Rights in Permitting Frequently Asked Questions" (Aug. 2022), suggests the use of benchmarks at 80, 90 or 95th percentiles (page 9 of Appendix B). The only community that exceeds any of these benchmarks is the population > 64 years of age, which is neither a group of color nor low income that triggers heightened EJ review. From this study, ADI does not believe that the proposed Benson plant will harm a potentially underserved community.

For additional detail into the results of the EJ Screen, a copy of the initial EJ Screen 2.1 report is included in Appendix E.

APPENDIX A. EMISSIONS CALCULATIONS

1. Aluminum Dynamics, Gila Bend Facility - Emission Unit Index

The following table provides an index of emission units that are referenced in the emission calculations and on air permit application forms.

Plant Area	Source ID	Process ID	Emission Unit Description	Process Description	Control Device ID	Control Device Description	Plant Stack ID	Stack Description
01. Scrap Processing	001	1	Scrap Processing System #1	Aluminum Production	BH1	Cold Baghouse #1	S1	Cold Baghouse #1 Stack
02. Melting and Casting	002	1	Decoater #1	Aluminum Production	BH2	Hot Baghouse #1	S2	Hot Baghouse #1 Stack
02. Melting and Casting	002	2	Decoater #1	Natural Gas Usage	BH2	Hot Baghouse #1	S2	Hot Baghouse #1 Stack
02. Melting and Casting	003	1	Melting Furnace #1	Aluminum Production	BH3	Hot Baghouse #2	S3	Hot Baghouse #2 Stack
02. Melting and Casting	003	2	Melting Furnace #1	Natural Gas Usage	BH3	Hot Baghouse #2	S3	Hot Baghouse #2 Stack
02. Melting and Casting	004	1	Melting Furnace #2	Aluminum Production	BH3	Hot Baghouse #3	S4	Hot Baghouse #3 Stack
02. Melting and Casting	004	2	Melting Furnace #2	Natural Gas Usage	BH3	Hot Baghouse #3	S4	Hot Baghouse #3 Stack
02. Melting and Casting	005	1	Holding Furnace #1	Aluminum Production	BH4	Hot Baghouse #3	S4	Hot Baghouse #3 Stack
02. Melting and Casting	005	2	Holding Furnace #1	Natural Gas Usage	BH4	Hot Baghouse #3	S4	Hot Baghouse #3 Stack
02. Melting and Casting	006	1	In-Line Degasser #1	Aluminum Production	BH4	Hot Baghouse #3	S4	Hot Baghouse #3 Stack
02. Melting and Casting	007	1	Sow Dryer	Natural Gas Usage	na	na	na	Building Fugitives
02. Melting and Casting	008	1	Dross House	Dross Production	BH5	Dross House Baghouse	S6	Dross House Baghouse Stack
02. Melting and Casting	008	2	Dross House Fugitives	Dross Production	na	na	na	Building Fugitives
02. Melting and Casting	009	1	Dross Press	Dross Production	na	na	na	Building Fugitives
02. Melting and Casting	010	1	Filter Box Preheater #1	Natural Gas Usage	na	na	na	Building Fugitives
03. Auxiliary Systems	011	1	Cooling Tower #1	Circulating Water	na	na	S7	Cooling Tower #1 Stack
03. Auxiliary Systems	012	1	Cooling Tower #2	Circulating Water	na	na	S8	Cooling Tower #2 Stack
03. Auxiliary Systems	013	1	Hot Baghouses Lime Silo	Lime Processed	na	na	na	Hot Baghouses Lime Silo Integral Bin Vent Filter Discharge
03. Auxiliary Systems	017	1	Haul Roads and Storage Yards	Paved Road Vehicle Miles Travelled	na	na	na	Haul Roads and Storage Yards
03. Auxiliary Systems	017	2	Haul Roads and Storage Yards	Unpaved Surface Vehicle Miles Travelled - Fork Trucks	na	na	na	Haul Roads and Storage Yards
03. Auxiliary Systems	017	3	Haul Roads and Storage Yards	Unpaved Surface Vehicle Miles Travelled - Heavy Duty Fork Trucks	na	na	na	Haul Roads and Storage Yards

1. Scrap Processing System

> One aluminum scrap processing system (#1) will be used to de-bale, shred, clean, and sort purchased aluminum scrap in preparation for further processing in the decoater. The scrap mix expected to be processed by the new scrap processing system will primarily consist of used beverage can (UBC) scrap, other forms of post-consumer scrap, and post industrial scrap from the food and beverage, automotive, and building and construction scrap markets. The scrap processing system will contain equipment classified as a new aluminum scrap shredder under the National Emission Standards for Hazardous Air Pollutants for Secondary Aluminum Production defined under 40 CFR 63, Subpart RRR (i.e., herein referred to as SMACT).

Emission Unit IDs:	**001-1**
Emission Unit Descriptions:	**Scrap Processing System #1**

1.1 Scrap Processing System Process Rates: Metal Throughput

1.1.1 Scrap Processing System Metal Processing Capacity

Maximum Hourly Aluminum Throughput:	33.0	ton/hr
Maximum Annual Throughput:	289,080	ton/yr

1.2 Baghouse Stack PM Emission Factor for Aluminum Scrap Processing System

> Emissions from the scrap processing system will be collected and routed to a dedicated baghouse (Cold Baghouse #1) for PM emissions control.

> Potential emissions for PM are estimated using an emission factor derived from the baghouse's emisisons performance (as exit grain loading) design basis. Emission factors are presented as the expected exit grain loading associated with the baghouse converted to a lb/ton Al processed basis using the flow capacity of the baghouse and the rated aluminum throughput capacity of the associated scrap processing system equipment.

> Filterable particulate emissions are speciated into filterable PM10 and filterable PM2.5 size fractions based on EPA's *PM Calculator* database for the relevant Source Classification Code (SCC) associated with secondary aluminum scrap shredding operations.

> The PM control efficiency assigned to the Cold Baghouse #1 to calculate the uncontrolled emission factor matches the nominal PM control efficiency for a well-designed baghouse with moderate inlet loading. Due to the high exhaust flow rate dedicated to the scrap processing system's capture and collection system to meet ACGIH requirements and the relatively low dust generation from scrap metal shredding, cleaning, and sorting processes as compared to other material handling industry sectors, the inlet loading to the baghouse is expected to be near the low end of the typical inlet loading range specified in EPA's Air Pollution Control Technology Fact Sheet for a pulse-jet cleaned fabric filters (commonly referred to as a baghouse). At this moderate inlet loading, Cold Baghouse #1 would not achieve the 99% PM control efficiency typically referenced for new baghouses when applicants assign a generic control efficiency to a new control system in the absence of source-specific baghouse inlet and outlet testing.

> The uncontrolled PM/PM10/PM2.5 emission factor derivation for the scrap processing system is presented here for reference.

Parameter	Value	Basis
Controlled Filt. PM Emission Factor (Grain Loading Basis)	0.002 gr/dscf	Exit grain loading design basis of Cold Baghouse #1
Filt. PM10 to Filt. PM Ratio	0.51 --	EPA's PM Calculator for appropriate SCC
Filt. PM2.5 to Filt. PM Ratio	0.15 --	
Controlled Filt. PM10 Emission Factor (Grain Loading Basis)	0.0010 gr/dscf	0.002 gr filt. PM/dscf x 0.51 lb filt. PM10/lb filt. PM = 0.0010 gr PM10/dscf
Controlled Filt. PM2.5 Emission Factor (Grain Loading Basis)	3.00E-04 gr/dscf	0.002 gr filt. PM/dscf x 0.15 lb filt. PM2.5/lb filt. PM = 3.00E-04 gr PM2.5/dscf
Cold Baghouse #1 Flow Capacity for Scrap Processing System #1	90,885 dscfm	Based on vendor design data
Maximum Hourly Aluminum Process Rate for Scrap Processing System #1	33.0 ton/hr	Design aluminum processing capacity
Nominal PM/PM10/PM2.5 Control Efficiency of the Cold Baghouse	90%	PM collection efficiency reflective of control efficiency typically achieved by a high air flow rate and moderate inlet loading dust collectors serving aluminum scrap processing systems.

1.2.1 PM/PM10/PM2.5 Baghouse Stack Emission Factors for Scrap Processing System #1

Parameter	Value	Basis
Controlled Filt. PM Emission Factor (Production Basis)	0.047 lb/ton	0.002 gr filt. PM/dscf x 90,885 dscf/min x 60 min/hr x 1 lb / 7,000 gr x 1 /33.0 ton Al/hr = 0.047 lb PM/ton Al
Uncontrolled Filt. PM Emission Factor (Production Basis)	0.47 lb/ton	0.002 gr filt. PM/dscf x 90,885 dscf/min x 60 min/hr x 1 lb / 7,000 gr x 1 /33.0 ton Al/hr x 1 / (1 - 0.90) = 0.47 lb PM/ton Al
Controlled Filt. PM10 Emission Factor (Production Basis)	0.024 lb/ton	0.047 lb PM/ton x 0.51 lb filt. PM10/lb filt. PM = 0.024 lb PM10/ton
Uncontrolled Filt. PM10 Emission Factor (Production Basis)	0.24 lb/ton	0.47 lb PM/ton x 0.51 lb filt. PM10/lb filt. PM = 0.24 lb PM10/ton
Controlled Filt. PM2.5 Emission Factor (Production Basis)	0.0071 lb/ton	0.047 lb PM/ton x 0.15 lb filt. PM2.5/lb filt. PM = 0.0071 lb PM2.5/ton
Uncontrolled Filt. PM2.5 Emission Factor (Production Basis)	0.071 lb/ton	0.47 lb PM/ton x 0.15 lb filt. PM2.5/lb filt. PM = 0.071 lb PM2.5/ton

1.2 HAP/Air Toxics Emissions Estimate for Aluminum Scrap Processing Lines

> ADI expects that a portion of the PM loading consists of aluminum fines which contain alloying elements that are HAPs or air toxics. ADI has reviewed a list of the assumed alloys being processed against reference alloy composition to derive the following emission factors.

Parameter	Value	Basis
Overall PM Loading Expected to be Aluminum Fines	100%	Depending on the scrap type, this can range from 15% to 100%. The cleaner the scrap, the higher percentage of aluminum. Potential emissions rely on the high end of the range.
Manganese (Mn) Composition Expected in Aluminum Fines	1.50%	Based on assumed alloys being processed and the composition from "International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys" from the Aluminum Association in August 2018 (a.k.a, "Teal Sheet").
Chromium (Cr) Composition Expected in Aluminum Fines	0.35%	Based on assumed alloys being processed and the composition from Teal Sheet

Vanadium (V) Composition Expected in Aluminum Fines	0.05%	Based on assumed alloys being processed and the composition from Teal Sheet
Controlled Mn Emission Factor (Production Basis)	7.08E-04 lb/ton	0.047 Controlled lb filt. PM/ton x 100% Al fines in filt. PM x 1.50% Mn in Al fines = 0.0007 lb Mn/ton Al
Controlled Cr Emission Factor (Production Basis)	1.65E-03 lb/ton	0.047 Controlled lb filt. PM/ton x 100% Al fines in filt. PM x 0.35% Cr in Al fines = 0.0017 lb Cr/ton Al
Controlled V Emission Factor (Production Basis)	2.36E-04 lb/ton	0.047 Controlled lb filt. PM/ton x 100% Al fines in filt. PM x 0.05% V in Al fines = 0.0002 lb V/ton Al

1.3 Potential Emission Calculations for the Scrap Processing System

1.3.1 Scrap Processing System #1 Baghouse Stack Emissions

> Emission factors shown below are the stack emission factors.

Pollutant	Baghouse Stack Emission Factor (lb/ton)	Emission Factor Basis	Maximum Hourly Process Rate (ton/hr)	Maximum Annual Process Rate (ton/yr)	Potential Emission Rate (lb/hr)	Potential Emission Rate (tpy)
PM	0.047	Grain Loading Design Basis	33.0	289,080	1.56	6.82
PM10	0.024	EPA PM Calculator	33.0	289,080	0.79	3.48
PM2.5	0.0071	EPA PM Calculator	33.0	289,080	0.23	1.02
Mn	7.08E-04	Alloy Composition	33.0	289,080	0.023	0.10
Cr	1.65E-03	Alloy Composition	33.0	289,080	5.45E-02	0.239
V	2.36E-04	Alloy Composition	33.0	289,080	7.79E-03	0.034
Total HAPs	2.36E-03	Sum of (Mn, Cr)	33.0	289,080	7.79E-02	0.341

2. Rotary Decoater

> The one (1) rotary decoater will be used for thermal decoating of "other than clean charge" aluminum scrap. The rotary decoater will be classified as a new scrap dryer/delacquering kiln/decoating kiln as defined under the SMACT. The decoater will be used to remove various organic contaminants (such as oil, paint, lacquer, or other coating types) from recycled aluminum scrap prior to melting in one of the two (2) new sidewell melting furnaces. Emissions generated by the rotary decoater will be controlled by a lime-injected baghouse (used for PM and HCl control).

Emission Unit ID:	**002-1 through 002-2**
Emission Unit Description:	**Decoater #1**

2.1 Decoater Process Rates: Metal Throughput and Gas Firing Rate

2.1.1 Metal Processing Capacity

Maximum Hourly Aluminum Throughput:	27.6	ton/hr	
Maximum Annual Throughput:	241,404	ton/yr	

2.1.2 Decoater Natural Gas Firing Rate

> The rotary decoater has two (2) 15.1 MMBtu/hr natural gas burners used for recirculating hot gases.

Maximum Burner Heat Input Capacity:	30.2	MMBtu/hr	
Heating Value of Natural Gas at Plant:	1,000	Btu/scf	
Maximum Hourly Natural Gas Usage:	0.030	MMscf/hr	= 30.2 MMBtu/hr / 1,000 Btu/scf
Maximum Annual Natural Gas Usage:	264.6	MMscf/yr	

2.2 Documentation of Emission Factors Used for the Decoater

2.2.1 PM Emission Factors Tied to Aluminum Metal Production

> The filterable (filt.) PM emission factor is presented as the expected exit grain loading associated with the baghouse controlling the decoater converted to a lb/ton Al processed basis using the flow capacity of the baghouse and rated aluminum throughput capacity of the decoater. Filt. particulate emissions are speciated into filt. PM10 and filt. PM2.5 size fractions based on EPA's PM Calculator database for the relevant SCC associated with secondary aluminum decoating. The condensable (cond.) PM emission factor is based on the emission factor associated with total PM10 and PM2.5 BACT limits set for recent similar source installations (Novelis Bay Minette, AL and Novelis Guthrie, KY).

Parameter	Value		Basis
Stack Emissions			
Controlled Filt. PM Emission Factor (Grain Loading Basis)	0.002	gr/dscf	Exit grain loading design basis of Hot Baghouse #1
Filt. PM10 to Filt. PM Ratio	0.92	--	EPA's PM Calculator for relevant SCC
Controlled Filt. PM10 Emission Factor (Grain Loading Basis)	0.0018	gr/dscf	0.002 gr filt. PM/dscf x 0.92 lb filt. PM10/lb filt. PM = 0.0018 gr PM10/dscf
Filt. PM2.5 to Filt. PM Ratio	0.82	--	EPA's PM Calculator for relevant SCC
Controlled Filt. PM2.5 Emission Factor (Grain Loading Basis)	0.0016	gr/dscf	0.002 gr filt. PM/dscf x 0.82 lb filt. PM2.5/lb filt. PM = 0.0016 gr PM2.5/dscf
Baghouse Flow Capacity	76,421	dscfm	Equivalent to 110,000 acfm flow capacity of Hot Baghouse #1 and nominal stack exit temperature of 300 deg. F and assuming minimal moisture content
Controlled (Cont.) Filt. PM Emission Factor (Production Basis)	0.048	lb/ton	0.002 gr filt. PM/dscf x 76,421 dscf/min x 60 min/hr x 1 lb / 7,000 gr x 1 / 27.6 ton Al/hr = 0.048 lb cont. filt. PM/ton
Controlled Filt. PM10 Emission Factor (Production Basis)	0.044	lb/ton	0.048 lb cont. filt. PM/ton x 0.92 lb filt. PM10/lb filt. PM = 0.044 lb cont. filt. PM10/ton
Controlled Filt. PM2.5 Emission Factor (Production Basis)	0.039	lb/ton	0.048 lb cont. filt. PM/ton x 0.82 lb filt. PM2.5/lb filt. PM = 0.039 lb cont. filt. PM2.5/ton
Nominal Filt. PM/PM10/PM2.5 Control Efficiency for Baghouse	98%	--	PM removal efficiency of lime-injected baghouse for Decoater
Uncontrolled (Uncont.) Filt. PM Emission Factor (Production Basis)	2.38	lb/ton	0.048 lb cont. filt. PM/ton / (1 - 0.98) = 2.38 lb uncont. filt. PM/ton
Uncontrolled Filt. PM10 Emission Factor (Production Basis)	2.19	lb/ton	2.38 lb uncont. filt. PM/ton x 0.92 lb filt. PM10/lb filt. PM = 2.19 lb uncont. filt. PM10/ton
Uncontrolled Filt. PM2.5 Emission Factor (Production Basis)	1.79	lb/ton	2.19 lb uncont. filt. PM/ton x 0.82 lb filt. PM2.5/lb filt. PM = 1.79 lb uncont. filt. PM2.5/ton
Cond. PM Emission Factor	0.14	lb/ton	Emission factor used as basis for total PM10 BACT limit at Novelis Bay Minette, AL and Guthrie, KY sites for similar rotary decoater operations
Uncontrolled Total PM10 Emission Factor (Production Basis)	2.33	lb/ton	2.19 lb uncont. filt. PM10/ton + 0.14 lb cond. PM/ton = 2.33 lb uncont. total PM10/ton
Uncontrolled Total PM2.5 Emission Factor (Production Basis)	1.93	lb/ton	1.79 lb uncont. filt. PM2.5/ton + 0.14 lb cond. PM/ton = 1.93 lb uncont. total PM2.5/ton
Controlled Total PM10 Emission Factor (Production Basis)	0.18	lb/ton	0.044 lb cont. filt. PM10/ton + 0.14 lb cond. PM/ton = 0.18 lb cont. total PM10/ton
Estimated Total PM10 Control Efficiency for Baghouse	92.09%	--	1 - (0.18 lb cont. total PM10/ton / 2.33 lb uncont. total PM10/ton) = 92.09%
Controlled Total PM2.5 Emission Factor (Production Basis)	0.18	lb/ton	0.039 lb cont. filt. PM2.5/ton + 0.14 lb cond. PM/ton = 0.18 lb cont. total PM2.5/ton
Estimated Total PM2.5 Control Efficiency for Baghouse	90.72%	--	1 - (0.18 lb cont. total PM2.5/ton / 1.93 lb uncont. total PM2.5/ton) = 90.72%

2.2.2 HCl Emission Factor Tied to Aluminum Metal Production

> The HCl emission factor is based on a calculated upper prediction limit (UPL) from stack test results for similar units located at Logan Aluminum (Russellville, KY) and Constellium (Muscle Shoals, AL) publised in WebFIRE where the UPL analysis was performed on 25 individual SMACT test runs of at a confidence level of 90%.

Parameter	Value		Basis
Stack Emissions			
Controlled HCl Emission Factor (Production Basis)	0.62	lb/ton	UPL analysis of representative HCl test data for Decoaters in SMACT testing database
HCl Control Efficiency of Lime-Injected Baghouse	90%	--	Engineering estimate based on inlet and outlet testing results for lime-injected baghouses serving decoaters at secondary aluminum facilities.
Uncontrolled HCl Emission Factor (Production Basis)	6.17	lb/ton	0.62 lb HCl/ton / (1 - 0.90 cont. eff.) = 6.17 lb uncont. HCl/ton

2.2.3 D/F Emission Factor Tied to Aluminum Metal Production

> As no maximum D/F content has been determined at this stage in design, ADI has decided to conservatively estimate D/F emissions by using the SMACT limit for Decoaters pursuant to 40 CFR 63.1505(e)(1)(iii).

Parameter	Value	Basis
Stack Emissions		
D/F Emission Limit from SMACT for Decoater	6.30E-07 gr/ton	SMACT D/F emission limit for Decoaters pursuant to 40 CFR 63.1505(e)(1)(iii)
D/F Emission Factor	9.00E-11 lb/ton	= 6.30E-07 gr D/F/ton / 7,000 gr/lb
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin Emission Factor	4.12E-12 lb/ton	= 9.00E-11 gr D/F/ton * 0.0458 Average Congener Weight Fraction
1,2,3,4,6,7,8-heptachlorodibenzo-p-furan Emission Factor	7.36E-12 lb/ton	= 4.12E-12 gr D/F/ton * 0.0818 Average Congener Weight Fraction
1,2,3,4,7,8,9-heptachlorodibenzo-p-furan Emission Factor	1.59E-12 lb/ton	= 7.36E-12 gr D/F/ton * 0.0177 Average Congener Weight Fraction
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin Emission Factor	1.69E-12 lb/ton	= 1.59E-12 gr D/F/ton * 0.0188 Average Congener Weight Fraction
1,2,3,4,7,8-hexachlorodibenzo-p-furan Emission Factor	6.40E-12 lb/ton	= 1.69E-12 gr D/F/ton * 0.0711 Average Congener Weight Fraction
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin Emission Factor	1.72E-12 lb/ton	= 6.40E-12 gr D/F/ton * 0.0191 Average Congener Weight Fraction
1,2,3,6,7,8-hexachlorodibenzo-p-furan Emission Factor	5.47E-12 lb/ton	= 1.72E-12 gr D/F/ton * 0.0608 Average Congener Weight Fraction
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin Emission Factor	1.33E-12 lb/ton	= 5.47E-12 gr D/F/ton * 0.0148 Average Congener Weight Fraction
1,2,3,7,8,9-hexachlorodibenzo-p-furan Emission Factor	1.68E-12 lb/ton	= 1.33E-12 gr D/F/ton * 0.0187 Average Congener Weight Fraction
1,2,3,7,8-pentachlorodibenzo-p-dioxin Emission Factor	2.82E-12 lb/ton	= 1.68E-12 gr D/F/ton * 0.0313 Average Congener Weight Fraction
1,2,3,7,8-pentachlorodibenzo-p-furan Emission Factor	6.65E-12 lb/ton	= 2.82E-12 gr D/F/ton * 0.0739 Average Congener Weight Fraction
2,3,4,6,7,8-hexachlorodibenzo-p-furan Emission Factor	5.18E-12 lb/ton	= 6.65E-12 gr D/F/ton * 0.0575 Average Congener Weight Fraction
2,3,4,7,8-pentachlorodibenzo-p-furan Emission Factor	1.91E-11 lb/ton	= 5.18E-12 gr D/F/ton * 0.2125 Average Congener Weight Fraction
2,3,7,8-tetrachlorodibenzo-p-dioxin Emission Factor	2.11E-12 lb/ton	= 1.91E-11 gr D/F/ton * 0.0234 Average Congener Weight Fraction
2,3,7,8-tetrachlorodibenzo-p-furan Emission Factor	1.47E-11 lb/ton	= 2.11E-12 gr D/F/ton * 0.1628 Average Congener Weight Fraction
Octachlorodibenzo-p-dioxin Emission Factor	5.25E-12 lb/ton	= 1.47E-11 gr D/F/ton * 0.0583 Average Congener Weight Fraction
Octachlorodibenzo-p-furan Emission Factor	3.47E-12 lb/ton	= 5.25E-12 gr D/F/ton * 0.0386 Average Congener Weight Fraction

2.2.4 NOX, CO, VOC Emission Factor Tied to Aluminum Metal Production

> The NOX emission factor is based on the BACT limit from a comparable facility (Logan Aluminum Decoaters A and B) and includes both the metal processing and natural gas combustion contributions to emissions. Both the CO and VOC post-afterburner emission factors tied to aluminum production are based on BACT limits for a comparable facility (Novelis Bay Minette, AL Decoaters #1-#3). The NOx emission factor includes natural gas combustion contributions, but a separate CO emission factor is derived for the natural gas contribution to the overall Decoater emissions profile.

> The CO/VOC removal efficiency of the Decoater integral afterburner is unknown because testing of emissions within the hot exhaust gas recirculation loop between the rotary kiln discharge and afterburner inlet is not technically feasible. Therefore, ADI has identified a conservatively high estimate for the possible CO and VOC removal efficiency across the integral afterburner by applying the highest possible reference emission factors for CO/VOC emissions generated from the non-aluminum contaminant burnoff processes occurring in the Decoater and afterburner. These reference emission factors are obtained from AP-42 Chapter 2.5 for Open Burning of municipal refuse. Open Burning should produce higher CO/VOC emissions levels than the highly controlled decoating reactions within the rotary kiln. Also, combustion of municipal refuse should provide higher CO/VOC emissions than burnoff of oils, paints, lacquers, other coatings, and other organic contaminants present in the feed/charge to the Decoater within the rotary kiln.

Parameter	Value		Basis
Stack Emissions			
Uncontrolled NOX Emission Factor (Production Basis)	0.32	lb/ton	Based on BACT limit from comparable facility (Logan Aluminum Decoaters A and B)
Post-Afterburner Stack CO Emission Factor (Production Basis)	0.24	lb/ton	Based on BACT limit from comparable facility (Novelis Bay Minette Decoaters #1-#3)
Reference CO Emissions Generated Factor for Open Burning of Refuse	85.00	lb/ton (as Refuse)	AP-42 Table 2.5-1 for Open Burning of Municipal Refuse
Maximum Non-Aluminum Content of Feed/Charge	4.5%	ton non-Al/ton feed/charge	Worst-case operating specification for Decoater based on anticipated feed/charge characteristics
CO Emissions Generated Factor for Decoater	3.83	lb/ton (as Feed/Charge)	85.00 lb CO/ton refuse x 4.5% ton non-Al (as refuse)/ton feed/charge = 3.83 lb CO generated/ton feed/charge
Nominal CO Removal Eff. of Integral Decoater Afterburner	93.7%	--	(1 - 0.24 lb CO post-afterburner/ton / 3.83 lb CO generated pre-afterburner/ton) = 93.7% CO removal efficiency
Pre-Afterburner CO Emission Factor (Production Basis)	3.83	lb/ton	0.24 lb CO/ton / (1 - 0.94 cont. eff.) = 3.83 lb uncont. CO/ton
Post-Afterburner Stack VOC Emission Factor (Production Basis)	0.16	lb/ton	Based on BACT limit from comparable facility (Novelis Bay Minette Decoaters #1-#3)
Reference Non-Methane TOC Emissions Generated Factor for Open Burning of Refuse	30.00	lb/ton (as Refuse)	AP-42 Table 2.5-1 for Open Burning of Municipal Refuse

Parameter	Value		Basis
VOC Emissions Generated Factor for Decoater	1.35	lb/ton (as Feed/Charge)	30.00 lb VOC/ton refuse x 4.5% ton non-Al (as refuse)/ton feed/charge = 1.35 lb VOC generated/ton feed/charge
Nominal VOC Removal Eff. of Integral Decoater Afterburner	88.1%	--	(1 - 0.16 lb VOC post-afterburner/ton / 1.35 lb VOC generated pre-afterburner/ton) = 88.1% VOC removal efficiency
Pre-Afterburner VOC Emission Factor (Production Basis)	1.35	lb/ton	0.16 lb VOC/ton / (1 - 0.88 cont. eff.) = 1.35 lb uncont. VOC/ton

2.2.5 GHG Emission Factors Tied to Aluminum Metal Production

> The CO2 emission factor is derived based on estimated maximum organic (carbon-containing) contaminants on the feed/charge that enters the Decoater.

Parameter	Value		Basis
Stack Emissions			
Max. Organic (Carbon-Containing) Contaminants on Feed/Charge Entering Decoater	4.5%	lb org. contaminant/lb Al	Engineering estimate assumed to be as pentane
Organic (Carbon-Containing) Contaminant Loading (Production Basis)	90.00	lb/ton	2,000 lb/ton x 0.05 lb org. contaminant/lb Al = 90.00 lb/ton
Carbon (C) Molecular Weight	12.01	lb/lb-mol	Reference value from Periodic Table
Hydrogen (H) Molecular Weight	1.01	lb/lb-mol	
Maximum % Carbon in Contaminants [Using Pentane (C5H12) as Surrogate]	83.21%	--	(12.01 lb/lb-mol C x 5 lbmol C) / [(1.01 lb/lb-mol H x 12 lbmol H) + (12.01 lb/lb-mol C x 5 lbmol C)] = 83.21% wt. % C in C5H12; where pentane is the lowest molecular weight, highest carbon content, saturated hydrocarbon that exists as a liquid at feed/charge temperatures.
Contaminant Loading as C (Production Basis)	74.89	lb/ton	90.00 lb/ton org. contaminant loading x 83% % C = 74.89 lb/ton
Oxygen (O) Molecular Weight	16.00	lb/lb-mol	Reference value from Periodic Table
Carbon Dioxide (CO2) Molecular Weight	44.01	lb/lb-mol	12.011 lb/lb-mol C + 2 x 16 lb/lb-mol O = 44.011 lb/lb-mol CO2
CO2 Emission Factor (Production Basis)	274.40	lb/ton	74.89 lb/ton uncont. contaminant VOC as C x 44.01 lb/lb-mol CO2 / 12.011 lb/lb-mol C = 274.40 lb/ton

2.2.6 Metal HAP Emission Factors Tied to Aluminum Metal Production

> The average ("Ave.") metal HAP emission factors are obtained from *Table 5. Summary of Metallic HAP Test Results* from the SMACT Docket Memo To: Rochelle Boyd, Environmental Protection Agency (the EPA) From: Mark Bahner, RTI International entitled "RE: Development of the RTR Risk Modeling Dataset for the Secondary Aluminum Production Source Category", January 30, 2012, Docket ID EPA-HQ-OAR-2010-0544-0139 ("RTR Modeling SMACT Docket Memo") for "Scrap Dryer/ Delacquering/ Decoating Kiln."

Parameter	Value		Basis
Stack Emissions			
Nominal Metal HAP Control Efficiency for Baghouse	98%	--	PM & Metal HAP removal efficiency of lime-injected baghouse for Decoater
Antimony Emission Factor (Normalized to PM Emitted)	5.56E-05	lb Antimony/lb PM	RTR Modeling SMACT Docket Memo Table 5 Antimony emission factor converted from mg/kg PM to lb/lb PM
Arsenic Emission Factor (Normalized to PM	4.30E-06	lb Arsenic/lb PM	RTR Modeling SMACT Docket Memo Table 5 Arsenic emission factor converted from mg/kg PM
Beryllium Emission Factor (Normalized to PM Emitted)	2.00E-06	lb Beryllium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Beryllium emission factor converted from mg/kg PM to lb/lb PM
Cadmium Emission Factor (Normalized to PM Emitted)	3.48E-05	lb Cadmium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Cadmium emission factor converted from mg/kg PM to lb/lb PM
Chromium III Emission Factor (Normalized to PM Emitted)	1.68E-04	lb Chromium III/lb PM	RTR Modeling SMACT Docket Memo Table 5 Chromium III emission factor converted from mg/kg PM to lb/lb PM
Chromium VI Emission Factor (Normalized to PM Emitted)	2.00E-07	lb Chromium VI/lb PM	RTR Modeling SMACT Docket Memo Table 5 Chromium VI emission factor converted from mg/kg PM to lb/lb PM
Cobalt Emission Factor (Normalized to PM Emitted)	9.40E-06	lb Cobalt/lb PM	RTR Modeling SMACT Docket Memo Table 5 Cobalt emission factor converted from mg/kg PM to lb/lb PM
Lead Emission Factor (Normalized to PM Emitted)	4.17E-04	lb Lead/lb PM	RTR Modeling SMACT Docket Memo Table 5 Lead emission factor converted from mg/kg PM to lb/lb PM
Manganese Emission Factor (Normalized to PM Emitted)	6.27E-04	lb Manganese/lb PM	RTR Modeling SMACT Docket Memo Table 5 Manganese emission factor converted from mg/kg PM to lb/lb PM
Mercury, elemental Emission Factor (Normalized to PM Emitted)	4.90E-07	lb Mercury, elemental/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, elemental emission factor converted from mg/kg PM to lb/lb PM
Mercury, gaseous Emission Factor (Normalized to PM Emitted)	6.00E-08	lb Mercury, gaseous/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, gaseous emission factor converted from mg/kg PM to lb/lb PM
Mercury, particulate Emission Factor (Normalized to PM Emitted)	6.00E-08	lb Mercury, particulate/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, particulate emission factor converted from mg/kg PM to lb/lb PM
Nickel Emission Factor (Normalized to PM Emitted)	7.90E-05	lb Nickel/lb PM	RTR Modeling SMACT Docket Memo Table 5 Nickel emission factor converted from mg/kg PM to lb/lb PM
Selenium Emission Factor (Normalized to PM Emitted)	2.31E-05	lb Selenium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Selenium emission factor converted from mg/kg PM to lb/lb PM
Total Metal HAP Emission Factor (Normalized to PM Emitted)	1.42E-03	lb metal HAP/lb PM	RTR Modeling SMACT Docket Memo total metal HAP emission factor converted from mg/kg PM to lb/lb PM

Cont. Antimony Emission Factor (Production Basis)	2.64E-06	lb Antimony/ton	5.56E-05 lb Antimony HAP/lb filt. PM x 0.048 lb filt. PM/ton = 2.64E-06 lb Antimony/ton
Cont. Arsenic Emission Factor (Production Basis)	2.04E-07	lb Arsenic/ton	4.30E-06 lb Arsenic HAP/lb filt. PM x 0.048 lb filt. PM/ton = 2.04E-07 lb Arsenic/ton
Cont. Beryllium Emission Factor (Production Basis)	9.51E-08	lb Beryllium/ton	2.00E-06 lb Beryllium HAP/lb filt. PM x 0.048 lb filt. PM/ton = 9.51E-08 lb Beryllium/ton
Cont. Cadmium Emission Factor (Production Basis)	1.65E-06	lb Cadmium/ton	3.48E-05 lb Cadmium HAP/lb filt. PM x 0.048 lb filt. PM/ton = 1.65E-06 lb Cadmium/ton
Cont. Chromium III Emission Factor (Production Basis)	7.99E-06	lb Chromium III/ton	1.68E-04 lb Chromium III HAP/lb filt. PM x 0.048 lb filt. PM/ton = 7.99E-06 lb Chromium III/ton
Cont. Chromium VI Emission Factor (Production Basis)	9.51E-09	lb Chromium VI/ton	2.00E-07 lb Chromium VI HAP/lb filt. PM x 0.048 lb filt. PM/ton = 9.51E-09 lb Chromium VI/ton
Cont. Cobalt Emission Factor (Production Basis)	4.47E-07	lb Cobalt/ton	9.40E-06 lb Cobalt HAP/lb filt. PM x 0.048 lb filt. PM/ton = 4.47E-07 lb Cobalt/ton
Cont. Lead Emission Factor (Production Basis)	1.98E-05	lb Lead/ton	4.17E-04 lb Lead HAP/lb filt. PM x 0.048 lb filt. PM/ton = 1.98E-05 lb Lead/ton
Cont. Manganese Emission Factor (Production Basis)	2.98E-05	lb Manganese/ton	6.27E-04 lb Manganese HAP/lb filt. PM x 0.048 lb filt. PM/ton = 2.98E-05 lb Manganese/ton
Cont. Mercury, elemental Emission Factor (Production Basis)	2.33E-08	lb Mercury, elemental/ton	4.90E-07 lb Mercury, elemental HAP/lb filt. PM x 0.048 lb filt. PM/ton = 2.33E-08 lb Mercury, elemental/ton
Cont. Mercury, gaseous Emission Factor (Production Basis)	2.85E-09	lb Mercury, gaseous/ton	6.00E-08 lb Mercury, gaseous HAP/lb filt. PM x 0.048 lb filt. PM/ton = 2.85E-09 lb Mercury, gaseous/ton
Cont. Mercury, particulate Emission Factor (Production Basis)	2.85E-09	lb Mercury, particulate/ton	6.00E-08 lb Mercury, particulate HAP/lb filt. PM x 0.048 lb filt. PM/ton = 2.85E-09 lb Mercury, particulate/ton
Cont. Nickel Emission Factor (Production Basis)	3.76E-06	lb Nickel/ton	7.90E-05 lb Nickel HAP/lb filt. PM x 0.048 lb filt. PM/ton = 3.76E-06 lb Nickel/ton
Cont. Selenium Emission Factor (Production Basis)	1.10E-06	lb Selenium/ton	2.31E-05 lb Selenium HAP/lb filt. PM x 0.048 lb filt. PM/ton = 1.10E-06 lb Selenium/ton
Cont. Metal HAP Emission Factor (Production Basis)	6.76E-05	lb metal HAP/ton	1.42E-03 lb metal HAP/lb filt. PM x 0.048 lb filt. PM/ton = 6.76E-05 lb metal HAP/ton

2.2.7 Organic HAP Emission Factors Tied to Aluminum Metal Production

> The average ("Ave.") organic HAP emission factor is obtained from *Table 6. Summary of Organic HAP Test Results, Allowable Emissions* from RTR Modeling SMACT Docket Memo for Scrap Dryer/ Delacquering/ Decoating Kiln. The naphthalene emission factor in Table 6 was flagged as an outlier due to the cumulative organic HAP emission factor using this value exceeding the SMACT allowable THC emission rate. The naphthalene emission factor was replaced with the maximum individual compound emission factor from among the other semi-volatile organic compounds (SVOC) [regulated as HAP from polycyclic organic matter (POM) category].

Parameter	Value		Basis
Stack Emissions			
Post-Afterburner Stack Organic HAP Emission Factor (Production Basis)	0.062	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor with adjustment to naphthalene emission factor as an outlier.
Acrylonitrile HAP Emission Factor (Production Basis)	3.02E-03	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Benzene HAP Emission Factor (Production Basis)	1.06E-02	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Carbon disulfide HAP Emission Factor (Production Basis)	7.60E-03	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Carbon tetrachloride HAP Emission Factor (Production Basis)	4.08E-05	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Chloroform HAP Emission Factor (Production Basis)	6.10E-04	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
1,2-Dichloroethane HAP Emission Factor (Production Basis)	4.14E-05	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Methylene chloride HAP Emission Factor (Production Basis)	2.88E-03	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Tetrachloroethene HAP Emission Factor (Production Basis)	1.05E-04	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Toluene HAP Emission Factor (Production Basis)	9.62E-03	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Trichloroethene HAP Emission Factor (Production Basis)	4.96E-05	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Acenaphthene HAP Emission Factor (Production Basis)	8.10E-04	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Acenaphthylene HAP Emission Factor (Production Basis)	3.42E-03	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Anthracene HAP Emission Factor (Production Basis)	6.34E-04	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Benzo(a)anthracene HAP Emission Factor (Production Basis)	2.16E-04	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Benzo(b)fluoranthene HAP Emission Factor (Production Basis)	1.58E-06	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Benzo(g,h,i)perylene HAP Emission Factor (Production Basis)	3.32E-04	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Chrysene HAP Emission Factor (Production Basis)	2.92E-04	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Fluoranthene HAP Emission Factor (Production Basis)	1.70E-03	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Fluorene HAP Emission Factor (Production Basis)	9.38E-04	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Naphthalene HAP Emission Factor (Production Basis)	8.72E-03	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Phenanthrene HAP Emission Factor (Production Basis)	8.72E-03	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor
Pyrene HAP Emission Factor (Production Basis)	1.92E-03	lb/ton	RTR Modeling SMACT Docket Memo Table 6 organic emission factor

2.2.8 CO Emission Factor Tied to Natural Gas Combustion

> The emission factor for CO from natural gas combustion is based on an emission factor for rotary decoater operation provided by a prospective rotary decoater furnace vendor.

Parameter	Value	Basis
Stack Emissions		
Uncontrolled CO Emission Factor (Heat Input Basis)	0.018 lb/MMBtu	Vendor supplied data
Uncontrolled CO Emission Factor (Fuel Usage Basis)	18.00 lb/MMscf	0.018 lb uncont. CO/MMBtu x 1,000 Btu/scf = 18.00 lb uncont. CO/MMscf

2.2.9 GHG Emission Factor Tied to Natural Gas Combustion

> Emission factors for GHGs from natural gas combustion are based on Subpart C of EPA's Mandatory Greenhouse Gas Reporting Rule (MRR, 40 CFR 98 Subpart C Tables C-1 and C-2).

> The global warming potential factors for CH4 and N2O are those specified in Subpart A.

Global Warming Potentials

GWP for CO2	1		40 CFR 98 Subpart A, Table A-1
GWP for CH4	25		40 CFR 98 Subpart A, Table A-1
GWP for N2O	298		40 CFR 98 Subpart A, Table A-1

Emission Factors

CO2	53.06	kg/MMBtu	40 CFR 98 Subpart C, Table C-1
	116,977	lb/MMscf	
CH4	1.00E-03	kg/MMBtu	40 CFR 98 Subpart C, Table C-2
	2.20	lb/MMscf	
N2O	1.00E-04	kg/MMBtu	40 CFR 98 Subpart C, Table C-2
	0.22	lb/MMscf	
CO2e	117,098	lb/MMscf	= 116,977 lb CO2/MMscf + (2.20 lb CH4/MMscf * 25) + (0.22 lb N2O/MMscf * 298)

2.2.10 HAP/Air Toxics Emission Factor Tied to Natural Gas Combustion

> Emission factors for HAP emissions from natural gas combustion are based on AP-42 Chapter 1.4 Tables 1.4-3 and 1.4-4.

Pollutant	CAS No.	HAP?	EF (lb/MMscf)
Acenaphthene	83-32-9	Y	1.80E-06
Acenaphthylene	206-96-8	Y	1.80E-06
Anthracene	120-12-7	Y	2.40E-06
Arsenic compounds	7440-38-2	Y	2.00E-04
Benzene	71-43-2	Y	2.10E-03
Benzo(a)anthracene	56-55-3	Y	1.80E-06
Benzo(a)pyrene	50-32-8	Y	1.20E-06
Benzo(b)fluoranthene	205-99-2	Y	1.80E-06
Benzo(g,h,i)perylene	191-24-2	Y	1.20E-06
Benzo(k)fluoranthene	207-08-9	Y	1.80E-06
Beryllium and compounds	7440-41-7	Y	1.20E-05
Cadmium and compounds	7440-43-9	Y	1.10E-03
Chromium and compounds	7440-47-3	Y	1.40E-03
Chrysene	218-01-9	Y	1.80E-06
Cobalt and compounds	7440-48-4	Y	8.40E-05
Dibenz(a,h)anthracene	53-70-3	Y	1.20E-06
1,4-Dichlorobenzene(p-Dichlorobenzene)	106-46-7	Y	1.20E-03
7,12-Dimethylbenz(a)anthracene	57-97-6	Y	1.60E-05
Fluoranthene	206-44-0	Y	3.00E-06
Fluorene	86-73-7	Y	2.80E-06
Formaldehyde	50-00-0	Y	0.075
Hexane	110-54-3	Y	1.80
Indeno (1,2,3-cd)pyrene	193-39-5	Y	1.80E-06
Lead and compounds	7439-92-1	Y	5.00E-04
Manganese and compounds	7439-96-5	Y	3.80E-04
Mercury and compounds	7439-97-6	Y	2.60E-04
3-Methylcholanthrene	56-49-5	Y	1.80E-06
Methylnaphthalene	91-57-6	Y	2.40E-05
Naphthalene	91-20-3	Y	6.10E-04
Nickel and compounds	7440-02-0	Y	2.10E-03
Pyrene	129-00-0	Y	5.00E-06
Selenium and compounds	7782-49-2	Y	2.40E-05
Toluene	108-88-3	Y	3.40E-03
Total HAPs			1.89

2.2.11 Additional Emission Factors Tied to Natural Gas Combustion

> PM emissions are accounted for in the baghouse outlet emissions estimate and NOX emissions are included in the emissions estimate for aluminum decoating. All other emission factors are based on reference literature (e.g., EPA's AP-42).

2.3 Potential Emission Calculations for the Decoater

2.3.1 Potential Emissions Tied to Aluminum Metal Production (Stack)

> Emission factors shown below are the stack emission factors.

Pollutant	Emission Factor (lb/ton)		Emission Factor Basis	Maximum Hourly Process Rate (ton/hr)	Maximum Annual Process Rate (ton/yr)	Potential Emission Rate (lb/hr)	Potential Emission Rate (tpy)
PM	0.048	lb/ton	Grain Loading Design Basis	27.6	241,404	1.31	5.74
PM10	0.18	lb/ton	EPA PM Calculator + Sim. Src. BACT	27.6	241,404	5.07	22.22
PM2.5	0.18	lb/ton	EPA PM Calculator + Sim. Src. BACT	27.6	241,404	4.94	21.65
HCl	0.62	lb/ton	UPL	27.6	241,404	17.02	74.53
D/F	9.00E-11	lb/ton	SMACT limit	27.6	241,404	2.48E-09	1.09E-08
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	4.12E-12	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	1.14E-10	4.98E-10
1,2,3,4,6,7,8-heptachlorodibenzo-p-furan	7.36E-12	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	2.03E-10	8.89E-10
1,2,3,4,7,8,9-heptachlorodibenzo-p-furan	1.59E-12	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	4.39E-11	1.92E-10
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	1.69E-12	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	4.66E-11	2.04E-10
1,2,3,4,7,8-hexachlorodibenzo-p-furan	6.40E-12	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	1.76E-10	7.72E-10
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	1.72E-12	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	4.74E-11	2.07E-10
1,2,3,6,7,8-hexachlorodibenzo-p-furan	5.47E-12	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	1.51E-10	6.60E-10
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	1.33E-12	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	3.67E-11	1.61E-10
1,2,3,7,8,9-hexachlorodibenzo-p-furan	1.68E-12	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	4.64E-11	2.03E-10
1,2,3,7,8-pentachlorodibenzo-p-dioxin	2.82E-12	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	7.76E-11	3.40E-10
1,2,3,7,8-pentachlorodibenzo-p-furan	6.65E-12	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	1.83E-10	8.03E-10
2,3,4,6,7,8-hexachlorodibenzo-p-furan	5.18E-12	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	1.43E-10	6.25E-10
2,3,4,7,8-pentachlorodibenzo-p-furan	1.91E-11	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	5.27E-10	2.31E-09
2,3,7,8-tetrachlorodibenzo-p-dioxin	2.11E-12	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	5.80E-11	2.54E-10
2,3,7,8-tetrachlorodibenzo-p-furan	1.47E-11	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	4.04E-10	1.77E-09

Octachlorodibenzo-p-dioxin	5.25E-12	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	1.45E-10	6.33E-10
Octachlorodibenzo-p-furan	3.47E-12	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	27.6	241,404	9.57E-11	4.19E-10
NOX	0.32	lb/ton	BACT limit (incl. NG contri.)	27.6	241,404	8.82	38.62
CO	0.24	lb/ton	Similar Source BACT Limit	27.6	241,404	6.66	29.16
VOC	0.16	lb/ton	Similar Source BACT Limit	27.6	241,404	4.41	19.32
CO2	274.40	lb/ton	Engineering Estimate	27.6	241,404	7,562	33,121
Lead	1.98E-05	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	5.46E-04	2.39E-03
Total Metal HAP	6.76E-05	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	1.86E-03	0.008
Antimony	2.64E-06	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	7.28E-05	3.19E-04
Arsenic	2.04E-07	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	5.63E-06	2.47E-05
Beryllium	9.51E-08	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	2.62E-06	1.15E-05
Cadmium	1.65E-06	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	4.56E-05	2.00E-04
Chromium III	7.99E-06	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	2.20E-04	9.64E-04
Chromium VI	9.51E-09	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	2.62E-07	1.15E-06
Cobalt	4.47E-07	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	1.23E-05	5.39E-05
Lead	1.98E-05	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	5.46E-04	2.39E-03
Manganese	2.98E-05	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	8.21E-04	3.60E-03
Mercury, elemental	2.33E-08	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	6.42E-07	2.81E-06
Mercury, gaseous	2.85E-09	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	7.86E-08	3.44E-07
Mercury, particulate	2.85E-09	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	7.86E-08	3.44E-07
Nickel	3.76E-06	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	1.03E-04	4.53E-04
Selenium	1.10E-06	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	3.03E-05	1.33E-04
Total Organic HAP	0.062	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	1.72	7.51
Acrylonitrile	3.02E-03	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	0.083	0.36
Benzene	1.06E-02	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	0.29	1.28
Carbon disulfide	7.60E-03	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	0.21	0.92
Carbon tetrachloride	4.08E-05	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	1.12E-03	4.92E-03
Chloroform	6.10E-04	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	0.02	0.07
1,2-Dichloroethane	4.14E-05	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	1.14E-03	5.00E-03
Methylene chloride	2.88E-03	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	0.08	0.35
Tetrachloroethene	1.05E-04	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	2.90E-03	1.27E-02
Toluene	9.62E-03	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	0.27	1.16
Trichloroethene	4.96E-05	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	1.37E-03	5.99E-03
Acenaphthene	8.10E-04	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	0.02	0.10
Acenaphthylene	3.42E-03	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	0.09	0.41
Anthracene	6.34E-04	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	0.02	0.08
Benzo(a)anthracene	2.16E-04	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	0.01	0.03
Benzo(b)fluoranthene	1.58E-06	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	4.35E-05	1.91E-04
Benzo(g,h,i)perylene	3.32E-04	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	9.15E-03	4.01E-02
Chrysene	2.92E-04	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	8.05E-03	3.52E-02
Fluoranthene	1.70E-03	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	0.047	0.20
Fluorene	9.38E-04	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	0.03	0.11
Naphthalene	8.72E-03	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	0.24	1.05
Phenanthrene	8.72E-03	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	0.24	1.05
Pyrene	1.92E-03	lb/ton	RTR Modeling SMACT Docket	27.6	241,404	0.053	0.23
Total HAPs	0.68	lb/ton	Sum(HCl, D/F, Metal HAP, Org. HAP)	27.6	241,404	18.73	82.05

2.3.2 Potential Emissions Tied to Natural Gas Combustion

> Emission factors shown below are the natural gas combustion emission factors.

Pollutant	Emission Factor (lb/MMscf)		Emission Factor Basis	Maximum Hourly Process Rate (MMscf/hr)	Maximum Annual Process Rate (MMscf/yr)	Potential Emission Rate (lb/hr)	Potential Emission Rate (tpy)
CO	18.0	lb/MMscf	Vendor estimate	0.030	264.6	0.54	2.38
VOC	5.5	lb/MMscf	AP-42 Table 1.4-2	0.030	264.6	0.17	0.73
SO2	0.6	lb/MMscf	AP-42 Table 1.4-2	0.030	264.6	0.018	0.079
CO2	116,977	lb/MMscf	40 CFR 98 Subpart C, Table C-1	0.030	264.6	3,533	15,473
CH4	2.20	lb/MMscf	40 CFR 98 Subpart C, Table C-2	0.030	264.6	0.067	0.29
N2O	0.22	lb/MMscf	40 CFR 98 Subpart C, Table C-2	0.030	264.6	6.66E-03	0.029
CO2e	117,098	lb/MMscf	40 CFR 98 Subpart C	0.030	264.6	3,536	15,489
Lead	5.00E-04	lb/MMscf	AP-42 Table 1.4-4	0.030	264.6	1.51E-05	6.61E-05
Acenaphthene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	5.44E-08	2.38E-07
Acenaphthylene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	5.44E-08	2.38E-07
Anthracene	2.40E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	7.25E-08	3.17E-07
Arsenic compounds	2.00E-04	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	6.04E-06	2.65E-05
Benzene	2.10E-03	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	6.34E-05	2.78E-04
Benzo(a)anthracene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	5.44E-08	2.38E-07
Benzo(a)pyrene	1.20E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	3.62E-08	1.59E-07
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	5.44E-08	2.38E-07
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	3.62E-08	1.59E-07
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	5.44E-08	2.38E-07
Beryllium and compounds	1.20E-05	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	3.62E-07	1.59E-06
Cadmium and compounds	1.10E-03	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	3.32E-05	1.46E-04
Chromium and compounds	1.40E-03	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	4.23E-05	1.85E-04
Chrysene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	5.44E-08	2.38E-07
Cobalt and compounds	8.40E-05	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	2.54E-06	1.11E-05
Dibenz(a,h)anthracene	1.20E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	3.62E-08	1.59E-07
1,4-Dichlorobenzene(p-Dichloroben:	1.20E-03	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	3.62E-05	1.59E-04
7,12-Dimethylbenz(a)anthracene	1.60E-05	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	4.83E-07	2.12E-06
Fluoranthene	3.00E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	9.06E-08	3.97E-07
Fluorene	2.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	8.46E-08	3.70E-07
Formaldehyde	7.50E-02	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	2.27E-03	9.92E-03
Hexane	1.80	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	5.44E-02	0.24
Indeno (1,2,3-cd)pyrene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	5.44E-08	2.38E-07
Manganese and compounds	3.80E-04	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	1.15E-05	5.03E-05
Mercury and compounds	2.60E-04	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	7.85E-06	3.44E-05
3-Methylcholanthrene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	5.44E-08	2.38E-07
Methylnaphthalene	2.40E-05	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	7.25E-07	3.17E-06
Naphthalene	6.10E-04	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	1.84E-05	8.07E-05
Nickel and compounds	2.10E-03	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	6.34E-05	2.78E-04
Pyrene	5.00E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	1.51E-07	6.61E-07
Selenium and compounds	2.40E-05	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	7.25E-07	3.17E-06
Toluene	3.40E-03	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	1.03E-04	4.50E-04
Total HAPs	1.89	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	264.6	0.057	0.25

3. Melting Furnaces #1-2

> Two (2) sidewell melting furnaces will receive decoated aluminum scrap from the decoater. The sidewell furnaces will also support solid reactive fluxing, classifying the two (2) sidewell melt furnaces as Group 1 Furnaces under the SMACT. Charge materials will be both automatically and manually fed to the sidewell of each furnace throughout a given operating period. Hard charge in the form of sows, T-bars, or billets can also be fed to the sidewells through the furnace flue hearth. Emissions generated in each sidewell melt furnace charge well and furnace main hearth will be routed to the respective baghouses serving the applicable furnace groupings as shown in the site-wide emission unit index.

Emission Unit IDs:	**003-1 through 003-2 & 004-1 through 004-2**
Emission Unit Descriptions:	**Melting Furnace #1 & Melting Furnace #2**

3.1 Melting Furnace Process Rates: Metal Throughput and Gas Firing Rate

3.1.1 Metal Processing Capacity

Maximum Hourly Aluminum Throughput (per Furnace):	14.3	ton/hr per furnace	
Maximum Annual Throughput (per Furnace):	124,830	ton/yr per furnace	Continuous annual operations

3.1.2 Furnace Natural Gas Firing Rate

> Each Melting Furnace contains one pair of regenerative burners. Each burner is rated at approximately 38 MMBtu/hr low NOX burners with regenerators, only one burners/regenerators will ever operate at a single time. While one burner head in a regenerative burner pair is operating to melt aluminum, the other burner head will gain heat to start combustion for the next cycle. Therefore, the maximum heat input rate for the furnace is equivalent to a single burner head rating of 38 MMBtu/hr.

Maximum Burner Heat Input Capacity (per Furnace):	38.0	MMBtu/hr per furnace	
Cycle Average Burner Heat Input Capacity (per Furnace):	30.4	MMBtu/hr per furnace	
Heating Value of Natural Gas at Plant:	1,000	Btu/scf	
Maximum Hourly Natural Gas Usage (per Furnace):	0.038	MMscf/hr per furnace	= 38.0 MMBtu/hr / 1,000 Btu/scf
Cycle Average Hourly Natural Gas Usage (per Furnace):	0.030	MMscf/hr per furnace	= 30.4 MMBtu/hr / 1,000 Btu/scf
Maximum Annual Natural Gas Usage (per Furnace):	266.3	MMscf/yr per furnace	Continuous annual operations at cycle average conditions

3.2 Documentation of Emission Factors Used for Sidewell Melting Furnaces

3.2.1 PM Emission Factors Tied to Aluminum Metal Production

> Stack particulate emissions attributable to molten metal processing for each melting furnace are estimated using the vendor estimated filterable PM outlet concentration of the baghouse controlling each melting furnace. For Hot Baghouse #3 shared between the Melting Furnace #2 and Holding Furnace #1, emissions attributable to each emission unit are ratioed based on their respective exhaust flow contributions. Filt. PM10 and PM2.5 emissions are estimated using filterable PM speciation data obtained from the TRC Report [see Note 1)]. Condensable PM emissions are estimated using the PM10/PM2.5 BACT limit basis for a comparable source (Novelis Bay Minette Sidewell Melting Furnaces #1-#5).

1) "Test Report - Particulate Matter Study at Three Representative Sources at Aluminum Recycling and Rolling Facilities", Prepared for the Aluminum Association by TRC Environmental, Project No. 157428, January 19, 2009 (herein referred to as the TRC Report).

Parameter	Value		Basis
Melting Furnace #1/Hot Baghouse #2 Stack Emissions			
Controlled Filt. PM Emission Factor (Grain Loading Basis)	0.002	gr/dscf	Standard emission factor for filterable particulate matter outlet grain loading
Hot Baghouse #2 Gas Volume	69,474	scfm	= 100,000 acfm / (460+300) x (460+68)
Hot Baghouse #2 Filt. PM Hourly Emission Factor	1.19	lb/hr	= 0.002 gr/dscf x 69,474 scfm x 60 minutes/hour / 7000 gr/lb
Filt. PM Emission Factor	0.084	lb/ton	= 1.19 lb filt. PM/hr / 14.3 ton/hr
Ratio of Filt. PM>10 to Filt. PM	0.29		*Particulate Matter Study at Three Representative Sources at Aluminum Recycling and Rolling Facilities, January 19, 2009* , "Box-Type Furnace Stack", TRC Report prepared for Aluminum Association.
Ratio of Filt. PM10-2.5 to Filt. PM	0.36		
Ratio of Filt. PM2.5 to Filt. PM	0.36		
Filt. PM10 to Filt. PM Ratio	0.71		
Filt. PM2.5 to Filt. PM Ratio	0.36		
Filt. PM10 Emission Factor	0.059	lb/ton	= 0.084 lb filt. PM/ton x 0.71 filt. PM10/filt. PM
Filt. PM2.5 Emission Factor	0.030	lb/ton	= 0.084 lb filt. PM/ton x 0.36 filt. PM2.5/filt. PM
Condensable PM Emission Factor	0.13	lb/ton	Emission factor used as basis for total PM10 BACT limit at Novelis Bay Minette, AL site for similar sidewell melting furnace operations
Total PM10 Emission Factor	0.19	lb/ton	= 0.059 lb filt. PM10/ton + 0.13 lb cond. PM/ton
Total PM2.5 Emission Factor	0.16	lb/ton	= 0.030 lb filt. PM2.5/ton + 0.13 lb cond. PM/ton
Nominal Filt. PM/PM10/PM2.5 Control Efficiency for Baghouse	98%	--	PM removal efficiency of lime-injected baghouses for Melting Furnaces #1 and #2
Uncontrolled (Uncont.) Filt. PM Emission Factor (Production Basis)	4.18	lb/ton	= 0.084 lb/ton controlled Filt. PM/ton / (1- 98% control efficiency)
Uncontrolled (Uncont.) Filt. PM10 Emission Factor (Production Basis)	2.97	lb/ton	= 0.059 lb/ton controlled Filt. PM10/ton / (1- 98% control efficiency)
Uncontrolled (Uncont.) Filt. PM2.5 Emission Factor (Production Basis)	1.49	lb/ton	= 0.030 lb/ton controlled Filt. PM10/ton / (1- 98% control efficiency)
Melting Furnace #2/Hot Baghouse #3 Stack Emissions			
Controlled Filt. PM Emission Factor (Grain Loading Basis)	0.002	gr/dscf	Standard emission factor for filterable particulate matter outlet grain loading
Hot Baghouse #3 Gas Volume	104,211	scfm	= 150,000 acfm / (460+300) x (460+68)
Hot Baghouse #3 Filt. PM Hourly Emission Factor	1.79	lb/hr	= 0.002 gr/dscf x 104,211 scfm x 60 minutes/hour / 7000 gr/lb
Flow Contribution from Melting Furnace #2 to Hot Baghouse #3	60.6%		Ventilation system design evaluation for Hot Baghouse #3 design basis
Filt. PM Emission Factor	0.076	lb/ton	= 1.79 lb filt. PM/hr from Hot Baghouse #3 x 60.6% flow cont. for Melting Furnace #2 / 14.3 ton/hr
Filt. PM10 Emission Factor	0.054	lb/ton	= 0.076 lb filt. PM/ton x 0.71 filt. PM10/filt. PM
Filt. PM2.5 Emission Factor	0.027	lb/ton	= 0.076 lb filt. PM/ton x 0.36 filt. PM2.5/filt. PM
Condensable PM Emission Factor	0.13	lb/ton	Emission factor used as basis for total PM10 BACT limit at Novelis Bay Minette, AL site for similar sidewell melting furnace operations
Total PM10 Emission Factor	0.18	lb/ton	= 0.054 lb filt. PM10/ton + 0.13 lb cond. PM/ton
Total PM2.5 Emission Factor	0.16	lb/ton	= 0.027 lb filt. PM2.5/ton + 0.13 lb cond. PM/ton
Nominal Filt. PM/PM10/PM2.5 Control Efficiency for Baghouse	98%	--	PM removal efficiency of lime-injected baghouses for Melting Furnaces #1 and #2
Uncontrolled (Uncont.) Filt. PM Emission Factor (Production Basis)	3.80	lb/ton	= 0.076 lb/ton controlled Filt. PM/ton / (1- 98% control efficiency)
Uncontrolled (Uncont.) Filt. PM10 Emission Factor (Production Basis)	2.70	lb/ton	= 0.054 lb/ton controlled Filt. PM10/ton / (1- 98% control efficiency)
Uncontrolled (Uncont.) Filt. PM2.5 Emission Factor (Production Basis)	1.35	lb/ton	= 0.027 lb/ton controlled Filt. PM10/ton / (1- 98% control efficiency)

3.2.2 HCl Emission Factor Tied to Aluminum Metal Production

> The HCl emission factor is based on a calculated upper prediction limit (UPL) from stack test results for similar units located at Logan Aluminum (Russellville, KY) and Alumax Mill Products (Nash, TX) published in WebFIRE where the UPL analysis was performed on 21 individual SMACT test runs of at a confidence level of 99%

Parameter	Value		Basis
Stack Emissions			
Controlled HCl Emission Factor (Production Basis)	0.030	lb/ton	UPL analysis of representative HCl test data for Sidewell Melting Furnaces in SMACT testing database
HCl Control Efficiency of Lime-Injected Baghouse	90%	--	Engineering estimate based on inlet and outlet testing results for lime-injected baghouses serving decoaters at secondary aluminum facilities.
Uncontrolled HCl Emission Factor (Production Basis)	0.30	lb/ton	0.030 lb HCl/ton / (1 - 0.90 cont. eff.) = 0.30 lb uncont. HCl/ton

3.2.3 D/F Emission Factor Tied to Aluminum Metal Production

> As no maximum D/F content has been determined at this stage in design, Aluminum Dynamics has decided to conservatively estimate D/F emissions by using the SMACT limit for Group 1 furnaces pursuant to 40 CFR 63.1505(i)(3).

Parameter	Value		Basis
Stack Emissions			
D/F Stack Emission Factor	2.10E-04	gr/ton	SMACT D/F emission limit for Group 1 furnaces pursuant to 40 CFR 63.1505(i)(3)
D/F Emission Factor	3.00E-08	lb/ton	= 2.10E-04 gr D/F/ton / 7,000 gr/lb
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin Emission Factor	1.37E-09	lb/ton	= 3.00E-08 gr D/F/ton * 0.0458 Average Congener Weight Fraction
1,2,3,4,6,7,8-heptachlorodibenzo-p-furan Emission Factor	2.45E-09	lb/ton	= 3.00E-08 gr D/F/ton * 0.0818 Average Congener Weight Fraction
1,2,3,4,7,8,9-heptachlorodibenzo-p-furan Emission Factor	5.31E-10	lb/ton	= 3.00E-08 gr D/F/ton * 0.0177 Average Congener Weight Fraction
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin Emission Factor	5.64E-10	lb/ton	= 3.00E-08 gr D/F/ton * 0.0188 Average Congener Weight Fraction
1,2,3,4,7,8-hexachlorodibenzo-p-furan Emission Factor	2.13E-09	lb/ton	= 3.00E-08 gr D/F/ton * 0.0711 Average Congener Weight Fraction
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin Emission Factor	5.73E-10	lb/ton	= 3.00E-08 gr D/F/ton * 0.0191 Average Congener Weight Fraction
1,2,3,6,7,8-hexachlorodibenzo-p-furan Emission Factor	1.82E-09	lb/ton	= 3.00E-08 gr D/F/ton * 0.0608 Average Congener Weight Fraction
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin Emission Factor	4.44E-10	lb/ton	= 3.00E-08 gr D/F/ton * 0.0148 Average Congener Weight Fraction
1,2,3,7,8,9-hexachlorodibenzo-p-furan Emission Factor	5.61E-10	lb/ton	= 3.00E-08 gr D/F/ton * 0.0187 Average Congener Weight Fraction
1,2,3,7,8-pentachlorodibenzo-p-dioxin Emission Factor	9.39E-10	lb/ton	= 3.00E-08 gr D/F/ton * 0.0313 Average Congener Weight Fraction
1,2,3,7,8-pentachlorodibenzo-p-furan Emission Factor	2.22E-09	lb/ton	= 3.00E-08 gr D/F/ton * 0.0739 Average Congener Weight Fraction
2,3,4,6,7,8-hexachlorodibenzo-p-furan Emission Factor	1.73E-09	lb/ton	= 3.00E-08 gr D/F/ton * 0.0575 Average Congener Weight Fraction
2,3,4,7,8-pentachlorodibenzo-p-furan Emission Factor	6.38E-09	lb/ton	= 3.00E-08 gr D/F/ton * 0.2125 Average Congener Weight Fraction
2,3,7,8-tetrachlorodibenzo-p-dioxin Emission Factor	7.02E-10	lb/ton	= 3.00E-08 gr D/F/ton * 0.0234 Average Congener Weight Fraction
2,3,7,8-tetrachlorodibenzo-p-furan Emission Factor	4.88E-09	lb/ton	= 3.00E-08 gr D/F/ton * 0.1628 Average Congener Weight Fraction
Octachlorodibenzo-p-dioxin Emission Factor	1.75E-09	lb/ton	= 3.00E-08 gr D/F/ton * 0.0583 Average Congener Weight Fraction
Octachlorodibenzo-p-furan Emission Factor	1.16E-09	lb/ton	= 3.00E-08 gr D/F/ton * 0.0386 Average Congener Weight Fraction

3.2.4 NOX, CO, VOC Emission Factor Tied to Aluminum Metal Production

> Aluminum scrap entering the melting furnaces will have no paint or additional coating besides residual lubricants and oils associated with industrial processing activities and similar surface contamination associated with bare post-consumer scrap sources. The melting furnace vendor estimate for the concentration of VOC in the exhaust gas was used to account for VOC from natural gas combustion and residual materials on the scrap.

> Both the NOX and CO emission factors tied to aluminum production are based on BACT limits for a comparable facility (Novelis Bay Minette, AL Sidewell Furnaces #1-#5). Separate NOX and CO emission factors are derived for the natural gas contribution to the overall melting furnace emissions profile.

Parameter	Value	Basis
Stack Emissions		
VOC Exhaust Concentration	10.0 ppmv	Vendor supplied data
VOC Molecular Weight	44 lb/lbmol	Propane as the VOC surrogate
Molar Volume Conversion Factor	386 scf/lbmol	Ideal gas law at 68 deg. F and 1 atm
VOC Exhaust Concentration	1.14E-06 lb/scf	= 10.0 lbmol VOC/1E6 lbmol gas x 44 lb VOC/1 lbmol VOC x 1 lbmol gas/386 scf gas
Uncontrolled VOC Emission Factor (Production Basis)	0.33 lb/ton	= 1.14E-06 lb VOC/scf x 69,474 scfm x 60 min/hr / 14.3 ton/hr
Uncontrolled NOX Emission Factor (Production Basis)	0.16 lb/ton	Based on BACT limit from comparable facility (Novelis Bay Minette Sidewell Melting Furnaces #1-#5)
Uncontrolled CO Emission Factor (Production Basis)	0.22 lb/ton	Based on BACT limit from comparable facility (Novelis Bay Minette Sidewell Melting Furnaces #1-#5)

3.2.5 NOX Emission Factor Tied to Natural Gas Combustion

> Potential emissions of NOX from the Melting Furnaces are calculated based on emissions estimates provided by prospective furnace burner vendors.

Parameter	Value	Basis
Maximum Hourly Emission Factor		-
NOX Exhaust Concentration	110 ppmv	Vendor estimate with regenerator (peak)
NO2 Molecular Weight	46 lb/lbmol	Consistent with Method 19, assume all NOX is NO2
Molar Volume Conversion Factor	386 scf/lbmol	Ideal gas law at 68 deg. F and 1 atm
NOX Exhaust Concentration	1.31E-05 lb NOX/dscf	= 110 lbmol NOX/lbmol gas x 46 lb NO2/1 lbmol NO2 x 1 lbmol gas/386 scf gas
F-Factor	8,710 dscf/MMBtu	EPA Method 19 Table 19-2 F-Factor for Various Fuels dry F-factor for natural gas
O2 Concentration for Emission Factor Correction	3 %	Vendor data
NOX Heat Input Rate-Based Emission Factor	0.13 lb/MMBtu	= 1.31E-05 lb NO2/dscf x 8,710 dscf/MMBtu x 20.9% / (20.9% - 3%)
NOX Natural Gas Usage Rate-Based Emission Factor	133.46 lb/MMscf	= 0.13 lb NO2/MMBtu x 1,030 MMBtu/MMscf
Annual Emission Factor		-
NOX Exhaust Concentration	100 ppmv	Vendor estimate with regenerator (cycle average)
NO2 Molecular Weight	46 lb/lbmol	Consistent with Method 19, assume all NOX is NO2
Molar Volume Conversion Factor	386 scf/lbmol	Ideal gas law at 68 deg. F and 1 atm
NOX Exhaust Concentration	1.19E-05 lb NOX/scf	= 100 lbmol NOX/lbmol gas x 46 lb NO2/1 lbmol NO2 x 1 lbmol gas/386 scf gas
F-Factor	8,710 dscf/MMBtu	EPA Method 19 Table 19-2 F-Factor for Various Fuels dry F-factor for natural gas
O2 Concentration for Emission Factor Correction	3 %	Vendor data
NOX Heat Input Rate-Based Emission Factor	0.12 lb/MMBtu	= 1.19E-05 lb NO2/dscf x 8,710 dscf/MMBtu x 20.9% / (20.9% - 3%)
NOX Natural Gas Usage Rate-Based Emission Factor	121.33 lb/MMscf	= 0.12lb NO2/MMBtu x 1,030 MMBtu/MMscf

3.2.6 CO Emission Factor Tied to Natural Gas Combustion

> Potential emissions of CO from the Melting Furnaces are calculated based on emissions estimates provided by prospective furnace burner vendors.

Parameter	Value	Basis
Maximum Hourly Emission Factor		-
CO Exhaust Concentration	110 ppmv	Vendor estimate with regenerator (peak)
CO Molecular Weight	28 lb/lbmol	Reference value from Periodic Table
CO Exhaust Concentration	7.99E-06 lb CO/dscf	= 110 lbmol CO/lbmol gas x 28 lb CO/1 lbmol CO x 1 lbmol gas/386 scf gas
O2 Concentration for Emission Factor Correction	3 %	Vendor data
CO Heat Input Rate-Based Emission Factor	0.081 lb/MMBtu	= 7.99E-06 lb CO/dscf x 8,710 dscf/MMBtu x 20.9% / (20.9% - 3%)
CO Natural Gas Usage Rate-Based Emission Factor	81.24 lb/MMscf	= 0.081 lb CO/MMBtu x 1,030 MMBtu/MMscf
Annual Emission Factor		
CO Exhaust Concentration	100 ppmv	Vendor estimate with regenerator (cycle average)
CO Molecular Weight	28 lb/lbmol	Reference value from Periodic Table
CO Exhaust Concentration	7.26E-06 lb CO/dscf	= 100 lbmol CO/lbmol gas x 28 lb CO/1 lbmol CO x 1 lbmol gas/386 scf gas
O2 Concentration for Emission Factor Correction	3 %	Vendor data
CO Heat Input Rate-Based Emission Factor	0.074 lb/MMBtu	= 7.26E-06 lb CO/dscf x 8,710 dscf/MMBtu x 20.9% / (20.9% - 3%)
CO Natural Gas Usage Rate-Based Emission Factor	73.85 lb/MMscf	=0.074 0.037 lb CO/MMBtu x 1,030 MMBtu/MMscf

3.2.7 Metal HAP Emission Factors Tied to Aluminum Metal Production

> The average ("Ave.") metal HAP emission factors are obtained from *Table 5. Summary of Metallic HAP Test Results* from the SMACT Docket Memo To: Rochelle Boyd, Environmental Protection Agency (the EPA) From: Mark Bahner, RTI International entitled "RE: Development of the RTR Risk Modeling Dataset for the Secondary Aluminum Production Source Category", January 30, 2012, Docket ID EPA-HQ-OAR-2010-0544-0139 ("RTR Modeling SMACT Docket Memo") for "Group 1 Furnace - Handling other than Clean Charge"

Parameter	Value	Basis
Melting Furnace #1/Hot Baghouse #2 Stack Emissions		
Nominal Metal HAP Control Efficiency	98% --	PM & Metal HAP removal efficiency of lime-injected baghouse for Melting Furnace #1
Antimony Emission Factor (Normalized to PM Emitted)	1.86E-05 lb Antimony/lb PM	RTR Modeling SMACT Docket Memo Table 5 Antimony emission factor converted from mg/kg PM to lb/lb PM
Arsenic Emission Factor (Normalized to PM Emitted)	1.90E-06 lb Arsenic/lb PM	RTR Modeling SMACT Docket Memo Table 5 Arsenic emission factor converted from mg/kg PM to lb/lb PM
Beryllium Emission Factor (Normalized to PM Emitted)	5.00E-07 lb Beryllium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Beryllium emission factor converted from mg/kg PM to lb/lb PM
Cadmium Emission Factor (Normalized to PM Emitted)	1.34E-05 lb Cadmium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Cadmium emission factor converted from mg/kg PM to lb/lb PM
Chromium III Emission Factor (Normalized to PM Emitted)	1.10E-05 lb Chromium III/lb PM	RTR Modeling SMACT Docket Memo Table 5 Chromium III emission factor converted from mg/kg PM to lb/lb PM
Chromium VI Emission Factor (Normalized to PM Emitted)	2.00E-07 lb Chromium VI/lb PM	RTR Modeling SMACT Docket Memo Table 5 Chromium VI emission factor converted from mg/kg PM to lb/lb PM
Cobalt Emission Factor (Normalized to PM Emitted)	1.30E-06 lb Cobalt/lb PM	RTR Modeling SMACT Docket Memo Table 5 Cobalt emission factor converted from mg/kg PM to lb/lb PM
Lead Emission Factor (Normalized to PM Emitted)	3.27E-05 lb Lead/lb PM	RTR Modeling SMACT Docket Memo Table 5 Lead emission factor converted from mg/kg PM to lb/lb PM
Manganese Emission Factor (Normalized to PM Emitted)	1.01E-04 lb Manganese/lb PM	RTR Modeling SMACT Docket Memo Table 5 Manganese emission factor converted from mg/kg PM to lb/lb PM
Mercury, elemental Emission Factor (Normalized to PM Emitted)	1.91E-07 lb Mercury, elemental/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, elemental emission factor converted from mg/kg PM to lb/lb PM
Mercury, gaseous Emission Factor (Normalized to PM Emitted)	2.40E-08 lb Mercury, gaseous/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, gaseous emission factor converted from mg/kg PM to lb/lb PM

Mercury, particulate Emission Factor (Normalized to PM Emitted)	2.40E-08	lb Mercury, particulate/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, particulate emission factor converted from mg/kg PM to lb/lb PM
Nickel Emission Factor (Normalized to PM Emitted)	1.30E-05	lb Nickel/lb PM	RTR Modeling SMACT Docket Memo Table 5 Nickel emission factor converted from mg/kg PM to lb/lb PM
Selenium Emission Factor (Normalized to PM Emitted)	4.10E-06	lb Selenium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Selenium emission factor converted from mg/kg PM to lb/lb PM
Total Metal HAP Emission Factor (Normalized to PM Emitted)	1.98E-04	lb Total/lb PM	RTR Modeling SMACT Docket Memo Table 5 Total emission factor converted from mg/kg PM to lb/lb PM
Cont. Antimony Emission Factor (Production Basis)	1.55E-06	lb Antimony/ton	1.86E-05 lb Antimony HAP/lb filt. PM x 0.084 lb filt. PM/ton = 1.55E-06 lb Antimony/ton
Cont. Arsenic Emission Factor (Production Basis)	1.59E-07	lb Arsenic/ton	1.90E-06 lb Arsenic HAP/lb filt. PM x 0.084 lb filt. PM/ton = 1.59E-07 lb Arsenic/ton
Cont. Beryllium Emission Factor (Production Basis)	4.18E-08	lb Beryllium/ton	5.00E-07 lb Beryllium HAP/lb filt. PM x 0.084 lb filt. PM/ton = 4.18E-08 lb Beryllium/ton
Cont. Cadmium Emission Factor (Production Basis)	1.12E-06	lb Cadmium/ton	1.34E-05 lb Cadmium HAP/lb filt. PM x 0.084 lb filt. PM/ton = 1.12E-06 lb Cadmium/ton
Cont. Chromium III Emission Factor (Production Basis)	9.19E-07	lb Chromium III/ton	1.10E-05 lb Chromium III HAP/lb filt. PM x 0.084 lb filt. PM/ton = 9.19E-07 lb Chromium III/ton
Cont. Chromium VI Emission Factor (Production Basis)	1.67E-08	lb Chromium VI/ton	2.00E-07 lb Chromium VI HAP/lb filt. PM x 0.084 lb filt. PM/ton = 1.67E-08 lb Chromium VI/ton
Cont. Cobalt Emission Factor (Production Basis)	1.09E-07	lb Cobalt/ton	1.30E-06 lb Cobalt HAP/lb filt. PM x 0.084 lb filt. PM/ton = 1.09E-07 lb Cobalt/ton
Cont. Lead Emission Factor (Production Basis)	2.73E-06	lb Lead/ton	3.27E-05 lb Lead HAP/lb filt. PM x 0.084 lb filt. PM/ton = 2.73E-06 lb Lead/ton
Cont. Manganese Emission Factor (Production Basis)	8.44E-06	lb Manganese/ton	1.01E-04 lb Manganese HAP/lb filt. PM x 0.084 lb filt. PM/ton = 8.44E-06 lb Manganese/ton
Cont. Mercury, elemental Emission Factor (Production Basis)	1.60E-08	lb Mercury, elemental/ton	1.91E-07 lb Mercury, elemental HAP/lb filt. PM x 0.084 lb filt. PM/ton = 1.60E-08 lb Mercury, elemental/ton
Cont. Mercury, gaseous Emission Factor (Production Basis)	2.01E-09	lb Mercury, gaseous/ton	2.40E-08 lb Mercury, gaseous HAP/lb filt. PM x 0.084 lb filt. PM/ton = 2.01E-09 lb Mercury, gaseous/ton
Cont. Mercury, particulate Emission Factor (Production Basis)	2.01E-09	lb Mercury, particulate/ton	2.40E-08 lb Mercury, particulate HAP/lb filt. PM x 0.084 lb filt. PM/ton = 2.01E-09 lb Mercury, particulate/ton
Cont. Nickel Emission Factor (Production Basis)	1.09E-06	lb Nickel/ton	1.30E-05 lb Nickel HAP/lb filt. PM x 0.084 lb filt. PM/ton = 1.09E-06 lb Nickel/ton
Cont. Selenium Emission Factor (Production Basis)	3.43E-07	lb Selenium/ton	4.10E-06 lb Selenium HAP/lb filt. PM x 0.084 lb filt. PM/ton = 3.43E-07 lb Selenium/ton
Cont. Total Emission Factor (Production Basis)	1.65E-05	lb Total/ton	1.98E-04 lb Total HAP/lb filt. PM x 0.084 lb filt. PM/ton = 1.65E-05 lb Total/ton

Parameter	Value		Basis
Melting Furnace #2/Hot Baghouse #3 Stack Emissions			
Nominal Metal HAP Control Efficiency for Baghouse	98%	--	PM & Metal HAP removal efficiency of lime-injected baghouse for Melting Furnace #2
Antimony Emission Factor (Normalized to PM Emitted)	1.86E-05	lb Antimony/lb PM	RTR Modeling SMACT Docket Memo Table 5 Antimony emission factor converted from mg/kg PM to lb/lb PM
Arsenic Emission Factor (Normalized to PM Emitted)	1.90E-06	lb Arsenic/lb PM	RTR Modeling SMACT Docket Memo Table 5 Arsenic emission factor converted from mg/kg PM to lb/lb PM
Beryllium Emission Factor (Normalized to PM Emitted)	5.00E-07	lb Beryllium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Beryllium emission factor converted from mg/kg PM to lb/lb PM
Cadmium Emission Factor (Normalized to PM Emitted)	1.34E-05	lb Cadmium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Cadmium emission factor converted from mg/kg PM to lb/lb PM
Chromium III Emission Factor (Normalized to PM Emitted)	1.10E-05	lb Chromium III/lb PM	RTR Modeling SMACT Docket Memo Table 5 Chromium III emission factor converted from mg/kg PM to lb/lb PM
Chromium VI Emission Factor (Normalized to PM Emitted)	2.00E-07	lb Chromium VI/lb PM	RTR Modeling SMACT Docket Memo Table 5 Chromium VI emission factor converted from mg/kg PM to lb/lb PM
Cobalt Emission Factor (Normalized to PM Emitted)	1.30E-06	lb Cobalt/lb PM	RTR Modeling SMACT Docket Memo Table 5 Cobalt emission factor converted from mg/kg PM to lb/lb PM
Lead Emission Factor (Normalized to PM Emitted)	3.27E-05	lb Lead/lb PM	RTR Modeling SMACT Docket Memo Table 5 Lead emission factor converted from mg/kg PM to lb/lb PM
Manganese Emission Factor (Normalized to PM Emitted)	1.01E-04	lb Manganese/lb PM	RTR Modeling SMACT Docket Memo Table 5 Manganese emission factor converted from mg/kg PM to lb/lb PM
Mercury, elemental Emission Factor (Normalized to PM Emitted)	1.91E-07	lb Mercury, elemental/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, elemental emission factor converted from mg/kg PM to lb/lb PM

Mercury, gaseous Emission Factor (Normalized to PM Emitted)	2.40E-08	lb Mercury, gaseous/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, gaseous emission factor converted from mg/kg PM to lb/lb PM
Mercury, particulate Emission Factor (Normalized to PM Emitted)	2.40E-08	lb Mercury, particulate/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, particulate emission factor converted from mg/kg PM to lb/lb PM
Nickel Emission Factor (Normalized to PM Emitted)	1.30E-05	lb Nickel/lb PM	RTR Modeling SMACT Docket Memo Table 5 Nickel emission factor converted from mg/kg PM to lb/lb PM
Selenium Emission Factor (Normalized to PM Emitted)	4.10E-06	lb Selenium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Selenium emission factor converted from mg/kg PM to lb/lb PM
Total Metal HAP Emission Factor (Normalized to PM Emitted)	1.98E-04	lb Total/lb PM	RTR Modeling SMACT Docket Memo Table 5 Total emission factor converted from mg/kg PM to lb/lb PM

Cont. Antimony Emission Factor (Production Basis)	1.41E-06	lb Antimony/ton	1.86E-05 lb Antimony HAP/lb filt. PM x 0.076 lb filt. PM/ton = 1.41E-06 lb Antimony/ton
Cont. Arsenic Emission Factor (Production Basis)	1.44E-07	lb Arsenic/ton	1.90E-06 lb Arsenic HAP/lb filt. PM x 0.076 lb filt. PM/ton = 1.44E-07 lb Arsenic/ton
Cont. Beryllium Emission Factor (Production Basis)	3.80E-08	lb Beryllium/ton	5.00E-07 lb Beryllium HAP/lb filt. PM x 0.076 lb filt. PM/ton = 3.80E-08 lb Beryllium/ton
Cont. Cadmium Emission Factor (Production Basis)	1.02E-06	lb Cadmium/ton	1.34E-05 lb Cadmium HAP/lb filt. PM x 0.076 lb filt. PM/ton = 1.02E-06 lb Cadmium/ton
Cont. Chromium III Emission Factor (Production Basis)	8.36E-07	lb Chromium III/ton	1.10E-05 lb Chromium III HAP/lb filt. PM x 0.076 lb filt. PM/ton = 8.36E-07 lb Chromium III/ton
Cont. Chromium VI Emission Factor (Production Basis)	1.52E-08	lb Chromium VI/ton	2.00E-07 lb Chromium VI HAP/lb filt. PM x 0.076 lb filt. PM/ton = 1.52E-08 lb Chromium VI/ton
Cont. Cobalt Emission Factor (Production Basis)	9.88E-08	lb Cobalt/ton	1.30E-06 lb Cobalt HAP/lb filt. PM x 0.076 lb filt. PM/ton = 9.88E-08 lb Cobalt/ton
Cont. Lead Emission Factor (Production Basis)	2.48E-06	lb Lead/ton	3.27E-05 lb Lead HAP/lb filt. PM x 0.076 lb filt. PM/ton = 2.48E-06 lb Lead/ton
Cont. Manganese Emission Factor (Production Basis)	7.67E-06	lb Manganese/ton	1.01E-04 lb Manganese HAP/lb filt. PM x 0.076 lb filt. PM/ton = 7.67E-06 lb Manganese/ton
Cont. Mercury, elemental Emission Factor (Production Basis)	1.45E-08	lb Mercury, elemental/ton	1.91E-07 lb Mercury, elemental HAP/lb filt. PM x 0.076 lb filt. PM/ton = 1.45E-08 lb Mercury, elemental/ton
Cont. Mercury, gaseous Emission Factor (Production Basis)	1.82E-09	lb Mercury, gaseous/ton	2.40E-08 lb Mercury, gaseous HAP/lb filt. PM x 0.076 lb filt. PM/ton = 1.82E-09 lb Mercury, gaseous/ton
Cont. Mercury, particulate Emission Factor (Production Basis)	1.82E-09	lb Mercury, particulate/ton	2.40E-08 lb Mercury, particulate HAP/lb filt. PM x 0.076 lb filt. PM/ton = 1.82E-09 lb Mercury, particulate/ton
Cont. Nickel Emission Factor (Production Basis)	9.88E-07	lb Nickel/ton	1.30E-05 lb Nickel HAP/lb filt. PM x 0.076 lb filt. PM/ton = 9.88E-07 lb Nickel/ton
Cont. Selenium Emission Factor (Production Basis)	3.12E-07	lb Selenium/ton	4.10E-06 lb Selenium HAP/lb filt. PM x 0.076 lb filt. PM/ton = 3.12E-07 lb Selenium/ton
Cont. Total Emission Factor (Production Basis)	1.50E-05	lb Total/ton	1.98E-04 lb Total HAP/lb filt. PM x 0.076 lb filt. PM/ton = 1.50E-05 lb Total/ton

3.2.8 Additional Emission Factors Tied to Natural Gas Combustion

> PM emissions are accounted for in the filter house outlet emissions estimate and VOC emissions are included in the emissions estimate for aluminum melting. All other emission factors are based on reference literature (e.g., EPA's AP-42 or MRR, 40 CFR 98 Subpart C Tables C-1 and C-2).

3.3 Potential Emission Calculations for Sidewell Melting Furnaces

3.3.1 Potential Emissions Tied to Aluminum Metal Production (Stack) for Melting Furnace #1

> Emission factors shown below are the stack emission factors.

Pollutant	Emission Factor (lb/ton)		Emission Factor Basis	Maximum Hourly Process Rate (ton/hr)	Maximum Annual Process Rate (ton/yr)	Potential Emission Rate (lb/hr)	Potential Emission Rate (tpy)
PM	0.084	lb/ton	Vendor Estimate/Engineering Estimate	14.3	124,830	1.19	5.22
PM10	0.189	lb/ton	Engineering Estimate	14.3	124,830	2.70	11.82
PM2.5	0.160	lb/ton	Engineering Estimate	14.3	124,830	2.28	9.97
HCl	0.030	lb/ton	UPL	14.3	124,830	0.42	1.85
D/F	3.00E-08	lb/ton	SMACT Allowable	14.3	124,830	4.28E-07	1.87E-06

1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	1.37E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	1.96E-08	8.58E-08
1,2,3,4,6,7,8-heptachlorodibenzo-p-furan	2.45E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	3.50E-08	1.53E-07
1,2,3,4,7,8,9-heptachlorodibenzo-p-furan	5.31E-10	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	7.57E-09	3.31E-08
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	5.64E-10	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	8.04E-09	3.52E-08
1,2,3,4,7,8-hexachlorodibenzo-p-furan	2.13E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	3.04E-08	1.33E-07
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	5.73E-10	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	8.17E-09	3.58E-08
1,2,3,6,7,8-hexachlorodibenzo-p-furan	1.82E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	2.60E-08	1.14E-07
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	4.44E-10	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	6.33E-09	2.77E-08
1,2,3,7,8,9-hexachlorodibenzo-p-furan	5.61E-10	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	7.99E-09	3.50E-08
1,2,3,7,8-pentachlorodibenzo-p-dioxin	9.39E-10	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	1.34E-08	5.86E-08
1,2,3,7,8-pentachlorodibenzo-p-furan	2.22E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	3.16E-08	1.38E-07
2,3,4,6,7,8-hexachlorodibenzo-p-furan	1.73E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	2.46E-08	1.08E-07
2,3,4,7,8-pentachlorodibenzo-p-furan	6.38E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	9.08E-08	3.98E-07
2,3,7,8-tetrachlorodibenzo-p-dioxin	7.02E-10	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	1.00E-08	4.38E-08
2,3,7,8-tetrachlorodibenzo-p-furan	4.88E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	6.96E-08	3.05E-07
Octachlorodibenzo-p-dioxin	1.75E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	2.49E-08	1.09E-07
Octachlorodibenzo-p-furan	1.16E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	1.65E-08	7.23E-08
NOX	0.16	lb/ton	Similar Source BACT Limit	14.3	124,830	2.22	9.74
CO	0.22	lb/ton	Similar Source BACT Limit	14.3	124,830	3.07	13.46
VOC	0.33	lb/ton	Vendor Estimate	14.3	124,830	4.77	20.88
Antimony	1.55E-06	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	2.22E-05	9.70E-05
Arsenic	1.59E-07	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	2.26E-06	9.91E-06
Beryllium	4.18E-08	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	5.95E-07	2.61E-06
Cadmium	1.12E-06	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	1.60E-05	6.99E-05
Chromium III	9.19E-07	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	1.31E-05	5.74E-05
Chromium VI	1.67E-08	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	2.38E-07	1.04E-06
Cobalt	1.09E-07	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	1.55E-06	6.78E-06
Lead	2.73E-06	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	3.89E-05	1.71E-04

Manganese	8.44E-06	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	1.20E-04	5.27E-04
Mercury, elemental	1.60E-08	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	2.27E-07	9.96E-07
Mercury, gaseous	2.01E-09	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	2.86E-08	1.25E-07
Mercury, particulate	2.01E-09	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	2.86E-08	1.25E-07
Nickel	1.09E-06	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	1.55E-05	6.78E-05
Selenium	3.43E-07	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	4.88E-06	2.14E-05
Total HAP	0.03	lb/ton	Sum (HCl, D/F, Metal HAPs)	14.3	124,830	0.42	1.85

3.3.2 Potential Emissions Tied to Aluminum Metal Production (Stack) for Melting Furnace #2

> Emission factors shown below are the stack emission factors.

Pollutant	Emission Factor (lb/ton)		Emission Factor Basis	Maximum Hourly Process Rate (ton/hr)	Maximum Annual Process Rate (ton/yr)	Potential Emission Rate (lb/hr)	Potential Emission Rate (tpy)
PM	0.076	lb/ton	Vendor Estimate/Engineering Estimate	14.3	124,830	1.08	4.74
PM10	0.184	lb/ton	Engineering Estimate	14.3	124,830	2.62	11.49
PM2.5	0.157	lb/ton	Engineering Estimate	14.3	124,830	2.24	9.80
HCl	0.030	lb/ton	UPL	14.3	124,830	0.42	1.85
D/F	3.00E-08	lb/ton	SMACT Allowable	14.3	124,830	4.28E-07	1.87E-06
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	1.37E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	1.96E-08	8.58E-08
1,2,3,4,6,7,8-heptachlorodibenzo-p-furan	2.45E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	3.50E-08	1.53E-07
1,2,3,4,7,8,9-heptachlorodibenzo-p-furan	5.31E-10	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	7.57E-09	3.31E-08
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	5.64E-10	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	8.04E-09	3.52E-08
1,2,3,4,7,8-hexachlorodibenzo-p-furan	2.13E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	3.04E-08	1.33E-07
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	5.73E-10	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	8.17E-09	3.58E-08
1,2,3,6,7,8-hexachlorodibenzo-p-furan	1.82E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	2.60E-08	1.14E-07
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	4.44E-10	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	6.33E-09	2.77E-08
1,2,3,7,8,9-hexachlorodibenzo-p-furan	5.61E-10	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	7.99E-09	3.50E-08
1,2,3,7,8-pentachlorodibenzo-p-dioxin	9.39E-10	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	1.34E-08	5.86E-08
1,2,3,7,8-pentachlorodibenzo-p-furan	2.22E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	3.16E-08	1.38E-07
2,3,4,6,7,8-hexachlorodibenzo-p-furan	1.73E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	2.46E-08	1.08E-07
2,3,4,7,8-pentachlorodibenzo-p-furan	6.38E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	9.08E-08	3.98E-07
2,3,7,8-tetrachlorodibenzo-p-dioxin	7.02E-10	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	1.00E-08	4.38E-08

2,3,7,8-tetrachlorodibenzo-p-furan	4.88E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	6.96E-08	3.05E-07
Octachlorodibenzo-p-dioxin	1.75E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	2.49E-08	1.09E-07
Octachlorodibenzo-p-furan	1.16E-09	lb/ton	SMACT limit * Congener Weight Fraction in Table 15 of RTR Modeling SMACT Docket	14.3	124,830	1.65E-08	7.23E-08
NOX	0.16	lb/ton	Similar Source BACT Limit	14.3	124,830	2.22	9.74
CO	0.22	lb/ton	Similar Source BACT Limit	14.3	124,830	3.07	13.46
VOC	0.33	lb/ton	Vendor Estimate	14.3	124,830	4.77	20.88
Antimony	1.41E-06	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	2.01E-05	8.82E-05
Arsenic	1.44E-07	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	2.06E-06	9.01E-06
Beryllium	3.80E-08	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	5.41E-07	2.37E-06
Cadmium	1.02E-06	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	1.45E-05	6.35E-05
Chromium III	8.36E-07	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	1.19E-05	5.22E-05
Chromium VI	1.52E-08	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	2.17E-07	9.48E-07
Cobalt	9.88E-08	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	1.41E-06	6.16E-06
Lead	2.48E-06	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	3.54E-05	1.55E-04
Manganese	7.67E-06	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	1.09E-04	4.79E-04
Mercury, elemental	1.45E-08	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	2.07E-07	9.06E-07
Mercury, gaseous	1.82E-09	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	2.60E-08	1.14E-07
Mercury, particulate	1.82E-09	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	2.60E-08	1.14E-07
Nickel	9.88E-07	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	1.41E-05	6.16E-05
Selenium	3.12E-07	lb/ton	RTR Modeling SMACT Docket	14.3	124,830	4.44E-06	1.94E-05
Total HAP	0.03	lb/ton	Sum (HCl, D/F,Metal HAPs)	14.3	124,830	0.42	1.85

3.3.3 Potential Emissions Tied to Natural Gas Combustion for Melting Furnaces #1 and #2

> The hourly emission rates reflect the peak NOX and CO vendor estimates while the annual emission rates reflect the cycle average vendor estimates.

Pollutant	Emission Factor (lb/MMscf)		Emission Factor Basis	Maximum Hourly Process Rate (MMscf/hr)	Maximum Annual Process Rate (MMscf/yr)	Potential Emission Rate per Furnace (lb/hr)	Potential Emission Rate per Furnace (tpy)	Total Potential Emissions (tpy)
NOX (Hourly)	133.5	lb/MMscf	Vendor Estimate	0.038	266.3	5.07	--	--
NOX (Annual)	121.3	lb/MMscf	Vendor Estimate	0.038	266.3	--	16.16	32.31
CO (Hourly)	81.2	lb/MMscf	Vendor Estimate	0.038	266.3	3.09	--	--
CO (Annual)	73.9	lb/MMscf	Vendor Estimate	0.038	266.3	--	9.83	19.67
SO2	0.6	lb/MMscf	AP-42 Table 1.4-2	0.038	266.3	0.023	0.080	0.16
CO2	116,977	lb/MMscf	40CFR98 Subpart C, Table C-1	0.038	266.3	4,445	15,576	31,152
CH4	2.2	lb/MMscf	40CFR98 Subpart C, Table C-2	0.038	266.3	0.084	0.29	0.59
N2O	0.22	lb/MMscf	40CFR98 Subpart C, Table C-2	0.038	266.3	8.38E-03	0.029	0.06
CO2e	117,098	lb/MMscf	40CFR98 Subpart A	0.038	266.3	4,450	15,592	31,184
Lead	5.00E-04	lb/MMscf	AP-42 Table 1.4-4	0.038	266.3	1.90E-05	6.66E-05	1.33E-04
Acenaphthene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	6.84E-08	2.40E-07	4.79E-07
Acenaphthylene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	6.84E-08	2.40E-07	4.79E-07
Anthracene	2.40E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	9.12E-08	3.20E-07	6.39E-07
Arsenic compounds	2.00E-04	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	7.60E-06	2.66E-05	5.33E-05
Benzene	2.10E-03	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	7.98E-05	2.80E-04	5.59E-04
Benzo(a)anthracene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	6.84E-08	2.40E-07	4.79E-07
Benzo(a)pyrene	1.20E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	4.56E-08	1.60E-07	3.20E-07
Benzo(b)fluoranthene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	6.84E-08	2.40E-07	4.79E-07
Benzo(g,h,i)perylene	1.20E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	4.56E-08	1.60E-07	3.20E-07
Benzo(k)fluoranthene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	6.84E-08	2.40E-07	4.79E-07
Beryllium and compounds	1.20E-05	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	4.56E-07	1.60E-06	3.20E-06
Cadmium and compounds	1.10E-03	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	4.18E-05	1.46E-04	2.93E-04
Chromium and compound	1.40E-03	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	5.32E-05	1.86E-04	3.73E-04
Chrysene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	6.84E-08	2.40E-07	4.79E-07
Cobalt and compounds	8.40E-05	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	3.19E-06	1.12E-05	2.24E-05
Dibenz(a,h)anthracene	1.20E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	4.56E-08	1.60E-07	3.20E-07
1,4-Dichlorobenzene(p-Di	1.20E-03	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	4.56E-05	1.60E-04	3.20E-04
7,12-Dimethylbenz(a)anth	1.60E-05	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	6.08E-07	2.13E-06	4.26E-06
Fluoranthene	3.00E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	1.14E-07	3.99E-07	7.99E-07
Fluorene	2.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	1.06E-07	3.73E-07	7.46E-07
Formaldehyde	7.50E-02	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	2.85E-03	9.99E-03	2.00E-02
Hexane	1.80	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	6.84E-02	2.40E-01	0.48
Indeno (1,2,3-cd)pyrene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	6.84E-08	2.40E-07	4.79E-07
Manganese and compoun	3.80E-04	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	1.44E-05	5.06E-05	1.01E-04
Mercury and compounds	2.60E-04	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	9.88E-06	3.46E-05	6.92E-05
3-Methylcholanthrene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	6.84E-08	2.40E-07	4.79E-07
Methylnaphthalene	2.40E-05	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	9.12E-07	3.20E-06	6.39E-06
Naphthalene	6.10E-04	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	2.32E-05	8.12E-05	1.62E-04
Nickel and compounds	2.10E-03	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	7.98E-05	2.80E-04	5.59E-04
Pyrene	5.00E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	1.90E-07	6.66E-07	1.33E-06
Selenium and compounds	2.40E-05	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	9.12E-07	3.20E-06	6.39E-06
Toluene	3.40E-03	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	1.29E-04	4.53E-04	9.05E-04
Total HAPs	1.89	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.038	266.3	0.072	0.25	0.50

4. Holding Furnace #1

> Once the melting cycle is complete, molten metal will flow from the Melting Furnaces through an interconnecting transfer system (i.e., trough) to the Tilting Holding Furnace. Heat to the Holding Furnace will be provided by two (2) natural gas-fired cold air burners, each rated at 15 MMBtu/hr. Each Holding Furnace will be equipped with a dedicated rotary flux injector (RFI). The dedicated RFI will serve to inject solid salt flux refining agents and to agitate the molten metal in the Holding Furnace. Solid salt flux will be added to help purify the metal product by removing alkali metals (e.g., sodium, calcium, and lithium), nonmetallic inclusions (e.g., oxides, borides and carbides), and dissolved hydrogen gas. Emissions generated in each furnace will be routed to a baghouse house serving one (1) sidewell melting furnace and one (1) tilting holding furnace. Natural gas combustion byproducts will also be routed to the filter house serving each casting line.

Emission Unit IDs:	**005-1 & 005-2**
Emission Unit Descriptions:	**Holding Furnace #1**

4.1 Holding Furnace Process Rates: Metal Throughput and Gas Firing Rate

4.1.1 Metal Processing Capacity

Maximum Hourly Aluminum Throughput (per Furnace):	34.4	ton/hr	
Maximum Annual Aluminum Throughput (per Furnace):	301,125	ton/yr	Continuous annual operations

4.1.2 Furnace Natural Gas Firing Rate

Maximum Burner Heat Input Capacity (per Furnace):	30.0	MMBtu/hr	
Cycle Average Burner Heat Input Capacity (per Furnace):	7.9	MMBtu/hr	
Heating Value of Natural Gas at Plant:	1,000	Btu/scf	
Maximum Hourly Natural Gas Usage (per Furnace):	0.030	MMscf/hr per furnace	= 30.0 MMBtu/hr / 1,000 Btu/scf
Cycle Average Hourly Natural Gas Usage (per Furnace):	0.008	MMscf/hr per furnace	= 7.9 MMBtu/hr / 1,000 Btu/scf
Maximum Annual Natural Gas Usage (per Furnace):	69.2	MMscf/yr per furnace	Continuous annual operations at cycle average conditions

4.2 Documentation of Emission Factors Used for Tilting Holding Furnaces

4.2.1 PM Emission Factors Tied to Aluminum Metal Production

> Stack particulate emissions attributable to molten metal processing for the holding furnace are estimated using the vendor estimated filterable PM outlet concentration of the baghouse controlling Melting Furnace #2 and Holding Furnace #1. Emissions attributable to each emission unit are ratioed based on their respective exhaust flow contributions. Speciated PM emission factors are calculated using PM speciation data obtained from the TRC Report.

Parameter	Value	Basis
Stack Emissions		
Controlled Filt. PM Emission Factor (Grain Loading Basis)	0.002 gr/dscf	Standard emission factor for filterable particulate matter outlet grain loading
Hot Baghouse #3 Gas Volume	104,211 scfm	= 150,000 acfm / (460+300) x (460+68)
Hot Baghouse #3 Filt. PM Hourly Emission Factor	1.79 lb/hr	= 0.002 gr/dscf x 104,211 scfm x 60 minutes/hour / 7000 gr/lb
Flow Contribution from Holding Furnace #1 to Hot Baghouse #3	39.4%	Ventilation system design evaluation for Hot Baghouse #3 design basis
Filt. PM Emission Factor	0.020 lb/ton	= 1.79 lb filt. PM/hr from Hot Baghouse #3 x 39.4% flow cont. for Holding Furnace #1 / 34.4 ton/hr
Filt. PM to Total PM Ratio	0.75	*Particulate Matter Study at Three Representative Sources at Aluminum Recycling and Rolling Facilities, January 19, 2009* , "Box-Type Furnace Stack", TRC Report prepared for Aluminum Association.
Ratio of Filt. PM>10 to Filt. PM	0.15	
Ratio of Filt. PM10-2.5 to Filt. PM	0.07	
Ratio of Filt. PM2.5 to Filt. PM	0.79	
Ratio of Filt. PM to Total PM	0.25	
Ratio of Cond. PM to Total PM	0.25	
Filt. PM10 to Filt. PM Ratio	0.85	
Filt. PM2.5 to Filt. PM Ratio	0.79	
Filt. PM10 Emission Factor	0.017 lb/ton	= 0.020 lb filt. PM/ton x 0.85 filt. PM10/filt. PM
Filt. PM2.5 Emission Factor	0.016 lb/ton	= 0.020 lb filt. PM/ton x 0.79 filt. PM2.5/filt. PM
Condensable PM Emission Factor	0.007 lb/ton	= (0.020 lb filt. PM/ton / 0.75 lb filt. PM/lb total PM) - 0.020 lb filt. PM/ton
Total PM10 Emission Factor	0.024 lb/ton	= 0.017 lb filt. PM10/ton + 0.007 lb cond. PM/ton
Total PM2.5 Emission Factor	0.023 lb/ton	= 0.016 lb filt. PM2.5/ton + 0.007 lb cond. PM/ton

4.2.2 HCl and HAP Emission Factors Tied to Aluminum Metal Production

> HCl emissions attributable to molten metal processing and flux usage for the holding furnace are estimated based on a calculated UPL from stack test results for similar units located at Novelis Berea (Berea, KY), Nichols Aluminum (Davenport, IA), and Alumax Mill Products (Nash, TX) published in WebFIRE where the UPL analysis was performed on 12 individual SMACT test runs of at a confidence level of 90%. A 90% confidence level has selected due to the high standard deviation of the selected holding furnaces equipped with lime-injected baghouses.

> The average ("Ave.") metal HAP emission factors are obtained from *Table 5. Summary of Metallic HAP Test Results* from the SMACT Docket Memo To: Rochelle Boyd, Environmental Protection Agency (the EPA) From: Mark Bahner, RTI International entitled "RE: Development of the RTR Risk Modeling Dataset for the Secondary Aluminum Production Source Category", January 30, 2012, Docket ID EPA-HQ-OAR-2010-0544-0139 ("RTR Modeling SMACT Docket Memo") for "Group 1 Furnace - Handling other than Clean Charge"

Parameter	Value	Basis
Stack Emissions		
HCl Emission Factor	0.093 lb/ton	UPL analysis of representative HCl test data for Holding Furnaces in SMACT testing database
Uncontrolled HCl Emission Factor	0.40 lb/ton	Multiple uncontrolled holding furnaces in SMACT testing database complying with Group 1 furnace allowable, so assume uncontrolled HCl emission factor approximately equivalent to SMACT allowable HCl emission limit
HCl Control Efficiency of Lime-Injected Baghouse for Holding Furnace Contribution	77%	Engineering estimate based on inlet and outlet testing results for lime-injected baghouses serving holding furnaces at secondary aluminum facilities; (0.40 lb HCl uncont./ton - 0.093 lb HCl cont./ton)/(0.40 lb HCl uncont./ton) = 77% HCl cont. eff.
Antimony Emission Factor (Normalized to PM Emitted)	1.86E-05 lb Antimony/lb PM	RTR Modeling SMACT Docket Memo Table 5 Antimony emission factor converted from mg/kg PM to lb/lb PM
Arsenic Emission Factor (Normalized to PM Emitted)	1.90E-06 lb Arsenic/lb PM	RTR Modeling SMACT Docket Memo Table 5 Arsenic emission factor converted from mg/kg PM to lb/lb PM
Beryllium Emission Factor (Normalized to PM Emitted)	5.00E-07 lb Beryllium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Beryllium emission factor converted from mg/kg PM to lb/lb PM
Cadmium Emission Factor (Normalized to PM Emitted)	1.34E-05 lb Cadmium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Cadmium emission factor converted from mg/kg PM to lb/lb PM
Chromium III Emission Factor (Normalized to PM Emitted)	1.10E-05 lb Chromium III/lb PM	RTR Modeling SMACT Docket Memo Table 5 Chromium III emission factor converted from mg/kg PM to lb/lb PM

Chromium VI Emission Factor (Normalized to PM Emitted)	2.00E-07	lb Chromium VI/lb PM	RTR Modeling SMACT Docket Memo Table 5 Chromium VI emission factor converted from mg/kg PM to lb/lb PM
Cobalt Emission Factor (Normalized to PM Emitted)	1.30E-06	lb Cobalt/lb PM	RTR Modeling SMACT Docket Memo Table 5 Cobalt emission factor converted from mg/kg PM to lb/lb PM
Lead Emission Factor (Normalized to PM Emitted)	3.27E-05	lb Lead/lb PM	RTR Modeling SMACT Docket Memo Table 5 Lead emission factor converted from mg/kg PM to lb/lb PM
Manganese Emission Factor (Normalized to PM Emitted)	1.01E-04	lb Manganese/lb PM	RTR Modeling SMACT Docket Memo Table 5 Manganese emission factor converted from mg/kg PM to lb/lb PM
Mercury, elemental Emission Factor (Normalized to PM Emitted)	1.91E-07	lb Mercury, elemental/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, elemental emission factor converted from mg/kg PM to lb/lb PM
Mercury, gaseous Emission Factor (Normalized to PM Emitted)	2.40E-08	lb Mercury, gaseous/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, gaseous emission factor converted from mg/kg PM to lb/lb PM
Mercury, particulate Emission Factor (Normalized to PM Emitted)	2.40E-08	lb Mercury, particulate/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, particulate emission factor converted from mg/kg PM to lb/lb PM
Nickel Emission Factor (Normalized to PM Emitted)	1.30E-05	lb Nickel/lb PM	RTR Modeling SMACT Docket Memo Table 5 Nickel emission factor converted from mg/kg PM to lb/lb PM
Selenium Emission Factor (Normalized to PM Emitted)	4.10E-06	lb Selenium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Selenium emission factor converted from mg/kg PM to lb/lb PM
Total Metal HAP Emission Factor (Normalized to PM Emitted)	1.98E-04	lb metal HAP/lb PM	RTR Modeling SMACT Docket Memo total metal HAP emission factor converted from mg/kg PM to lb/lb PM

Cont. Antimony Emission Factor (Production Basis)	3.81E-07	lb Antimony/ton	1.86E-05 lb Antimony HAP/lb filt. PM x 0.020 lb filt. PM/ton = 3.81E-07 lb Antimony/ton
Cont. Arsenic Emission Factor (Production Basis)	3.89E-08	lb Arsenic/ton	1.90E-06 lb Arsenic HAP/lb filt. PM x 0.020 lb filt. PM/ton = 3.89E-08 lb Arsenic/ton
Cont. Beryllium Emission Factor (Production Basis)	1.02E-08	lb Beryllium/ton	5.00E-07 lb Beryllium HAP/lb filt. PM x 0.020 lb filt. PM/ton = 1.02E-08 lb Beryllium/ton
Cont. Cadmium Emission Factor (Production Basis)	2.74E-07	lb Cadmium/ton	1.34E-05 lb Cadmium HAP/lb filt. PM x 0.020 lb filt. PM/ton = 2.74E-07 lb Cadmium/ton
Cont. Chromium III Emission Factor (Production Basis)	2.25E-07	lb Chromium III/ton	1.10E-05 lb Chromium III HAP/lb filt. PM x 0.020 lb filt. PM/ton = 2.25E-07 lb Chromium III/ton
Cont. Chromium VI Emission Factor (Production Basis)	4.09E-09	lb Chromium VI/ton	2.00E-07 lb Chromium VI HAP/lb filt. PM x 0.020 lb filt. PM/ton = 4.09E-09 lb Chromium VI/ton
Cont. Cobalt Emission Factor (Production Basis)	2.66E-08	lb Cobalt/ton	1.30E-06 lb Cobalt HAP/lb filt. PM x 0.020 lb filt. PM/ton = 2.66E-08 lb Cobalt/ton
Cont. Lead Emission Factor (Production Basis)	6.69E-07	lb Lead/ton	3.27E-05 lb Lead HAP/lb filt. PM x 0.020 lb filt. PM/ton = 6.69E-07 lb Lead/ton
Cont. Manganese Emission Factor (Production Basis)	2.07E-06	lb Manganese/ton	1.01E-04 lb Manganese HAP/lb filt. PM x 0.020 lb filt. PM/ton = 2.07E-06 lb Manganese/ton
Cont. Mercury, elemental Emission Factor (Production Basis)	3.91E-09	lb Mercury, elemental/ton	1.91E-07 lb Mercury, elemental HAP/lb filt. PM x 0.020 lb filt. PM/ton = 3.91E-09 lb Mercury, elemental/ton
Cont. Mercury, gaseous Emission Factor (Production Basis)	4.91E-10	lb Mercury, gaseous/ton	2.40E-08 lb Mercury, gaseous HAP/lb filt. PM x 0.020 lb filt. PM/ton = 4.91E-10 lb Mercury, gaseous/ton
Cont. Mercury, particulate Emission Factor (Production Basis)	4.91E-10	lb Mercury, particulate/ton	2.40E-08 lb Mercury, particulate HAP/lb filt. PM x 0.020 lb filt. PM/ton = 4.91E-10 lb Mercury, particulate/ton
Cont. Nickel Emission Factor (Production Basis)	2.66E-07	lb Nickel/ton	1.30E-05 lb Nickel HAP/lb filt. PM x 0.020 lb filt. PM/ton = 2.66E-07 lb Nickel/ton
Cont. Selenium Emission Factor (Production Basis)	8.39E-08	lb Selenium/ton	4.10E-06 lb Selenium HAP/lb filt. PM x 0.020 lb filt. PM/ton = 8.39E-08 lb Selenium/ton
Cont. Total Emission Factor (Production Basis)	4.05E-06	lb Total/ton	1.98E-04 lb Total HAP/lb filt. PM x 0.020 lb filt. PM/ton = 4.05E-06 lb Total/ton

4.2.3 VOC Emission Factor Tied to Aluminum Metal Production

> Minimal organic compounds will be present in the holding furnaces. If any oil is present on the metal surface, it would be evaporated and combusted in the melting furnace. To be conservative, the holding furnace vendor estimates the VOC concentration in the exhaust stream from aluminum processing and natural gas fuel usage contributions to be equivalent to the melting furnace VOC emissions basis.

Parameter	Value		Basis
Stack Emissions			
VOC Exhaust Concentration	10.0	ppmv	Vendor supplied data
VOC Molecular Weight	44	lb/lbmol	Propane as the VOC surrogate
Molar Volume Conversion Factor	386	scf/lbmol	Ideal gas
VOC Exhaust Concentration	1.14E-06	lb/scf	= 10.0 lbmol VOC/1E6 lbmol gas x 44 lb VOC/1 lbmol VOC x 1 lbmol gas/386 scf gas
VOC Emission Factor	0.208	lb/ton	= 1.14E-06 lb VOC/scf x 65,000 acfm x (460 + 77)/(460 + 350 deg. F) x 60 min/hr /34.4 ton/hr

4.2.4 NOX Emission Factor Tied to Natural Gas Combustion

> Potential emissions of NOX from the Holding Furnace is calculated based on emissions estimates provided by prospective furnace burner vendors.

Parameter	Value		Basis
NOX Exhaust Concentration	55	ppmv	Vendor estimate
NO2 Molecular Weight	46	lb/lbmol	Consistent with Method 19, assume all NOX is NO2
Molar Volume Conversion Factor	386	scf/lbmol	Ideal gas law at 68 deg. F and 1 atm
NOX Exhaust Concentration	6.56E-06	lb NOX/dscf	= 55 lbmol NOX/lbmol gas x 46 lb NO2/1 lbmol NO2 x 1 lbmol gas/386 scf gas
F-Factor	8,710	dscf/MMBtu	EPA Method 19 Table 19-2 F-Factor for Various Fuels dry F-factor for natural gas
O2 Concentration for Emission Factor Correction	3	%	Vendor data
NOX Heat Input Rate-Based Emission Factor	0.067	lb/MMBtu	= 6.56E-06 lb NO2/dscf x 8,710 dscf/MMBtu x 20.9% / (20.9% - 3%)
NOX Natural Gas Usage Rate-Based Emission Factor	66.73	lb/MMscf	= 0.067 lb NO2/MMBtu x 1,030 MMBtu/MMscf

4.2.5 CO Emission Factor Tied to Natural Gas Combustion

> Potential emissions of CO from the Holding Furnaces are calculated based on emissions estimates provided by prospective furnace burner vendors.

Maximum Hourly Emission Factor

Parameter	Value	Basis
CO Exhaust Concentration	100 ppmv	Vendor estimate (peak)
CO Molecular Weight	28 lb/lbmol	Reference value from Periodic Table
CO Exhaust Concentration	7.26E-06 lb CO/dscf	= 100 lbmol CO/lbmol gas x 28 lb CO/1 lbmol CO x 1 lbmol gas/386 scf gas
O2 Concentration for Emission Factor Correction	3 %	Vendor data
CO Heat Input Rate-Based Emission Factor	0.074 lb/MMBtu	= 7.26E-06 lb CO/dscf x 8,710 dscf/MMBtu x 20.9% / (20.9% - 3%)
CO Natural Gas Usage Rate-Based Emission Factor	73.85 lb/MMscf	= 0.074 lb CO/MMBtu x 1,030 MMBtu/MMscf

Annual Emission Factor

Parameter	Value	Basis
CO Exhaust Concentration	50 ppmv	Vendor estimate (cycle average)
CO Molecular Weight	28 lb/lbmol	Reference value from Periodic Table
Molar Volume Conversion Factor	386 scf/lbmol	Ideal gas law at 68 deg. F and 1 atm
CO Exhaust Concentration	3.63E-06 lb CO/dscf	= 50 lbmol CO/lbmol gas x 28 lb CO/1 lbmol CO x 1 lbmol gas/386 scf gas
F-Factor	8,710 dscf/MMBtu	EPA Method 19 Table 19-2 F-Factor for Various Fuels dry F-factor for natural gas
O2 Concentration for Emission Factor Correction	3 %	Vendor data
CO Heat Input Rate-Based Emission Factor	0.037 lb/MMBtu	= 3.63E-06 lb NO2/dscf x 8,710 dscf/MMBtu x 20.9% / (20.9% - 3%)
CO Natural Gas Usage Rate-Based Emission Factor	36.93 lb/MMscf	= 0.037 lb NO2/MMBtu x 1,030 MMBtu/MMscf

4.2.6 Additional Emission Factor Tied to Natural Gas Combustion

> PM emissions are accounted for in the filter house outlet emissions estimate and VOC emissions are included in the emissions estimate for aluminum processing. All other emission factors are based on reference literature (e.g., EPA's AP-42 or MRR, 40 CFR 98 Subpart C Tables C-1 and C-2).

4.3 Potential Emission Calculations for Tilting Holding Furnaces

4.3.1 Potential Emissions Tied to Aluminum Metal Production (Stack)

> Emission factors shown below are the stack emission factors.

Pollutant	Emission Factor (lb/ton)		Emission Factor Basis	Maximum Hourly Process Rate (ton/hr)	Maximum Annual Process Rate (ton/yr)	Potential Emission Rate (lb/hr)	Potential Emission Rate (tpy)
PM	0.020	lb/ton	Vendor Estimate/Engineering Estimate	34.4	301,125	0.70	3.08
PM10	0.024	lb/ton	Engineering Estimate	34.4	301,125	0.84	3.66
PM2.5	0.023	lb/ton	Engineering Estimate	34.4	301,125	0.79	3.45
HCl	0.093	lb/ton	Mass Balance/Engineering Estimate	34.4	301,125	3.21	14.05
Antimony	3.81E-07	lb/ton	RTR Modeling SMACT Docket	34.4	301,125	1.31E-05	5.73E-05
Arsenic	3.89E-08	lb/ton	RTR Modeling SMACT Docket	34.4	301,125	1.34E-06	5.86E-06
Beryllium	1.02E-08	lb/ton	RTR Modeling SMACT Docket	34.4	301,125	3.52E-07	1.54E-06
Cadmium	2.74E-07	lb/ton	RTR Modeling SMACT Docket	34.4	301,125	9.43E-06	4.13E-05
Chromium III	2.25E-07	lb/ton	RTR Modeling SMACT Docket	34.4	301,125	7.74E-06	3.39E-05
Chromium VI	4.09E-09	lb/ton	RTR Modeling SMACT Docket	34.4	301,125	1.41E-07	6.16E-07
Cobalt	2.66E-08	lb/ton	RTR Modeling SMACT Docket	34.4	301,125	9.15E-07	4.01E-06
Lead	6.69E-07	lb/ton	RTR Modeling SMACT Docket	34.4	301,125	2.30E-05	1.01E-04
Manganese	2.07E-06	lb/ton	RTR Modeling SMACT Docket	34.4	301,125	7.11E-05	3.11E-04
Mercury, elemental	3.91E-09	lb/ton	RTR Modeling SMACT Docket	34.4	301,125	1.34E-07	5.89E-07
Mercury, gaseous	4.91E-10	lb/ton	RTR Modeling SMACT Docket	34.4	301,125	1.69E-08	7.40E-08
Mercury, particulate	4.91E-10	lb/ton	RTR Modeling SMACT Docket	34.4	301,125	1.69E-08	7.40E-08
Nickel	2.66E-07	lb/ton	RTR Modeling SMACT Docket	34.4	301,125	9.15E-06	4.01E-05
Selenium	8.39E-08	lb/ton	RTR Modeling SMACT Docket	34.4	301,125	2.89E-06	1.26E-05
VOC	0.208	lb/ton	Vendor Estimate	34.4	301,125	7.15	31.32

4.3.2 Potential Emissions Tied to Natural Gas Combustion

Pollutant	Emission Factor (lb/MMscf)		Emission Factor Basis	Maximum Hourly Process Rate (MMscf/hr)	Maximum Annual Process Rate (MMscf/yr)	Potential Emission Rate (lb/hr)	Potential Emission Rate (tpy)
NOX	66.7	lb/MMscf	Vendor Estimate	0.030	69.2	2.00	2.31
CO (Hourly)	73.9	lb/MMscf	Vendor Estimate	0.030	69.2	2.22	--
CO (Annual)	36.9	lb/MMscf	Vendor Estimate	0.030	69.2	--	1.28
SO2	0.6	lb/MMscf	AP-42 Table 1.4-2	0.030	69.2	0.018	0.021
CO2	116,977	lb/MMscf	40CFR98 Subpart C, Table C-1	0.030	69.2	3,509	4,048
CH4	2.2	lb/MMscf	40CFR98 Subpart C, Table C-2	0.030	69.2	0.066	0.076
N2O	0.22	lb/MMscf	40CFR98 Subpart C, Table C-2	0.030	69.2	6.61E-03	7.63E-03
CO2e	117,098	lb/MMscf	40CFR98 Subpart A	0.030	69.2	3,513	4,052
Lead	5.00E-04	lb/MMscf	AP-42 Table 1.4-4	0.030	69.2	1.50E-05	1.73E-05
Acenaphthene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	5.40E-08	6.23E-08
Acenaphthylene	1.80E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	5.40E-08	6.23E-08
Anthracene	2.40E-06	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	7.20E-08	8.30E-08
Arsenic compounds	2.00E-04	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	6.00E-06	6.92E-06
Benzene	2.10E-03	lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	6.30E-05	7.27E-05

Benzo(a)anthracene	1.80E-06 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	5.40E-08	6.23E-08
Benzo(a)pyrene	1.20E-06 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	3.60E-08	4.15E-08
Benzo(b)fluoranthene	1.80E-06 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	5.40E-08	6.23E-08
Benzo(g,h,i)perylene	1.20E-06 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	3.60E-08	4.15E-08
Benzo(k)fluoranthene	1.80E-06 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	5.40E-08	6.23E-08
Beryllium and compounds	1.20E-05 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	3.60E-07	4.15E-07
Cadmium and compounds	1.10E-03 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	3.30E-05	3.81E-05
Chromium and compounc	1.40E-03 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	4.20E-05	4.84E-05
Chrysene	1.80E-06 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	5.40E-08	6.23E-08
Cobalt and compounds	8.40E-05 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	2.52E-06	2.91E-06
Dibenz(a,h)anthracene	1.20E-06 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	3.60E-08	4.15E-08
1,4-Dichlorobenzene(p-Di	1.20E-03 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	3.60E-05	4.15E-05
7,12-Dimethylbenz(a)anth	1.60E-05 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	4.80E-07	5.54E-07
Fluoranthene	3.00E-06 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	9.00E-08	1.04E-07
Fluorene	2.80E-06 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	8.40E-08	9.69E-08
Formaldehyde	7.50E-02 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	2.25E-03	2.60E-03
Hexane	1.80 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	5.40E-02	6.23E-02
Indeno (1,2,3-cd)pyrene	1.80E-06 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	5.40E-08	6.23E-08
Manganese and compour	3.80E-04 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	1.14E-05	1.31E-05
Mercury and compounds	2.60E-04 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	7.80E-06	9.00E-06
3-Methylcholanthrene	1.80E-06 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	5.40E-08	6.23E-08
Methylnaphthalene	2.40E-05 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	7.20E-07	8.30E-07
Naphthalene	6.10E-04 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	1.83E-05	2.11E-05
Nickel and compounds	2.10E-03 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	6.30E-05	7.27E-05
Pyrene	5.00E-06 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	1.50E-07	1.73E-07
Selenium and compounds	2.40E-05 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	7.20E-07	8.30E-07
Toluene	3.40E-03 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	1.02E-04	1.18E-04
Total HAPs	1.89 lb/MMscf	AP-42 Tables 1.4-3 & 1.4-4	0.030	69.2	0.057	0.065

5. In-Line Degasser #1

> The casting line will be equipped with a dedicated in-line aluminum compact degasser (i.e., In-line Degasser). If the desired metal quality for a given batch of material cannot be achieved after fluxing in the Tilted Holding Furnace, the associated In-line Degasser will be used for additional treatment. Emissions for the In-line Degassers are ducted into the Holding Furnace's exhaust system and controlled for PM emissions via Hot Baghouse #3.

Emission Unit IDs: **006-1**
Emission Unit Descriptions: **In-Line Degasser #1**

5.1 In-Line Degasser Process Rates: Metal Throughput

5.1.1 Metal Processing Capacity

Maximum Hourly Aluminum Throughput (per Unit):	34.4	ton/hr	
Maximum Annual Aluminum Throughput (per Unit):	301,125	ton/yr	Continuous annual operations

5.2 Documentation of Emission Factors Used for In-Line Degassers

5.2.1 PM & HAPs Emission Factors

> Pursuant to 40 CFR 63.1512(h)(2), compliance with the SMACT in-line fluxer PM emissions standard is allowed to be assumed when a facility complies with the HCl emission standard on the basis of a mass balance. ADI will not use reactive chlorine flux in the in-line degasser and would not be expected to emit HCl. Therefore, the same approach for presumed compliance with the applicable PM emissions standard would form a reasonable basis for the potential emission factor for this source. ADI will conduct initial source testing to demonstrate compliance with the SMACT in-line fluxer PM emissions standard and would be in a position to validate this PM emissions basis for the in-line degasser upon completing this initial performance test.

The average ("Ave.") metal HAP emission factors are obtained from *Table 5. Summary of Metallic HAP Test Results* from the SMACT Docket Memo To: Rochelle Boyd, Environmental Protection Agency (the EPA) From: Mark Bahner, RTI International entitled "RE: Development of the RTR Risk Modeling Dataset for the Secondary Aluminum Production Source Category", January 30, 2012, Docket ID EPA-HQ-OAR-2010-0544-0139 ("RTR Modeling SMACT Docket Memo") for "In-Line Mixer"

Parameter	Value		Basis
Filt. PM Emission Factor	0.010	lb/ton	SMACT PM emission limit for In-line Degassers in 40 CFR 63.1505(j)(2) as a surrogate for controlled filt. PM emission factor
Filt. PM10 to Filt. PM Ratio	0.532	--	EPA's PM Calculator for appropriate SCC
Filt. PM2.5 to Filt. PM Ratio	0.198	--	
Filt. PM10 Emission Factor	5.32E-03	lb/ton	PM Calculator PM10:PM ratio for appropriate SCC
Filt. PM2.5 Emission Factor	1.98E-03	lb/ton	PM Calculator PM2.5:PM ratio for appropriate SCC
Antimony Emission Factor (Normalized to PM Emitted)	5.00E-07	lb Antimony/lb PM	RTR Modeling SMACT Docket Memo Table 5 Antimony emission factor converted from mg/kg PM to lb/lb PM
Arsenic Emission Factor (Normalized to PM Emitted)	5.00E-07	lb Arsenic/lb PM	RTR Modeling SMACT Docket Memo Table 5 Arsenic emission factor converted from mg/kg PM to lb/lb PM
Beryllium Emission Factor (Normalized to PM Emitted)	5.00E-07	lb Beryllium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Beryllium emission factor converted from mg/kg PM to lb/lb PM
Cadmium Emission Factor (Normalized to PM Emitted)	1.90E-06	lb Cadmium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Cadmium emission factor converted from mg/kg PM to lb/lb PM
Chromium III Emission Factor (Normalized to PM Emitted)	4.00E-06	lb Chromium III/lb PM	RTR Modeling SMACT Docket Memo Table 5 Chromium III emission factor converted from mg/kg PM to lb/lb PM
Chromium VI Emission Factor (Normalized to PM Emitted)	3.00E-07	lb Chromium VI/lb PM	RTR Modeling SMACT Docket Memo Table 5 Chromium VI emission factor converted from mg/kg PM to lb/lb PM
Cobalt Emission Factor (Normalized to PM Emitted)	1.10E-06	lb Cobalt/lb PM	RTR Modeling SMACT Docket Memo Table 5 Cobalt emission factor converted from mg/kg PM to lb/lb PM
Lead Emission Factor (Normalized to PM Emitted)	5.00E-07	lb Lead/lb PM	RTR Modeling SMACT Docket Memo Table 5 Lead emission factor converted from mg/kg PM to lb/lb PM
Manganese Emission Factor (Normalized to PM Emitted)	1.00E-04	lb Manganese/lb PM	RTR Modeling SMACT Docket Memo Table 5 Manganese emission factor converted from mg/kg PM to lb/lb PM
Mercury, elemental Emission Factor (Normalized to PM Emitted)	8.00E-09	lb Mercury, elemental/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, elemental emission factor converted from mg/kg PM to lb/lb PM

Mercury, gaseous Emission Factor (Normalized to PM Emitted)	1.00E-09 lb Mercury, gaseous/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, gaseous emission factor converted from mg/kg PM to lb/lb PM
Mercury, particulate Emission Factor (Normalized to PM Emitted)	1.00E-09 lb Mercury, particulate/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, particulate emission factor converted from mg/kg PM to lb/lb PM
Nickel Emission Factor (Normalized to PM Emitted)	1.40E-05 lb Nickel/lb PM	RTR Modeling SMACT Docket Memo Table 5 Nickel emission factor converted from mg/kg PM to lb/lb PM
Selenium Emission Factor (Normalized to PM Emitted)	1.90E-06 lb Selenium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Selenium emission factor converted from mg/kg PM to lb/lb PM
Total Metal HAP Emission Factor (Normalized to PM Emitted)	1.25E-04 lb Total/lb PM	RTR Modeling SMACT Docket Memo Table 5 Total emission factor converted from mg/kg PM to lb/lb PM

Cont. Antimony Emission Factor (Production Basis)	5.00E-09 lb Antimony/ton	5.00E-07 lb Antimony HAP/lb filt. PM x 0.010 lb filt. PM/ton = 5.00E-09 lb Antimony/ton
Cont. Arsenic Emission Factor (Production Basis)	5.00E-09 lb Arsenic/ton	5.00E-07 lb Arsenic HAP/lb filt. PM x 0.010 lb filt. PM/ton = 5.00E-09 lb Arsenic/ton
Cont. Beryllium Emission Factor (Production Basis)	5.00E-09 lb Beryllium/ton	5.00E-07 lb Beryllium HAP/lb filt. PM x 0.010 lb filt. PM/ton = 5.00E-09 lb Beryllium/ton
Cont. Cadmium Emission Factor (Production Basis)	1.90E-08 lb Cadmium/ton	1.90E-06 lb Cadmium HAP/lb filt. PM x 0.010 lb filt. PM/ton = 1.90E-08 lb Cadmium/ton
Cont. Chromium III Emission Factor (Production Basis)	4.00E-08 lb Chromium III/ton	4.00E-06 lb Chromium III HAP/lb filt. PM x 0.010 lb filt. PM/ton = 4.00E-08 lb Chromium III/ton
Cont. Chromium VI Emission Factor (Production Basis)	3.00E-09 lb Chromium VI/ton	3.00E-07 lb Chromium VI HAP/lb filt. PM x 0.010 lb filt. PM/ton = 3.00E-09 lb Chromium VI/ton
Cont. Cobalt Emission Factor (Production Basis)	1.10E-08 lb Cobalt/ton	1.10E-06 lb Cobalt HAP/lb filt. PM x 0.010 lb filt. PM/ton = 1.10E-08 lb Cobalt/ton
Cont. Lead Emission Factor (Production Basis)	5.00E-09 lb Lead/ton	5.00E-07 lb Lead HAP/lb filt. PM x 0.010 lb filt. PM/ton = 5.00E-09 lb Lead/ton
Cont. Manganese Emission Factor (Production Basis)	1.00E-06 lb Manganese/ton	1.00E-04 lb Manganese HAP/lb filt. PM x 0.010 lb filt. PM/ton = 1.00E-06 lb Manganese/ton
Cont. Mercury, elemental Emission Factor (Production Basis)	8.00E-11 lb Mercury, elemental/ton	8.00E-09 lb Mercury, elemental HAP/lb filt. PM x 0.010 lb filt. PM/ton = 8.00E-11 lb Mercury, elemental/ton
Cont. Mercury, gaseous Emission Factor (Production Basis)	1.00E-11 lb Mercury, gaseous/ton	1.00E-09 lb Mercury, gaseous HAP/lb filt. PM x 0.010 lb filt. PM/ton = 1.00E-11 lb Mercury, gaseous/ton
Cont. Mercury, particulate Emission Factor (Production Basis)	1.00E-11 lb Mercury, particulate/ton	1.00E-09 lb Mercury, particulate HAP/lb filt. PM x 0.010 lb filt. PM/ton = 1.00E-11 lb Mercury, particulate/ton
Cont. Nickel Emission Factor (Production Basis)	1.40E-07 lb Nickel/ton	1.40E-05 lb Nickel HAP/lb filt. PM x 0.010 lb filt. PM/ton = 1.40E-07 lb Nickel/ton
Cont. Selenium Emission Factor (Production Basis)	1.90E-08 lb Selenium/ton	1.90E-06 lb Selenium HAP/lb filt. PM x 0.010 lb filt. PM/ton = 1.90E-08 lb Selenium/ton
Cont. Total Emission Factor (Production Basis)	1.25E-06 lb Total/ton	1.25E-04 lb Total HAP/lb filt. PM x 0.010 lb filt. PM/ton = 1.25E-06 lb Total/ton

5.3 Potential Emission Calculations for In-Line Degassers

5.3.1 Potential Emissions Tied to Aluminum Metal Production (Stack)

> Emission factors shown below are the stack emission factors.

Pollutant	Emission Factor (lb/ton)	Emission Factor Basis	Maximum Hourly Process Rate (ton/hr)	Maximum Annual Process Rate (ton/yr)	Potential Emission Rate (lb/hr)	Potential Emission Rate (tpy)
PM	0.010	Vendor Estimate/Engineering Estimate	34.4	301,125	0.34	1.51
PM10	5.32E-03	EPA PM Calculator	34.4	301,125	0.18	0.80
PM2.5	1.98E-03	EPA PM Calculator	34.4	301,125	0.068	0.30
Antimony	5.00E-09	RTR Modeling SMACT Docket	34.4	301,125	1.72E-07	7.53E-07
Arsenic	5.00E-09	RTR Modeling SMACT Docket	34.4	301,125	1.72E-07	7.53E-07
Beryllium	5.00E-09	RTR Modeling SMACT Docket	34.4	301,125	1.72E-07	7.53E-07
Cadmium	1.90E-08	RTR Modeling SMACT Docket	34.4	301,125	6.53E-07	2.86E-06
Chromium III	4.00E-08	RTR Modeling SMACT Docket	34.4	301,125	1.38E-06	6.02E-06
Chromium VI	3.00E-09	RTR Modeling SMACT Docket	34.4	301,125	1.03E-07	4.52E-07
Cobalt	1.10E-08	RTR Modeling SMACT Docket	34.4	301,125	3.78E-07	1.66E-06
Lead	5.00E-09	RTR Modeling SMACT Docket	34.4	301,125	1.72E-07	7.53E-07
Manganese	1.00E-06	RTR Modeling SMACT Docket	34.4	301,125	3.44E-05	1.51E-04
Mercury, elemental	8.00E-11	RTR Modeling SMACT Docket	34.4	301,125	2.75E-09	1.20E-08
Mercury, gaseous	1.00E-11	RTR Modeling SMACT Docket	34.4	301,125	3.44E-10	1.51E-09
Mercury, particulate	1.00E-11	RTR Modeling SMACT Docket	34.4	301,125	3.44E-10	1.51E-09
Nickel	1.40E-07	RTR Modeling SMACT Docket	34.4	301,125	4.81E-06	2.11E-05
Selenium	1.90E-08	RTR Modeling SMACT Docket	34.4	301,125	6.53E-07	2.86E-06
Total	1.25E-06	RTR Modeling SMACT Docket	34.4	301,125	4.30E-05	1.89E-04

6. Sow Dryers #1

> Aluminum Dynamics plans to install one (1) natural gas-fired sow dryer/preheater for drying and preheating aluminum sows and other forms of hard charge prior to feeding to the Melting Furnaces. Emissions from the dryer will be routed to a dedicated stack.

Emission Unit IDs: **007-1**
Emission Unit Descriptions: **Sow Dryer**

6.1 Sow Dryer Gas Usage Rate

> The maximum hourly emissions from the Sow Dryer is a function of the maximum gas usage, which is based on the heat input capacity of the burners and the heating value of the gas consumed at the plant.

Heat Input Capacity of Sow Dryer:	4.8 MMBtu/hr	Design specification
Heating Value of Natural Gas at Plant:	1,000 Btu/scf	
Maximum Hourly Gas Usage Rate:	0.0048 MMscf/hr	= 4.8 MMBtu/hr / 1,000 Btu/scf

6.2 Documentation of Emission Factors Used for Sow Dryer

> Potential emissions of NOX and CO from the Sow Dryer are calculated based on performance specifications for the burner systems planned to be specified for equipment procurement. Total PM10 and PM2.5 emissions are calculated by applying a filterable to total PM ratio to the AP-42 value for filterable PM. The ratio was calculated using data from EPA's SPECIATE database for Natural Gas Combustion - Composite with no controls. The potential emission factor derivations are presented here for reference. All other emission factors are based on reference literature (e.g., EPA's AP-42 and 40 CFR 98).

6.2.1 NOX Emission Factor

Parameter	Value	Basis
NOX Exhaust Concentration	35 ppmv	Performance specification
NO2 Molecular Weight	46 lb/lbmol	Consistent with Method 19, assume all NOX is NO2
Molar Volume Conversion Factor	386 scf/lbmol	Ideal gas law at 68 deg. F and 1 atm
NOX Exhaust Concentration	4.18E-06 lb NOX/dscf	= 35 lbmol NOX/lbmol gas x 46 lb NO2/1 lbmol NO2 x 1 lbmol gas/386 scf gas
F-Factor	8,710 dscf/MMBtu	EPA Method 19 Table 19-2 F-Factor for Various Fuels dry F-factor for natural gas
O2 Concentration for Emission Factor Correction	3 %	Basis of performance specification
NOX Heat Input Rate-Based Emission Factor	0.042 lb/MMBtu	= 4.18E-06 lb NO2/dscf x 8,710 dscf/MMBtu x 20.9% / (20.9% - 3%)
NOX Natural Gas Usage Rate-Based Emission Factor	42.47 lb/MMscf	= 0.042 lb NO2/MMBtu x 1,030 MMBtu/MMscf

6.2.2 CO Emission Factor

Parameter	Value	Basis
CO Exhaust Concentration	50 ppmv	Performance specification
CO Molecular Weight	28 lb/lbmol	Reference value from Periodic Table
CO Exhaust Concentration	3.63E-06 lb CO/dscf	= 50 lbmol CO/lbmol gas x 28 lb CO/1 lbmol CO x 1 lbmol gas/386 scf gas
O2 Concentration for Emission Factor Correction	3 %	Basis of performance specification
CO Heat Input Rate-Based Emission Factor	0.037 lb/MMBtu	= 3.63E-06 lb CO/dscf x 8,710 dscf/MMBtu x 20.9% / (20.9% - 3%)
CO Natural Gas Usage Rate-Based Emission Factor	36.93 lb/MMscf	= 0.037 lb CO/MMBtu x 1,030 MMBtu/MMscf

6.2.3 PM Emission Factors

Parameter	Value	Basis
Filt. PM Emission Factor	1.9 lb/MMscf	AP-42, Chp.1.4, Tbl 1.4-2
Filt. PM2.5 to Total PM2.5 Emissions Ratio	0.55	Based on the uncontrolled Natural Gas Combustion - Composite speciation profile from the EPA SPECIATE Data Browser for the 0-2.5 µm particle size range
Total PM2.5 Emission Factor	3.5 lb/MMscf	= 1.9 lb/MMscf / 0.55 filt. PM/tot. PM
Total PM10 Emission Factor	3.5 lb/MMscf	Based on the assumption that all filterable PM generated is less than 2.5 µm

6.3 Potential Emission Calculations for Sow Dryer

Pollutant	Emission Factor (lb/MMscf)	Emission Factor Basis	Maximum Hourly Process Rate (MMscf/hr)	Potential Emission Rate (lb/hr)	Potential Emission Rate (tpy)
NOX	42.5	Performance Specification	0.0048	0.20	0.89
CO	36.9	Performance Specification	0.0048	0.18	0.78
PM	1.9	AP-42, Chp.1.4, Tbl 1.4-2	0.0048	9.12E-03	0.040
PM10	3.5	Engineering Estimate	0.0048	0.017	0.073
PM2.5	3.5	Engineering Estimate	0.0048	0.017	0.073
VOC	5.5	AP-42, Chp.1.4, Tbl 1.4-2	0.0048	0.026	0.12
SO2	0.6	AP-42, Chp.1.4, Tbl 1.4-2	0.0048	2.88E-03	0.013
CO2	116,977	40CFR98 Subpart C, Table C-1	0.0048	561	2,459
CH4	2.2	40CFR98 Subpart C, Table C-2	0.0048	0.011	0.046
N2O	0.22	40CFR98 Subpart C, Table C-2	0.0048	1.06E-03	4.63E-03
CO2e	117,098	40CFR98 Subpart A	0.0048	562	2,462
Lead	5.00E-04	AP-42 Table 1.4-4	0.0048	2.40E-06	1.05E-05
Acenaphthene	1.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0048	8.64E-09	3.78E-08
Acenaphthylene	1.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0048	8.64E-09	3.78E-08
Anthracene	2.40E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0048	1.15E-08	5.05E-08

Arsenic compounds	2.00E-04	AP-42 Tables 1.4-3 & 1.4-4	0.0048	9.60E-07	4.20E-06
Benzene	2.10E-03	AP-42 Tables 1.4-3 & 1.4-4	0.0048	1.01E-05	4.42E-05
Benzo(a)anthracene	1.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0048	8.64E-09	3.78E-08
Benzo(a)pyrene	1.20E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0048	5.76E-09	2.52E-08
Benzo(b)fluoranthene	1.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0048	8.64E-09	3.78E-08
Benzo(g,h,i)perylene	1.20E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0048	5.76E-09	2.52E-08
Benzo(k)fluoranthene	1.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0048	8.64E-09	3.78E-08
Beryllium and compounds	1.20E-05	AP-42 Tables 1.4-3 & 1.4-4	0.0048	5.76E-08	2.52E-07
Cadmium and compounds	1.10E-03	AP-42 Tables 1.4-3 & 1.4-4	0.0048	5.28E-06	2.31E-05
Chromium and compounds	1.40E-03	AP-42 Tables 1.4-3 & 1.4-4	0.0048	6.72E-06	2.94E-05
Chrysene	1.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0048	8.64E-09	3.78E-08
Cobalt and compounds	8.40E-05	AP-42 Tables 1.4-3 & 1.4-4	0.0048	4.03E-07	1.77E-06
Dibenz(a,h)anthracene	1.20E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0048	5.76E-09	2.52E-08
1,4-Dichlorobenzene(p-Dichlo	1.20E-03	AP-42 Tables 1.4-3 & 1.4-4	0.0048	5.76E-06	2.52E-05
7,12-Dimethylbenz(a)anthrace	1.60E-05	AP-42 Tables 1.4-3 & 1.4-4	0.0048	7.68E-08	3.36E-07
Fluoranthene	3.00E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0048	1.44E-08	6.31E-08
Fluorene	2.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0048	1.34E-08	5.89E-08
Formaldehyde	7.50E-02	AP-42 Tables 1.4-3 & 1.4-4	0.0048	3.60E-04	1.58E-03
Hexane	1.80	AP-42 Tables 1.4-3 & 1.4-4	0.0048	8.64E-03	3.78E-02
Indeno (1,2,3-cd)pyrene	1.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0048	8.64E-09	3.78E-08
Manganese and compounds	3.80E-04	AP-42 Tables 1.4-3 & 1.4-4	0.0048	1.82E-06	7.99E-06
Mercury and compounds	2.60E-04	AP-42 Tables 1.4-3 & 1.4-4	0.0048	1.25E-06	5.47E-06
3-Methylcholanthrene	1.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0048	8.64E-09	3.78E-08
Methylnaphthalene	2.40E-05	AP-42 Tables 1.4-3 & 1.4-4	0.0048	1.15E-07	5.05E-07
Naphthalene	6.10E-04	AP-42 Tables 1.4-3 & 1.4-4	0.0048	2.93E-06	1.28E-05
Nickel and compounds	2.10E-03	AP-42 Tables 1.4-3 & 1.4-4	0.0048	1.01E-05	4.42E-05
Pyrene	5.00E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0048	2.40E-08	1.05E-07
Selenium and compounds	2.40E-05	AP-42 Tables 1.4-3 & 1.4-4	0.0048	1.15E-07	5.05E-07
Toluene	3.40E-03	AP-42 Tables 1.4-3 & 1.4-4	0.0048	1.63E-05	7.15E-05
Total HAPs	1.89	AP-42 Tables 1.4-3 & 1.4-4	0.0048	9.06E-03	0.040

7. Filter Box Preheater #1

> Successful casting relies on a minimal temperature drop between the Holding Furnace and the casting machine. Therefore, in addition to electrically powered trough heating, the ceramic foam filter box or deep bed filter box refractory will also be preheated to ensure that box inside temperature is within acceptable range and does not lead to temperature drop of molten metal. This heat will be provided by a dedicated Filter Box Preheater. The Filter Box Preheater is a source of uncaptured natural gas combustion byproduct emissions. The Filter Box Preheater burners do not have stacks and thus combustion by-product emissions are released into the production building.

Emission Unit IDs: **010-1**
Emission Unit Descriptions: **Filter Box Preheater #1**

7.1 Filter Box Preheater Gas Usage Rate

> The maximum hourly emissions from the Filter Box Preheaters are a function of the maximum gas usage, which is based on the heat input capacity of the burners and the heating value of the gas consumed at the plant.

7.1.1 Furnace Natural Gas Firing Rate

Heat Input Capacity of Each Preheater:	0.18	MMBtu/hr	Design specification
Heating Value of Natural Gas at Plant:	1,000	Btu/scf	
Maximum Hourly Gas Usage Rate:	0.00018	MMscf/hr	= 0.2 MMBtu/hr / 1,000 Btu/scf

7.2 Documentation of Emission Factors Used for Filter Box Preheater

> The potential emission factor derivations for select pollutants generated by the Filter Box Preheater are presented here for reference. Refer to Section 6.2.3 for the PM10 and PM2.5 emission factor derivation. All other emission factors are based on reference literature (e.g., EPA's AP-42 and 40 CFR 98).

7.2.1 PM Emission Factors

Parameter	Value	Basis
Filt. PM Emission Factor	1.9 lb/MMscf	AP-42, Chp.1.4, Tbl 1.4-2
Filt. PM2.5 to Total PM2.5 Emissions Ratio	0.55	Based on the uncontrolled Natural Gas Combustion - Composite speciation profile from the EPA SPECIATE Data Browser for the 0-2.5 µm particle size range
Total PM2.5 Emission Factor	3.5 lb/MMscf	= 1.9 lb/MMscf / 0.55 filt. PM/tot. PM
Total PM10 Emission Factor	3.5 lb/MMscf	Based on the assumption that all filterable PM generated is less than 2.5 µm

7.3 Potential Emission Calculations for Filter Box Preheater

Pollutant	Emission Factor (lb/MMscf)	Emission Factor Basis	Maximum Hourly Process Rate (MMscf/hr)	Potential Emission Rate (lb/hr)	Potential Emission Rate (tpy)
NOX	100.0	AP-42 Table 1.4-1	0.0002	0.018	0.077
CO	84.0	AP-42 Table 1.4-1	0.0002	0.015	0.065
PM	1.9	AP-42, Chp.1.4, Tbl 1.4-2	0.0002	3.35E-04	1.47E-03
PM10	3.5	Engineering Estimate	0.0002	6.13E-04	2.69E-03
PM2.5	3.5	Engineering Estimate	0.0002	6.13E-04	2.69E-03
VOC	5.5	AP-42, Chp.1.4, Tbl 1.4-2	0.0002	9.71E-04	4.25E-03
SO2	0.6	AP-42, Chp.1.4, Tbl 1.4-2	0.0002	1.06E-04	4.64E-04
CO2	116,977	40CFR98 Subpart C, Table C-1	0.0002	21	90
CH4	2.2	40CFR98 Subpart C, Table C-2	0.0002	3.89E-04	1.71E-03
N2O	0.22	40CFR98 Subpart C, Table C-2	0.0002	3.89E-05	1.71E-04
CO2e	117,098	40CFR98 Subpart A	0.0002	21	91
Lead	5.00E-04	AP-42 Table 1.4-4	0.0002	8.83E-08	3.87E-07
Acenaphthene	1.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0002	3.18E-10	1.39E-09
Acenaphthylene	1.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0002	3.18E-10	1.39E-09
Anthracene	2.40E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0002	4.24E-10	1.86E-09
Arsenic compounds	2.00E-04	AP-42 Tables 1.4-3 & 1.4-4	0.0002	3.53E-08	1.55E-07
Benzene	2.10E-03	AP-42 Tables 1.4-3 & 1.4-4	0.0002	3.71E-07	1.62E-06
Benzo(a)anthracene	1.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0002	3.18E-10	1.39E-09
Benzo(a)pyrene	1.20E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0002	2.12E-10	9.28E-10
Benzo(b)fluoranthene	1.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0002	3.18E-10	1.39E-09
Benzo(g,h,i)perylene	1.20E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0002	2.12E-10	9.28E-10
Benzo(k)fluoranthene	1.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0002	3.18E-10	1.39E-09
Beryllium and compounds	1.20E-05	AP-42 Tables 1.4-3 & 1.4-4	0.0002	2.12E-09	9.28E-09
Cadmium and compounds	1.10E-03	AP-42 Tables 1.4-3 & 1.4-4	0.0002	1.94E-07	8.51E-07
Chromium and compounds	1.40E-03	AP-42 Tables 1.4-3 & 1.4-4	0.0002	2.47E-07	1.08E-06
Chrysene	1.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0002	3.18E-10	1.39E-09
Cobalt and compounds	8.40E-05	AP-42 Tables 1.4-3 & 1.4-4	0.0002	1.48E-08	6.50E-08
Dibenz(a,h)anthracene	1.20E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0002	2.12E-10	9.28E-10
1,4-Dichlorobenzene(p-Dichlo	1.20E-03	AP-42 Tables 1.4-3 & 1.4-4	0.0002	2.12E-07	9.28E-07
7,12-Dimethylbenz(a)anthrace	1.60E-05	AP-42 Tables 1.4-3 & 1.4-4	0.0002	2.83E-09	1.24E-08
Fluoranthene	3.00E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0002	5.30E-10	2.32E-09
Fluorene	2.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0002	4.94E-10	2.17E-09
Formaldehyde	7.50E-02	AP-42 Tables 1.4-3 & 1.4-4	0.0002	1.32E-05	5.80E-05
Hexane	1.80	AP-42 Tables 1.4-3 & 1.4-4	0.0002	3.18E-04	1.39E-03
Indeno (1,2,3-cd)pyrene	1.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0002	3.18E-10	1.39E-09
Manganese and compounds	3.80E-04	AP-42 Tables 1.4-3 & 1.4-4	0.0002	6.71E-08	2.94E-07
Mercury and compounds	2.60E-04	AP-42 Tables 1.4-3 & 1.4-4	0.0002	4.59E-08	2.01E-07
3-Methylcholanthrene	1.80E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0002	3.18E-10	1.39E-09
Methylnaphthalene	2.40E-05	AP-42 Tables 1.4-3 & 1.4-4	0.0002	4.24E-09	1.86E-08
Naphthalene	6.10E-04	AP-42 Tables 1.4-3 & 1.4-4	0.0002	1.08E-07	4.72E-07

Nickel and compounds	2.10E-03	AP-42 Tables 1.4-3 & 1.4-4	0.0002	3.71E-07	1.62E-06
Pyrene	5.00E-06	AP-42 Tables 1.4-3 & 1.4-4	0.0002	8.83E-10	3.87E-09
Selenium and compounds	2.40E-05	AP-42 Tables 1.4-3 & 1.4-4	0.0002	4.24E-09	1.86E-08
Toluene	3.40E-03	AP-42 Tables 1.4-3 & 1.4-4	0.0002	6.00E-07	2.63E-06
Total HAPs	1.89	AP-42 Tables 1.4-3 & 1.4-4	0.0002	3.33E-04	1.46E-03

8. Dross House

> Dross produced during aluminum melting and molten aluminum processing activities in each of the two (2) melting furnaces, one (1) holding furnace, and ingot casting process will be collected and transported to a dedicated dross processing building. Once there, dross is pressed, cooled, stored, loaded into trucks and eventually sold to outside firms for processing and metal reclamation. Emissions generated by dross handling activities will be collected and ducted to a dedicated baghouse for emissions control.

Emission Unit ID: **008-1**
Emission Unit Description: **Dross House**

Emission Unit ID: **008-2**
Emission Unit Description: **Dross House Fugitives**

8.1 Dross House Maximum Dross Processing Rate

> Dross generation is calculated using the vendor estimate for percent dross generated from the melting furnace, holding furnace, and ingot casting process aluminum throughput.

Parameter	Value	Basis
Melting Furnace Dross Generation Rate	3.0 %	Vendor estimate for dross generation rate between 2% and 3% for the melting furnaces
Holding Furnace Dross Generation Rate	1.5 %	Vendor estimate for dross generation rate between 0.8% and 1.5% for the holding furnaces
Ingot Casting Dross Generation Rate	0.025 %	Equivalent to vendor estimate for dross generation rate of 0.5 lb/ton Al
Maximum Hourly Melting Furnace Dross Generation	0.855 ton/hr	= 3% x 14.3 ton/hr Al x 2 furnaces
Maximum Hourly Holding Furnace Dross Generation	0.516 ton/hr	= 1.5% x 34.4 ton/hr Al
Maximum Hourly Ingot Casting Dross Generation	0.009 ton/hr	= 0.025% x 34.4 ton/hr Al
Maximum Hourly Dross Throughput	1.38 ton/hr	= 0.86 ton/hr + 0.52 ton/hr + 0.009 ton/hr
Maximum Annual Melting Furnace Dross Generation	7,490 ton/yr	= 3% x 124,830 ton/yr Al x 2 furnaces
Maximum Annual Holding Furnace Dross Generation	4,517 ton/yr	= 1.5% x 301,125 ton/yr Al
Maximum Annual Ingot Casting Dross Generation	75.3 ton/yr	= 0.025% x 301,125 ton/yr Al
Maximum Annual Dross Throughput	12,082 ton/yr	= SUM(7,490 ton/yr, 4,517 ton/yr, 75.3 ton/yr)

8.2 Documentation of Emission Factors Used for Dross House Captured PM

> Particulate emissions at the outlet of the proposed dross house baghouse are based on the baghouse performance specification.

> The Dross House will have one drop point and one truck loadout operation; therefore, the corresponding emission factors from AP-42 11.17 are provided and summed below in order to calculate a cumulative uncontrolled emission rate in lb/ton dross processed. The PM control efficiencies for the Dross House baghouse are then calculated from the exit grain-loading based controlled emission rate expressed on a dross process rate basis (i.e., lb/ton) and the AP-42 Chapter 11.17 uncontrolled emission factors.

> PM10 and PM2.5 emission factors are calculated using data presented in EPA's PM calculator database for the appropriate SCC (3-04-001-07) associated with hot dross processing [i.e., Secondary Metal Production (3-04), Aluminum (3-04-001), Hot Dross Processing (3-04-001-07)].

> There are no condensable PM emissions associated with this process.

Parameter	Value		Basis
Controlled Filt. PM Emission Factor (Grain Loading Basis)	0.0020	gr/dscf	Performance specification for exit grain loading of dross house baghouse
Filt. PM10 to Filt. PM Ratio	0.94	--	EPA's PM Calculator for appropriate SCC
Filt. PM2.5 to Filt. PM Ratio	0.78	--	
Controlled Filt. PM10 Emission Factor (Grain Loading Basis)	0.0019	gr/dscf	= 0.0020 gr filt. PM/dscf x 0.94 lb filt. PM10/lb filt. PM
Controlled Filt. PM2.5 Emission Factor (Grain Loading Basis)	0.0016	gr/dscf	= 0.0020 gr filt. PM/dscf x 0.78 lb filt. PM2.5/lb filt. PM
Baghouse Flow Capacity	64,918	dscfm	Equivalent to 75,000 acfm at stack exit temperature of 150 deg. F and minimal stack gas moisture content
Maximum Hourly Dross Process Rate	1.38	ton/hr	Design aluminum processing capacity of dross house
Controlled Filt. PM Emission Factor (Dross Process Rate Basis)	0.807	lb/ton	= 0.0020 gr filt. PM/dscf x 64,918 dscf/min x 60 min/hr x 1 lb/7,000 grain / 1.38 ton dross/hr
Controlled Filt. PM10 Emission Factor (Dross Process Rate Basis)	0.758	lb/ton	= 0.0019 gr filt. PM10/dscf x 64,918 dscf/min x 60 min/hr x 1 lb/7,000 grain / 1.38 ton dross/hr
Controlled Filt. PM2.5 Emission Factor (Dross Process Rate Basis)	0.629	lb/ton	= 0.0016 gr filt. PM2.5/dscf x 64,918 dscf/min x 60 min/hr x 1 lb/7,000 grain / 1.38 ton dross/hr
Uncontrolled Filt. PM Emission Factor for one (1) Drop Point	2.20	lb/ton	AP-42 Table 11.17-4 for Transfer and Conveying (SCC 3-05-016-15) in lb/ton product loaded
Uncontrolled Filt. PM Emission Factor for one (1) Truck Loadout	1.50	lb/ton	AP-42 Table 11.17-4 for Product Loading, Open Truck (SCC 3-05-016-27) in lb/ton product loaded
Uncontrolled Filt. PM10 Emission Factor (Production Basis)	3.48	lb/ton	= SUM(2.20 lb PM/ton from Drop Point, 1.50 lb PM/ton from Truck Loadout) x 0.94 lb filt. PM10/lb filt. PM
Uncontrolled Filt. PM2.5 Emission Factor (Production Basis)	2.89	lb/ton	= SUM(2.20 lb PM/ton from Drop Point, 1.50 lb PM/ton from Truck Loadout) x 0.78 lb filt. PM2.5/lb filt. PM
PM/PM10/PM2.5 Control Efficiency of Dross House Baghouse	78%		= 100% - 0.807 lb cont. filt PM/ton / 3.70 lb uncont. filt. PM/ton

8.3 Metal HAP Emission Factors Tied to Dross House

> The average ("Ave.") metal HAP emission factors are obtained from *Table 5. Summary of Metallic HAP Test Results* from the SMACT Docket Memo To: Rochelle Boyd, Environmental Protection Agency (the EPA) From: Mark Bahner, RTI International entitled "RE: Development of the RTR Risk Modeling Dataset for the Secondary Aluminum Production Source Category", January 30, 2012, Docket ID EPA-HQ-OAR-2010-0544-0139 ("RTR Modeling SMACT Docket Memo") for "Dross-Only Furnace"

	Value		Basis
Antimony Emission Factor (Normalized to PM Emitted)	5.00E-07	lb Antimony/lb PM	RTR Modeling SMACT Docket Memo Table 5 Antimony emission factor converted from mg/kg PM to lb/lb PM
Arsenic Emission Factor (Normalized to PM Emitted)	5.00E-07	lb Arsenic/lb PM	RTR Modeling SMACT Docket Memo Table 5 Arsenic emission factor converted from mg/kg PM to lb/lb PM
Beryllium Emission Factor (Normalized to PM Emitted)	2.80E-06	lb Beryllium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Beryllium emission factor converted from mg/kg PM to lb/lb PM

Cadmium Emission Factor (Normalized to PM Emitted)	5.00E-07	lb Cadmium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Cadmium emission factor converted from mg/kg PM to lb/lb PM
Chromium III Emission Factor (Normalized to PM Emitted)	4.60E-04	lb Chromium III/lb PM	RTR Modeling SMACT Docket Memo Table 5 Chromium III emission factor converted from mg/kg PM to lb/lb PM
Chromium VI Emission Factor (Normalized to PM Emitted)	3.00E-07	lb Chromium VI/lb PM	RTR Modeling SMACT Docket Memo Table 5 Chromium VI emission factor converted from mg/kg PM to lb/lb PM
Cobalt Emission Factor (Normalized to PM Emitted)	2.00E-06	lb Cobalt/lb PM	RTR Modeling SMACT Docket Memo Table 5 Cobalt emission factor converted from mg/kg PM to lb/lb PM
Lead Emission Factor (Normalized to PM Emitted)	4.90E-06	lb Lead/lb PM	RTR Modeling SMACT Docket Memo Table 5 Lead emission factor converted from mg/kg PM to lb/lb PM
Manganese Emission Factor (Normalized to PM Emitted)	3.40E-03	lb Manganese/lb PM	RTR Modeling SMACT Docket Memo Table 5 Manganese emission factor converted from mg/kg PM to lb/lb PM
Mercury, elemental Emission Factor (Normalized to PM Emitted)	1.00E-08	lb Mercury, elemental/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, elemental emission factor converted from mg/kg PM to lb/lb PM
Nickel Emission Factor (Normalized to PM Emitted)	2.70E-05	lb Nickel/lb PM	RTR Modeling SMACT Docket Memo Table 5 Nickel emission factor converted from mg/kg PM to lb/lb PM
Selenium Emission Factor (Normalized to PM Emitted)	5.00E-07	lb Selenium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Selenium emission factor converted from mg/kg PM to lb/lb PM
Total Metal HAP Emission Factor (Normalized to PM Emitted)	3.90E-03	lb metal HAP/lb PM	RTR Modeling SMACT Docket Memo total metal HAP emission factor converted from mg/kg PM to lb/lb PM

Cont. Antimony Emission Factor (Production Basis)	4.03E-07	lb Antimony/ton	5.00E-07 lb Antimony HAP/lb filt. PM x 0.807 lb filt. PM/ton = 4.03E-07 lb Antimony/ton
Cont. Arsenic Emission Factor (Production Basis)	4.03E-07	lb Arsenic/ton	5.00E-07 lb Arsenic HAP/lb filt. PM x 0.807 lb filt. PM/ton = 4.03E-07 lb Arsenic/ton
Cont. Beryllium Emission Factor (Production Basis)	2.26E-06	lb Beryllium/ton	2.80E-06 lb Beryllium HAP/lb filt. PM x 0.807 lb filt. PM/ton = 2.26E-06 lb Beryllium/ton
Cont. Cadmium Emission Factor (Production Basis)	4.03E-07	lb Cadmium/ton	5.00E-07 lb Cadmium HAP/lb filt. PM x 0.807 lb filt. PM/ton = 4.03E-07 lb Cadmium/ton
Cont. Chromium III Emission Factor (Production Basis)	3.71E-04	lb Chromium III/ton	4.60E-04 lb Chromium III HAP/lb filt. PM x 0.807 lb filt. PM/ton = 3.71E-04 lb Chromium III/ton
Cont. Chromium VI Emission Factor (Production Basis)	2.42E-07	lb Chromium VI/ton	3.00E-07 lb Chromium VI HAP/lb filt. PM x 0.807 lb filt. PM/ton = 2.42E-07 lb Chromium VI/ton
Cont. Cobalt Emission Factor (Production Basis)	1.61E-06	lb Cobalt/ton	2.00E-06 lb Cobalt HAP/lb filt. PM x 0.807 lb filt. PM/ton = 1.61E-06 lb Cobalt/ton
Cont. Lead Emission Factor (Production Basis)	3.95E-06	lb Lead/ton	4.90E-06 lb Lead HAP/lb filt. PM x 0.807 lb filt. PM/ton = 3.95E-06 lb Lead/ton
Cont. Manganese Emission Factor (Production Basis)	2.74E-03	lb Manganese/ton	3.40E-03 lb Manganese HAP/lb filt. PM x 0.807 lb filt. PM/ton = 2.74E-03 lb Manganese/ton
Cont. Mercury, elemental Emission Factor (Production Basis)	8.07E-09	lb Mercury, elemental/ton	1.00E-08 lb Mercury, elemental HAP/lb filt. PM x 0.807 lb filt. PM/ton = 8.07E-09 lb Mercury, elemental/ton
Cont. Nickel Emission Factor (Production Basis)	2.18E-05	lb Nickel/ton	2.70E-05 lb Nickel HAP/lb filt. PM x 0.807 lb filt. PM/ton = 2.18E-05 lb Nickel/ton
Cont. Selenium Emission Factor (Production Basis)	4.03E-07	lb Selenium/ton	5.00E-07 lb Selenium HAP/lb filt. PM x 0.807 lb filt. PM/ton = 4.03E-07 lb Selenium/ton
Cont. Metal HAP Emission Factor (Production Basis)	3.15E-03	lb metal HAP/ton	3.90E-03 lb metal HAP/lb filt. PM x 0.940 lb filt. PM/ton = 3.15E-03 lb metal HAP/ton

8.4 Documentation of Emission Factors Used for Dross House Uncaptured PM

> Based on the dimensions of the Dross House and flow capacity of the baghouse, candidate vendors have indicated an achievable capture efficiency for the Dross House in the range of 90% to 95%. ADI has applied the minimum capture efficiency estimate to ensure the conservatism of the resulting potential emissions assigned to the Dross House for assessing the Gila Bend facility's air permitting source classification.

Parameter	Value		Basis
Dross House Capture Efficiency	90%		Performance specification for dross house capture system
Uncaptured Filt. PM Emission Factor (Production Basis)	0.41	lb/ton	= 3.70 lb uncont. filt. PM/ton / 90% capt. eff. x (1 - 90% capt. eff.)
Uncaptured Filt. PM10 Emission Factor (Production Basis)	0.39	lb/ton	= 3.48 lb uncont. filt. PM10/ton / 90% capt. eff. x (1 - 90% capt. eff.)
Uncaptured Filt. PM2.5 Emission Factor (Production Basis)	0.32	lb/ton	= 2.89 lb uncont. filt. PM2.5/ton / 90% capt. eff. x (1 - 90% capt. eff.)
Uncontrolled Antimony Emission Factor (Production Basis)	2.29E-06	lb/ton	= 4.03E-07 lb cont. Antimony/ton / (1 - 78%) = 2.29E-06 lb uncont. Antimony/ton
Uncontrolled Arsenic Emission Factor (Production Basis)	2.29E-06	lb/ton	= 4.03E-07 lb cont. Arsenic/ton / (1 - 78%) = 2.29E-06 lb uncont. Arsenic/ton
Uncontrolled Beryllium Emission Factor (Production Basis)	1.28E-05	lb/ton	= 2.26E-06 lb cont. Beryllium/ton / (1 - 78%) = 1.28E-05 lb uncont. Beryllium/ton
Uncontrolled Cadmium Emission Factor (Production Basis)	2.29E-06	lb/ton	= 4.03E-07 lb cont. Cadmium/ton / (1 - 78%) = 2.29E-06 lb uncont. Cadmium/ton
Uncontrolled Chromium III Emission Factor (Production Basis)	2.11E-03	lb/ton	= 3.71E-04 lb cont. Chromium III/ton / (1 - 78%) = 2.11E-03 lb uncont. Chromium III/ton
Uncontrolled Chromium VI Emission Factor (Production Basis)	1.38E-06	lb/ton	= 2.42E-07 lb cont. Chromium VI/ton / (1 - 78%) = 1.38E-06 lb uncont. Chromium VI/ton
Uncontrolled Cobalt Emission Factor (Production Basis)	9.17E-06	lb/ton	= 1.61E-06 lb cont. Cobalt/ton / (1 - 78%) = 9.17E-06 lb uncont. Cobalt/ton
Uncontrolled Lead Emission Factor (Production Basis)	2.25E-05	lb/ton	= 3.95E-06 lb cont. Lead/ton / (1 - 78%) = 2.25E-05 lb uncont. Lead/ton
Uncontrolled Manganese Emission Factor (Production Basis)	1.56E-02	lb/ton	= 2.74E-03 lb cont. Manganese/ton / (1 - 78%) = 1.56E-02 lb uncont. Manganese/ton
Uncontrolled Mercury, elemental Emission Factor (Production Basis)	4.59E-08	lb/ton	= 8.07E-09 lb cont. Mercury, elemental/ton / (1 - 78%) = 4.59E-08 lb uncont. Mercury, elemental/ton
Uncontrolled Nickel Emission Factor (Production Basis)	1.24E-04	lb/ton	= 2.18E-05 lb cont. Mercury, gaseous/ton / (1 - 78%) = 1.24E-04 lb uncont. Mercury, gaseous/ton
Uncontrolled Selenium Emission Factor (Production Basis)	2.29E-06	lb/ton	= 4.03E-07 lb cont. Mercury, particulate/ton / (1 - 78%) = 2.29E-06 lb uncont. Mercury, particulate/ton
Uncontrolled Total Emission Factor (Production Basis)	1.79E-02	lb/ton	= 3.15E-03 lb cont. Nickel/ton / (1 - 78%) = 1.79E-02 lb uncont. Nickel/ton
Uncaptured Antimony Emission Factor (Production Basis)	2.55E-07	lb/ton	2.29E-06 lb uncont. Antimony/ton / 0.90 capt. eff. x (1 - 0.90 capt. eff.) = 2.55E-07 lb uncapt. Antimony/ton
Uncaptured Arsenic Emission Factor (Production Basis)	2.55E-07	lb/ton	2.29E-06 lb uncont. Arsenic/ton / 0.90 capt. eff. x (1 - 0.90 capt. eff.) = 2.55E-07 lb uncapt. Arsenic/ton
Uncaptured Beryllium Emission Factor (Production Basis)	1.43E-06	lb/ton	1.28E-05 lb uncont. Beryllium/ton / 0.90 capt. eff. x (1 - 0.90 capt. eff.) = 1.43E-06 lb uncapt. Beryllium/ton
Uncaptured Cadmium Emission Factor (Production Basis)	2.55E-07	lb/ton	2.29E-06 lb uncont. Cadmium/ton / 0.90 capt. eff. x (1 - 0.90 capt. eff.) = 2.55E-07 lb uncapt. Cadmium/ton
Uncaptured Chromium III Emission Factor (Production Basis)	2.34E-04	lb/ton	2.11E-03 lb uncont. Chromium III/ton / 0.90 capt. eff. x (1 - 0.90 capt. eff.) = 2.34E-04 lb uncapt. Chromium III/ton
Uncaptured Chromium VI Emission Factor (Production Basis)	1.53E-07	lb/ton	1.38E-06 lb uncont. Chromium VI/ton / 0.90 capt. eff. x (1 - 0.90 capt. eff.) = 1.53E-07 lb uncapt. Chromium VI/ton

Uncaptured Cobalt Emission Factor (Production Basis)	1.02E-06 lb/ton	9.17E-06 lb uncont. Cobalt/ton / 0.90 capt. eff. x (1 - 0.90 capt. eff.) = 1.02E-06 lb uncapt. Cobalt/ton
Uncaptured Lead Emission Factor (Production Basis)	2.50E-06 lb/ton	2.25E-05 lb uncont. Lead/ton / 0.90 capt. eff. x (1 - 0.90 capt. eff.) = 2.50E-06 lb uncapt. Lead/ton
Uncaptured Manganese Emission Factor (Production Basis)	1.73E-03 lb/ton	1.56E-02 lb uncont. Manganese/ton / 0.90 capt. eff. x (1 - 0.90 capt. eff.) = 1.73E-03 lb uncapt. Manganese/ton
Uncaptured Mercury, elemental Emission Factor (Production Basis)	5.09E-09 lb/ton	4.59E-08 lb uncont. Mercury, elemental/ton / 0.90 capt. eff. x (1 - 0.90 capt. eff.) = 5.09E-09 lb uncapt. Mercury, elemental/ton
Uncaptured Nickel Emission Factor (Production Basis)	1.38E-05 lb/ton	1.24E-04 lb uncont. Mercury, gaseous/ton / 0.90 capt. eff. x (1 - 0.90 capt. eff.) = 1.38E-05 lb uncapt. Mercury, gaseous/ton
Uncaptured Selenium Emission Factor (Production Basis)	2.55E-07 lb/ton	2.29E-06 lb uncont. Mercury, particulate/ton / 0.90 capt. eff. x (1 - 0.90 capt. eff.) = 2.55E-07 lb uncapt. Mercury, particulate/ton
Uncaptured Total Emission Factor (Production Basis)	1.99E-03 lb/ton	1.79E-02 lb uncont. Nickel/ton / 0.90 capt. eff. x (1 - 0.90 capt. eff.) = 1.99E-03 lb uncapt. Nickel/ton

8.1 Potential Emission Calculations for Dross House Dross Processing

8.1.1 Potential Emissions Tied to Dross Processing (Stack)

> Emission factors shown below are the stack emission factors.

Pollutant	Emission Factor (lb/ton)		Emission Factor Basis	Maximum Hourly Process Rate (ton/hr)	Maximum Annual Process Rate (ton/yr)	Potential Emission Rate (lb/hr)	Potential Emission Rate (tpy)
PM	0.807	lb/ton	Performance Specification	1.38	12,082	1.11	4.87
PM10	0.758	lb/ton	Engineering Estimate	1.38	12,082	1.05	4.58
PM2.5	0.629	lb/ton	Engineering Estimate	1.38	12,082	0.87	3.80
Antimony	4.03E-07	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	5.56E-07	2.44E-06
Arsenic	4.03E-07	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	5.56E-07	2.44E-06
Beryllium	2.26E-06	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	3.12E-06	1.36E-05
Cadmium	4.03E-07	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	5.56E-07	2.44E-06
Chromium III	3.71E-04	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	5.12E-04	2.24E-03
Chromium VI	2.42E-07	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	3.34E-07	1.46E-06
Cobalt	1.61E-06	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	2.23E-06	9.75E-06
Lead	3.95E-06	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	5.45E-06	2.39E-05
Manganese	2.74E-03	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	3.78E-03	1.66E-02
Mercury, elemental	8.07E-09	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	1.11E-08	4.87E-08
Nickel	2.18E-05	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	3.00E-05	1.32E-04
Selenium	4.03E-07	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	5.56E-07	2.44E-06
Total	3.15E-03	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	4.34E-03	1.90E-02

8.1.2 Potential Emissions Tied to Dross Processing (Uncaptured)

> Emission factors shown below are the uncaptured emission factors.

Pollutant	Emission Factor (lb/ton)		Emission Factor Basis	Maximum Hourly Process Rate (ton/hr)	Maximum Annual Process Rate (ton/yr)	Potential Emission Rate (lb/hr)	Potential Emission Rate (tpy)
PM	0.411	lb/ton	Engineering Estimate	1.38	12,082	0.57	2.48
PM10	0.386	lb/ton	Engineering Estimate	1.38	12,082	0.53	2.33
PM2.5	0.321	lb/ton	Engineering Estimate	1.38	12,082	0.44	1.94
Antimony	2.55E-07	lb/ton	Engineering Estimate	1.38	12,082	3.51E-07	1.54E-06
Arsenic	2.55E-07	lb/ton	Engineering Estimate	1.38	12,082	3.51E-07	1.54E-06

Beryllium	1.43E-06	lb/ton	Engineering Estimate	1.38	12,082	1.97E-06	8.62E-06
Cadmium	2.55E-07	lb/ton	Engineering Estimate	1.38	12,082	3.51E-07	1.54E-06
Chromium III	2.34E-04	lb/ton	Engineering Estimate	1.38	12,082	3.23E-04	1.42E-03
Chromium VI	1.53E-07	lb/ton	Engineering Estimate	1.38	12,082	2.11E-07	9.23E-07
Cobalt	1.02E-06	lb/ton	Engineering Estimate	1.38	12,082	1.41E-06	6.16E-06
Lead	2.50E-06	lb/ton	Engineering Estimate	1.38	12,082	3.44E-06	1.51E-05
Manganese	1.73E-03	lb/ton	Engineering Estimate	1.38	12,082	2.39E-03	1.05E-02
Mercury, elemental	5.09E-09	lb/ton	Engineering Estimate	1.38	12,082	7.03E-09	3.08E-08
Nickel	1.38E-05	lb/ton	Engineering Estimate	1.38	12,082	1.90E-05	8.31E-05
Selenium	2.55E-07	lb/ton	Engineering Estimate	1.38	12,082	3.51E-07	1.54E-06
Total	1.44E-03	lb/ton	Engineering Estimate	1.38	12,082	1.98E-03	8.69E-03

9. Dross Press #1

> Dross produced during aluminum melting and molten aluminum processing activities in each of the two (2) sidewell furnaces, one (1) holding furnace, and one (1) in-line degasser can be routed to the Dross Press used to extract molten metal from the dross prior to routing it to the Dross House. The Dross Press will be ducted to a baghouse.

Emission Unit IDs: **009-1**
Emission Unit Descriptions: **Dross Press**

9.1 Dross Press Process Rates: Metal Throughput

9.1.1 Metal Processing Capacity

Maximum Hourly Aluminum Throughput:	1.38	ton/hr	Assume equivalent to dross generation rate
Maximum Annual Throughput:	12,082	ton/yr	

9.2 Documentation of Emission Factors Used for the Dross Press

9.2.1 PM Emission Factors Tied to Dross Processing

> Filterable (filt.) particulate emissions at the outlet of the integral filtration unit are based on the dross press vendor's performance estimate

> Filt. PM10 and PM2.5 emission factors are calculated using data presented in EPA's PM calculator database for the appropriate SCC (3-04-001-07) associated with hot dross processing [i.e., Secondary Metal Production (3-04), Aluminum (3-04-001), Hot Dross Processing (3-04-001-07)].

> There are no condensable PM emissions associated with this process.

Parameter	Value		Basis
Stack Emissions			
Controlled (Cont.) Filt. PM Emission Factor (Grain Loading Basis)	0.002	gr/dscf	Exit grain loading design basis of integral filtration unit
Dross Press Integral Filtration Unit Flow Capacity	1,500	dscfm	Vendor specification
Filt. PM Emission Factor (Dross Process Rate Basis)	0.019	lb/ton	0.002 gr filt. PM/dscf x 1,500 dscf/min x 60 min/hr x 1 lb / 7,000 gr x 1 / 1.4 ton Al/hr = 0.019 lb PM/ton Al
Filt. PM10 to Filt. PM Ratio	0.94	--	EPA's PM Calculator for appropriate SCC
Filt. PM2.5 to Filt. PM Ratio	0.78	--	EPA's PM Calculator for appropriate SCC
Filt. PM10 Emission Factor (Dross Process Rate Basis)	0.018	lb/ton	0.019 lb cont. filt. PM/ton x 0.94 lb filt. PM10/lb filt. PM = 0.018 lb cont. filt. PM10/ton
Filt. PM2.5 Emission Factor (Dross Process Rate Basis)	0.015	lb/ton	0.019 lb cont. filt. PM/ton x 0.78 lb filt. PM2.5/lb filt. PM = 0.015 lb cont. filt. PM2.5/ton

9.1 Metal HAP Emission Factors Tied to Dross Press

> The average ("Ave.") metal HAP emission factors are obtained from *Table 5. Summary of Metallic HAP Test Results* from the SMACT Docket Memo To: Rochelle Boyd, Environmental Protection Agency (the EPA) From: Mark Bahner, RTI International entitled "RE: Development of the RTR Risk Modeling Dataset for the Secondary Aluminum Production Source Category", January 30, 2012, Docket ID EPA-HQ-OAR-2010-0544-0139 ("RTR Modeling SMACT Docket Memo") for "Dross-Only Furnace"

	Value	Basis	
Antimony Emission Factor (Normalized to PM Emitted)	5.00E-07	lb Antimony/lb PM	RTR Modeling SMACT Docket Memo Table 5 Antimony emission factor converted from mg/kg PM to lb/lb PM
Arsenic Emission Factor (Normalized to PM Emitted)	5.00E-07	lb Arsenic/lb PM	RTR Modeling SMACT Docket Memo Table 5 Arsenic emission factor converted from mg/kg PM to lb/lb PM
Beryllium Emission Factor (Normalized to PM Emitted)	2.80E-06	lb Beryllium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Beryllium emission factor converted from mg/kg PM to lb/lb PM
Cadmium Emission Factor (Normalized to PM Emitted)	5.00E-07	lb Cadmium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Cadmium emission factor converted from mg/kg PM to lb/lb PM
Chromium III Emission Factor (Normalized to PM Emitted)	4.60E-04	lb Chromium III/lb PM	RTR Modeling SMACT Docket Memo Table 5 Chromium III emission factor converted from mg/kg PM to lb/lb PM
Chromium VI Emission Factor (Normalized to PM Emitted)	3.00E-07	lb Chromium VI/lb PM	RTR Modeling SMACT Docket Memo Table 5 Chromium VI emission factor converted from mg/kg PM to lb/lb PM
Cobalt Emission Factor (Normalized to PM Emitted)	2.00E-06	lb Cobalt/lb PM	RTR Modeling SMACT Docket Memo Table 5 Cobalt emission factor converted from mg/kg PM to lb/lb PM
Lead Emission Factor (Normalized to PM Emitted)	4.90E-06	lb Lead/lb PM	RTR Modeling SMACT Docket Memo Table 5 Lead emission factor converted from mg/kg PM to lb/lb PM
Manganese Emission Factor (Normalized to PM Emitted)	3.40E-03	lb Manganese/lb PM	RTR Modeling SMACT Docket Memo Table 5 Manganese emission factor converted from mg/kg PM to lb/lb PM
Mercury, elemental Emission Factor (Normalized to PM Emitted)	1.00E-08	lb Mercury, elemental/lb PM	RTR Modeling SMACT Docket Memo Table 5 Mercury, elemental emission factor converted from mg/kg PM to lb/lb PM
Nickel Emission Factor (Normalized to	2.70E-05	lb Nickel/lb PM	RTR Modeling SMACT Docket Memo Table 5 Nickel emission factor
Selenium Emission Factor (Normalized to PM Emitted)	5.00E-07	lb Selenium/lb PM	RTR Modeling SMACT Docket Memo Table 5 Selenium emission factor converted from mg/kg PM to lb/lb PM
Total Emission Factor (Normalized to PM Emitted)	3.90E-03	lb Total/lb PM	RTR Modeling SMACT Docket Memo Table 5 Total emission factor converted from mg/kg PM to lb/lb PM
Cont. Antimony Emission Factor (Production Basis)	9.32E-09	lb Antimony/ton	5.00E-07 lb Antimony HAP/lb filt. PM x 0.019 lb filt. PM/ton = 9.32E-09 lb Antimony/ton
Cont. Arsenic Emission Factor (Production Basis)	9.32E-09	lb Arsenic/ton	5.00E-07 lb Arsenic HAP/lb filt. PM x 0.019 lb filt. PM/ton = 9.32E-09 lb Arsenic/ton
Cont. Beryllium Emission Factor (Production Basis)	5.22E-08	lb Beryllium/ton	2.80E-06 lb Beryllium HAP/lb filt. PM x 0.019 lb filt. PM/ton = 5.22E-08 lb Beryllium/ton
Cont. Cadmium Emission Factor (Production Basis)	9.32E-09	lb Cadmium/ton	5.00E-07 lb Cadmium HAP/lb filt. PM x 0.019 lb filt. PM/ton = 9.32E-09 lb Cadmium/ton
Cont. Chromium III Emission Factor (Production Basis)	8.58E-06	lb Chromium III/ton	4.60E-04 lb Chromium III HAP/lb filt. PM x 0.019 lb filt. PM/ton = 8.58E-06 lb Chromium III/ton
Cont. Chromium VI Emission Factor (Production Basis)	5.59E-09	lb Chromium VI/ton	3.00E-07 lb Chromium VI HAP/lb filt. PM x 0.019 lb filt. PM/ton = 5.59E-09 lb Chromium VI/ton
Cont. Cobalt Emission Factor (Production Basis)	3.73E-08	lb Cobalt/ton	2.00E-06 lb Cobalt HAP/lb filt. PM x 0.019 lb filt. PM/ton = 3.73E-08 lb Cobalt/ton
Cont. Lead Emission Factor (Production Basis)	9.14E-08	lb Lead/ton	4.90E-06 lb Lead HAP/lb filt. PM x 0.019 lb filt. PM/ton = 9.14E-08 lb Lead/ton

Cont. Manganese Emission Factor (Production Basis)	6.34E-05	lb Manganese/ton	3.40E-03 lb Manganese HAP/lb filt. PM x 0.019 lb filt. PM/ton = 6.34E-05 lb Manganese/ton
Cont. Mercury, elemental Emission Factor (Production Basis)	1.86E-10	lb Mercury, elemental/ton	1.00E-08 lb Mercury, elemental HAP/lb filt. PM x 0.019 lb filt. PM/ton = 1.86E-10 lb Mercury, elemental/ton
Cont. Nickel Emission Factor (Production Basis)	5.03E-07	lb Nickel/ton	3.90E-03 lb Nickel HAP/lb filt. PM x 0.019 lb filt. PM/ton = 5.03E-07 lb Nickel/ton
Cont. Selenium Emission Factor (Production Basis)	9.32E-09	lb Selenium/ton	0.00E+00 lb Selenium HAP/lb filt. PM x 0.019 lb filt. PM/ton = 9.32E-09 lb Selenium/ton
Cont. Total Emission Factor (Production Basis)	7.27E-05	lb Total/ton	9.32E-09 lb Total HAP/lb filt. PM x 0.019 lb filt. PM/ton = 7.27E-05 lb Total/ton

9.1 Potential Emission Calculations for the Dross Press

9.1.1 Potential Emissions Tied to Dross Processing (Stack- Interior Venting)

> Emission factors shown below are the stack emission factors.

Pollutant	Emission Factor (lb/ton)		Emission Factor Basis	Maximum Hourly Process Rate (ton/hr)	Maximum Annual Process Rate (ton/yr)	Potential Emission Rate (lb/hr)	Potential Emission Rate (tpy)
PM	0.019	lb/ton	Filter Vendor Grain Loading	1.38	12,082	0.026	0.11
PM10	0.018	lb/ton	EPA PM Calculator	1.38	12,082	2.42E-02	1.06E-01
PM2.5	0.015	lb/ton	EPA PM Calculator	1.38	12,082	0.020	0.088
Antimony	9.32E-09	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	1.29E-08	5.63E-08
Arsenic	9.32E-09	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	1.29E-08	5.63E-08
Beryllium	5.22E-08	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	7.20E-08	3.15E-07
Cadmium	9.32E-09	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	1.29E-08	5.63E-08
Chromium III	8.58E-06	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	1.18E-05	5.18E-05
Chromium VI	5.59E-09	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	7.71E-09	3.38E-08
Cobalt	3.73E-08	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	5.14E-08	2.25E-07
Lead	9.14E-08	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	1.26E-07	5.52E-07
Manganese	6.34E-05	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	8.74E-05	3.83E-04
Mercury, elemental	1.86E-10	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	2.57E-10	1.13E-09
Nickel	5.03E-07	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	6.94E-07	3.04E-06
Selenium	9.32E-09	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	1.29E-08	5.63E-08
Total	7.27E-05	lb/ton	RTR Modeling SMACT Docket	1.38	12,082	1.00E-04	4.39E-04

10. Cooling Towers #1-2

> Two (2) mechanical draft, wet cooling tower will be installed to supply cooling water to the casting pit and for HVAC and miscellaneous other uses.

> As the water flows down through the cooling tower, the draft air picks up water droplets that can be emitted from the top of the tower (i.e., "drift loss"). Drift loss is minimized through the use of mist eliminators. PM emissions result from residual solids remaining after evaporation of the liquid droplets released from the cooling tower. No VOC/HAP-containing water treatment chemicals will be used in the cooling tower, and the cooling water will not contact any process materials containing VOC/HAP. Therefore, the cooling tower will not be a quantifiable source of VOC/HAP emissions.

Emission Unit IDs: **011-1 through 012-1**

Emission Unit Descriptions: **Cooling Tower #1 through Cooling Tower #2**

10.1 Methodology for Quantifying Potential PM Emissions

> Potential PM emissions from the cooling towers are estimated based on the calculation methodology presented in AP-42 Chapter 13.4 for Wet Cooling Towers (1/95) and particle size distribution methodologies data presented in "Calculating Realistic PM10 Emissions from Cooling Towers" by Joe Reisman and Gordon Frisbie, Environmental Progress, Volume 21, Issue 2 (April 20, 2004) (herein referred to as Reisman Frisbie).

10.1.1 Cooling Tower Design Values

Parameter	Value		Basis
Cooling Tower #1 Circulating Water Flow Rate	3,500	gal/min	Design specification
	0.21	MMgal/hr	= 3,500 gal/min x 60 min/hr / 1E6 gal/MMgal
	1,839.60	MMgal/yr	Design specification
Cooling Tower #2 Circulating Water Flow Rate	1,500	gal/min	Design specification
	0.09	MMgal/hr	= 1,500 gal/min x 60 min/hr / 1E6 gal/MMgal
	788.40	MMgal/yr	Design specification
Total Dissolved Solids (TDS) of Recirculating Water	3,000	ppm	Conservative engineering estimate
Drift Percentage for Cooling Tower Mist Eliminator	0.001	%	Design specification

10.1.2 Cooling Tower PM Emission Factor

> The PM emission factor derivation is shown below using the water circulation rate for Cooling Tower #1 as an example. While the other cooling towers have different water circulation rates, the emission factor remains the same.

Parameter	Value		Basis
Cooling Tower PM Emission Rate	0.25	lb/MMgal	= 3,500 gal/min x 60 min/hr x 8.34 lb/gal x 0.0030 lb solid/lb water x 0.0010% / 0.21 MMgal/hr

10.1.3 Cooling Tower Particle Size Distribution

> The aerodynamic diameter of a particle resulting from drift was calculated over a target droplet size distribution presented in the table below. By interpolating on the calculated aerodynamic particle diameter, the corresponding mass percentage smaller than PM2.5 and PM10 can be derived.

Droplet Diameter Size[1] (µm)	**EPRI % Mass Smaller**[1] (%)	**Droplet Volume** (μm^3)	**Droplet Mass** (µg)	**Particle Mass (Solids)** (µg)	**Solid Particle Volume** (μm^3)	**Solid Particle Diameter** (µm)	**Aerodyn. Particle Diameter** (µm)
10	0	524	5.24E-04	1.57E-06	0.71	1.11	1.6
15.2	0.10	***1,839***	***1.8E-03***	5.52E-06	***2.51***	1.69	***2.5***
20	0.20	4,189	4.19E-03	1.26E-05	5.71	2.22	3.3
30	0.23	14,137	0.01	4.24E-05	19.28	3.33	4.9
40	0.51	33,510	0.03	1.01E-04	45.70	4.44	6.6
50	1.82	65,450	0.07	1.96E-04	89.25	5.54	8.2
60	5.70	113,097	0.11	3.39E-04	154.22	6.65	9.9
60.8	6.95	***117,682***	***0.12***	3.53E-04	***160.48***	6.74	***10***
70	21.35	179,594	0.18	5.39E-04	244.90	7.76	11.5
90	49.81	381,704	0.38	1.15E-03	520.50	9.98	14.8
110	70.51	696,910	0.70	2.09E-03	950	12.20	18.1
130	82.023	1,150,347	1.15	3.45E-03	1,569	14.42	21.4
150	88.012	1,767,146	1.77	5.30E-03	2,410	16.63	24.7
180	91.032	3,053,628	3.05	9.16E-03	4,164	19.96	29.6
210	92.47	4,849,048	4.85	1.45E-02	6,612	23.29	34.5
240	94.091	7,238,229	7.24	2.17E-02	9,870	26.61	39.5
270	94.69	10,305,995	10.31	3.09E-02	14,054	29.94	44.4
300	96.29	14,137,167	14.14	4.24E-02	19,278	33.27	49.3
350	97.011	22,449,298	22.45	6.73E-02	30,613	38.81	57.6
400	98.34	33,510,322	33.51	1.01E-01	45,696	44.36	65.8
450	99.071	47,712,938	47.71	1.43E-01	65,063	49.90	74.0
500	99.071	65,449,847	65.45	1.96E-01	89,250	55.45	82.2
600	100	113,097,336	113.10	3.39E-01	154,224	66.54	98.7

Bold highlights indicate interpolated values to determine $PM_{10}/PM_{2.5}$ speciation.

[1] Based on drift droplet size distribution testing from EPRI test facility published in the Reisman and Frisbie paper.

> By interpolating the data in Reisman and Frisbie for a tower with 3,000 ppm TDS circulating water, PM10 was estimated to be 7.0% of the total particulate matter and PM2.5 was estimated to be 0.1% of the total particulate matter.

Parameter	Value	Basis
Estimated PM10/PM Ratio	0.070	EPRI ratio of mass smaller than PM10
Cooling Tower PM10 Emission Factor	0.0174 lb/MMgal	= 0.25 lb PM/MMgal x 0.0695 PM10/PM
Estimated PM2.5/PM Ratio	0.0010	EPRI ratio of mass smaller than PM2.5
Cooling Tower PM10 Emission Factor	0.00026 lb/MMgal	= 0.25 lb PM/MMgal x 0.0010 PM2.5/PM

10.2 Potential Emission Calculations for Cooling Towers

10.2.1 Potential Emissions from Cooling Tower #1

Pollutant	Emission Factor (lb/MMgal)	Emission Factor Basis	Maximum Hourly Process Rate (MMgal/hr)	Maximum Annual Process Rate (MMgal/yr)	Potential Emission Rate (lb/hr)	Potential Emission Rate (tpy)
PM	0.25	Engineering Estimate	0.21	1,839.60	0.053	0.23
PM10	0.0174	Engineering Estimate	0.21	1,839.60	3.65E-03	1.60E-02
PM2.5	2.55E-04	Engineering Estimate	0.21	1,839.60	5.36E-05	2.35E-04

10.2.2 Potential Emissions from Cooling Tower #2

Pollutant	Emission Factor (lb/MMgal)	Emission Factor Basis	Maximum Hourly Process Rate (MMgal/hr)	Maximum Annual Process Rate (MMgal/yr)	Potential Emission Rate (lb/hr)	Potential Emission Rate (tpy)
PM	0.25	Engineering Estimate	0.090	788.40	0.023	0.10
PM10	0.0174	Engineering Estimate	0.090	788.40	1.57E-03	6.86E-03
PM2.5	2.55E-04	Engineering Estimate	0.090	788.40	2.30E-05	1.01E-04

11. Hot Baghouses Lime Silo

> The hot baghouses will use a free standing lime silo complete with level sensors including a live bin bottom to prevent clogging and a high level sensor to avoid overfilling. Silo venting will be accomplished by a bin vent, so no additional pressure relief device will be used. A fill line from the truck unload station to the silo will be equipped with a pneumatic knife gate with operator.

Emission Unit IDs: **013-1**

Emission Unit Descriptions: **Hot Baghouses Lime Silo**

11.1 Documentation of Emission Factors Used for the Lime Silo

11.1.1 PM Emission Factors Tied to Lime Processing

> Particulate emissions at the outlet of the proposed lime silo are estimated using an assumed emissions performance. To determine the annual emissions, the maximum annual lime throughput and assumed truck lime weight are used to determine the number of annual truck deliveries. Estimating the truck loading time then provides the annual truck loading time when emissions are routed to the bin vent for exhaust to the atmosphere.

> Assumes PM = PM10 = PM2.5. There are no condensable PM emissions associated with this process.

Parameter	Value		Basis
Stack Emissions			
Controlled Filt. PM Emission Factor (Grain Loading Basis)	0.010	gr/dscf	Exit grain loading design basis for bin vent filter
Bin Vent Filter Flow Capacity	1,500	dscfm	Equivalent to 1,500 acfm at ambient temperature (approximately equivalent to standard temperature) and minimal stack gas moisture content
Filt. PM Hourly Emission Rate	0.129	lb/hr	0.010 gr filt. PM/dscf x 1,500 dscf/min x 60 min/hr x 1 lb / 7,000 gr = 0.129 lb PM/hr
Alk. Reagent Density	35.0	lb/cf	
Max. Hourly Alk. Reagent Process	150.0	lb/hr	Nominal capacity
Max. Annual Alk. Reagent Process	657.0	ton/yr	150 lb/hr x 8,760 hr/yr / 2,000 lb/ton = 657.0 ton/yr
Assumed Alk. Reagent Weight in Delivery Trucks	25.0	ton/truck	
Max. Annual Truck Deliveries	26.0	truck/yr	657 ton/yr / 25 ton/truck = 26.0 truck/yr
Max. Annual Truck Loading Time	52.0	hr/yr	Assumed worst-case truck loading event duration is 2 hours
Filt. PM Annual Emission Rate	6.69	lb/yr	0.129 lb/hr x 52.00 hr/yr = 6.69 lb/yr
Filt. PM Annual Emission Rate	3.34E-03	tpy	6.69 lb/yr / 2,000 lb/ton = 3.34E-03 ton/yr
Filt. PM Annual Emission Rate (Production Basis)	1.02E-02	lb/ton	6.69 lb/yr / 657 ton/yr = 1.02E-02 ton/yr

11.2 Potential Emission Calculations for the Lime Silo

11.2.1 Potential Emissions Tied to Lime Processing (Stack)

> Emission factors shown below are the stack emission factors.

Pollutant	Emission Factor (lb/ton)		Emission Factor Basis	Maximum Hourly Process Rate (ton/hr)	Maximum Annual Process Rate (ton/yr)	Potential Emission Rate (lb/hr)	Potential Emission Rate (tpy)
PM/PM10/PM2.5	1.02E-02	lb/ton	Grain Loading Design Basis	0.075	657.0	7.63E-04	3.34E-03

12. Haul Road and Storage Yard Potential Emission Calculations

> PM/PM10/PM2.5 emissions from transporting material in significant quantities by haul truck and mobile equipment on paved roads and unpaved storage yards are quantified. The truck/mobile equipment traffic information and the meteorological data shown below are used to calculate the potential emissions from plant roadways. Plant roads at the facility used for transporting materials on or off site will be paved and will be swept as necessary to control fugitive dust emissions. Storage yards for raw materials and products will be unpaved and will be watered as necessary to control dust emissions.

Emission Unit IDs: **017-3**
Emission Unit Descriptions: **Haul Roads and Storage Yards**

12.1 Paved Haul Road Emission Factor Derivation

> The methodologies indicated in AP42 Chapter 13.2.1 were used to quantify the potential particulate emissions generated by truck traffic at the Gila Bend facility.

Unmitigated Emission Factor, Ef = [k * (sL)^0.91 * (W)^1.02] — AP42 Section 13.2.1, Equation 1
Mitigated Emission Factor, Eext = Ef * [1 - (p/4N)] — AP42 Section 13.2.1, Equation 2

where,
Ef = the dry paved road particulate emission factor (lb/VMT)
Eext = the annual average particulate emission factor extrapolated to account for the emissions control provided by natural precipitation (lb/VMT)
k = particle size multiplier (lb/VMT)
sL = road surface silt loading (g/m2)
W = average weight of vehicles (tons)
p = number of days with greater than 0.01 in. of precipitation per year
N = number of days in averaging period

12.1.1 Vehicle and Site Information

Parameter	Value		Basis
Vehicle Type	Haul Trucks		
Maximum Vehicles per Day	74	trucks/day	Engineering estimate for maximum daily truck traffic; see routes below
Maximum Vehicle Weight, W	30	tons	Engineering estimate for maximum gross vehicle weight of cab, truck and load
Annual Average Days of Rain, p	33.4	days	2022 NOAA Local Climatological Data Annual Summary w/ Comparative Data for Phoenix, AZ (KPHX) for 30-year period of record (POR)
Number of Days in Averaging Period, N	365		
Control Efficiency for Periodic Sweeping	50	%	Ch. 4 AWMA Air Pollution Control Eng. Manual, pg 141

12.1.2 PM Emission Factor Derivation

Parameter	Value		Basis
Particle Size Multiplier, k	0.011	lb/VMT	AP42 Table 13.2.1-1
Silt Loading, sL	0.23	g/m^2	Low-traffic arterial paved road surface silt content in Section 5.3.1 of Maricopa Association of Governments (MAG) 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area May 2012
Unmitigated Emission Factor	0.093	lb/VMT	= 0.01100 lb/VMT * (0.2 ^ 0.91) * (30 ^ 1.02)
Mitigated Emission Factor	0.091	lb/VMT	= 0.09 lb/VMT * (1 - (33 / (4 * 365)))
Controlled Emission Factor	0.045	lb/VMT	= 0.09 lb/VMT * (1 - 50%)

12.1.3 PM10 Emission Factor Derivation

Parameter	Value		Basis
Particle Size Multiplier, k	0.0022	lb/VMT	AP42 Table 13.2.1-1
Silt Loading, sL	0.23	g/m^2	See MAG reference above
Unmitigated Emission Factor	0.019	lb/VMT	= 0.00220 lb/VMT * (0.2 ^ 0.91) * (30 ^ 1.02)
Mitigated Emission Factor	0.018	lb/VMT	= 0.019 lb/VMT * (1 - (33 / (4 * 365)))
Controlled Emission Factor	0.009	lb/VMT	= 0.018 lb/VMT * (1 - 50%)

12.1.4 PM2.5 Emission Factor Derivation

Parameter	Value		Basis
Particle Size Multiplier, k	0.00054	lb/VMT	AP42 Table 13.2.1-1
Silt Loading, sL	0.23	g/m^2	See MAG reference above
Unmitigated Emission Factor	0.005	lb/VMT	= 0.00054 lb/VMT * (0.2 ^ 0.91) * (30 ^ 1.02)
Mitigated Emission Factor	0.004	lb/VMT	= 0.005 lb/VMT * (1 - (33 / (4 * 365)))
Controlled Emission Factor	0.0022	lb/VMT	= 0.004 lb/VMT * (1 - 50%)

12.1.5 Truck Traffic Calculations

Truck Route	Length of Route[1] (miles)	Maximum Truck Traffic (trucks/day)	Maximum Daily Vehicle Miles Traveled (VMT/day)
Scrap Dropoff	0.88	66	58.1
Dross Pickup	1.17	3	3.5
Supplies and Maintenance	1.15	5	5.7
		Total	**67.4**

[1] Based on measurements taken in GIS of anticipated truck routes.

12.2 Summary of Paved Haul Road Potential Emissions

Pollutant	Unmitigated Emission Factor for Short-Term Emissions (lb/VMT)	Mitigated Emission Factor for Annual Emissions (lb/VMT)	Controlled Short-Term Emission Factor (lb/VMT)	Controlled Annual Emission Factor (lb/VMT)	EF Basis	Max. Traffic Rate (VMT/day)	Uncontrolled Potential Emission Rate (lb/hr)	Uncontrolled Potential Emission Rate (tpy)	Controlled Potential Emission Rate (lb/hr)	Controlled Potential Emission Rate (tpy)
PM	0.093	0.091	0.046	0.045	AP-42, Chp.13.2	67.4	0.26	1.11	0.13	0.56
PM10	0.019	0.018	0.009	0.009	AP-42, Chp.13.2	67.4	0.052	0.22	0.026	0.11
PM2.5	0.005	0.004	0.0023	0.0022	AP-42, Chp.13.2	67.4	0.013	0.055	6.39E-03	0.027

12.3 Unpaved Storage Yard Emission Factor Derivation

> The methodologies indicated in AP42 Chapter 13.2.2 were used to quantify the potential particulate emissions generated by mobile equipment traffic on unpaved storage yards at the Gila Bend facility.

Unmitigated Emission Factor, Ef = [k * (s/12)^a * (W/3)^b] — AP42 Section 13.2.1, Equation 1

Mitigated Emission Factor, Eext = Ef * [(365 - P)/365] — AP42 Section 13.2.1, Equation 2

where,

Ef = the dry unpaved road particulate emission factor (lb/VMT)
Eext = the annual average particulate emission factor extrapolated to account for the emissions control provided by natural precipitation (lb/VMT)
k = particle size multiplier (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (tons)
P = number of days with greater than 0.01 in. of precipitation per year

12.3.1 Vehicle and Site Information

Parameter	Value		Basis
Vehicle Type	Fork Trucks		
Maximum Trips per Day (Fork Trucks)	90	trips/day	Engineering estimate for number of fork truck trips required for unloading scrap, placing in storage yard, and collecting from storage yard for use in process; see routes below
Maximum Vehicle Weight, W (Fork Trucks)	8.87	tons	Engineering estimate for average vehicle weight and load assuming 50:50 ratio of empty/full based on planned process use.
Vehicle Type	Heavy Duty Fork Truck		
Maximum Vehicles per Day (Heavy-Duty Fork Trucks)	19	truck/day	Engineering estimate for number of heavy-duty fork truck trips required for ingot movements from casting pit to storage yard and from storage yard to railcar; see routes below
Maximum Vehicle Weight, W (Heavy-Duty Fork Trucks)	86.50	tons	Engineering estimate for average vehicle weight and load assuming 50:50 ratio of empty/full based on planned process use.
Annual Average Days of Rain, p	33.4	days	2022 NOAA Local Climatological Data Annual Summary w/ Comparative Data for Phoenix, AZ (KPHX) for 30-year period of record (POR)
Control Efficiency for Periodic Watering	80	%	Ch. 4 AWMA Air Pollution Control Eng. Manual, Figure 6

12.3.2 PM Emission Factor Derivation

Parameter	Value		Basis
Particle Size Multiplier, k	4.9	lb/VMT	AP42 Table 13.2.2-2
Silt Content, s	6	%	Mean silt content for "Iron and steel production" from AP42 Table 13.2.2-1; Conservatively assume iron and steel unpaved road conditions represent secondary aluminum storage yards
Constant, a	0.7		AP42 Table 13.2.2-2
Constant, b	0.45		AP42 Table 13.2.2-2
Unmitigated Emission Factor (Fork Truck)	4.91	lb/VMT	= 4.9 lb/VMT * (6.0/12 ^ 0.70) * (8.87/3 ^ 0.45)
Mitigated Emission Factor (Fork Truck)	4.46	lb/VMT	= 4.91 lb/VMT * (365 - 33.4) / 365
Controlled Emission Factor (Fork Truck)	0.89	lb/VMT	= 4.46 lb/VMT * (1 - 80%)
Unmitigated Emission Factor (Heavy Duty Fork Truck)	13.69	lb/VMT	= 4.9 lb/VMT * (6.0/12 ^ 0.70) * (86.50/3 ^ 0.45)
Mitigated Emission Factor (Heavy Duty Fork Truck)	12.44	lb/VMT	= 13.69 lb/VMT * (365 - 33.4) / 365
Controlled Emission Factor (Heavy Duty Fork Truck)	2.49	lb/VMT	= 12.44 lb/VMT * (1 - 80%)

12.3.3 PM10 Emission Factor Derivation

Parameter	Value		Basis
Particle Size Multiplier, k	1.5	lb/VMT	AP42 Table 13.2.2-2
Silt Content, s	6	%	Mean silt content for "Iron and steel production" from AP42 Table 13.2.2-1; Conservatively assume iron and steel unpaved road conditions represent secondary aluminum storage yards
Constant, a	0.9		AP42 Table 13.2.2-2
Constant, b	0.45		AP42 Table 13.2.2-2
Unmitigated Emission Factor (Fork Truck)	1.31	lb/VMT	= 1.5 lb/VMT * (6.0/12 ^ 0.90) * (8.87/3 ^ 0.45)
Mitigated Emission Factor (Fork Truck)	1.19	lb/VMT	= 1.31 lb/VMT * (365 - 33.4) / 365
Controlled Emission Factor (Fork Truck)	0.24	lb/VMT	= 1.19 lb/VMT * (1 - 80%)
Unmitigated Emission Factor (Heavy Duty Fork Truck)	3.65	lb/VMT	= 1.5 lb/VMT * (6.0/12 ^ 0.90) * (86.50/3 ^ 0.45)
Mitigated Emission Factor (Heavy Duty Fork Truck)	3.31	lb/VMT	= 3.65 lb/VMT * (365 - 33.4) / 365
Controlled Emission Factor (Heavy Duty Fork Truck)	0.66	lb/VMT	= 3.31 lb/VMT * (1 - 80%)

12.3.4 PM2.5 Emission Factor Derivation

Parameter	Value		Basis
Particle Size Multiplier, k	0.2	lb/VMT	AP42 Table 13.2.2-2
Silt Content, s	6	%	Mean silt content for "Iron and steel production" from AP42 Table 13.2.2-1; Conservatively assume iron and steel unpaved road conditions represent secondary aluminum storage yards
Constant, a	0.9		AP42 Table 13.2.2-2
Constant, b	0.45		AP42 Table 13.2.2-2
Unmitigated Emission Factor (Fork Truck)	0.13	lb/VMT	= 0.2 lb/VMT * (6.0/12 ^ 0.90) * (8.87/3 ^ 0.45)
Mitigated Emission Factor (Fork Truck)	0.12	lb/VMT	= 0.13 lb/VMT * (365 - 33.4) / 365
Controlled Emission Factor (Fork Truck)	0.024	lb/VMT	= 0.12 lb/VMT * (1 - 80%)
Unmitigated Emission Factor (Heavy Duty Fork Truck)	0.36	lb/VMT	= 0.2 lb/VMT * (6.0/12 ^ 0.90) * (86.50/3 ^ 0.45)
Mitigated Emission Factor (Heavy Duty Fork Truck)	0.33	lb/VMT	= 0.36 lb/VMT * (365 - 33.4) / 365
Controlled Emission Factor (Heavy Duty Fork Truck)	0.066	lb/VMT	= 0.33 lb/VMT * (1 - 80%)

12.3.5 Mobile Equipment Traffic Calculations

Truck Route	Length of Route[1] (miles)	Maximum Truck Traffic (trucks/day)	Maximum Daily Vehicle Miles Traveled (VMT/day)
Fork Trucks	0.17	90	15.3
Heavy Duty Fork Trucks	0.14	19	2.8
		Total	**18.1**

[1] Based on measurements taken from to-scale site plan for length and width of scrap and ingot storage yards assuming each one-way trip traverses 50% of the yard width and length.

12.4 Summary of Unpaved Storage Yard Potential Emissions - Fork Trucks

Pollutant	Unmitigated Emission Factor for Short-Term Emissions (lb/VMT)	Mitigated Emission Factor for Annual Emissions (lb/VMT)	Controlled Short-Term Emission Factor (lb/VMT)	Controlled Annual Emission Factor (lb/VMT)	EF Basis	Max. Traffic Rate (VMT/day)	Uncontrolled Potential Emission Rate (lb/hr)	(tpy)	Controlled Potential Emission Rate (lb/hr)	(tpy)
PM	4.912	4.462	0.982	0.892	AP-42, Chp.13.2	15.3	3.14	12.49	0.63	2.50
PM10	1.309	1.189	0.262	0.238	AP-42, Chp.13.2	15.3	0.84	3.33	0.17	0.67
PM2.5	0.131	0.119	0.0262	0.0238	AP-42, Chp.13.2	15.3	0.08	0.33	0.017	0.07

12.5 Summary of Unpaved Storage Yard Potential Emissions - Heavy-Duty Fork Trucks

Pollutant	Unmitigated Emission Factor for Short-Term Emissions (lb/VMT)	Mitigated Emission Factor for Annual Emissions (lb/VMT)	Controlled Short-Term Emission Factor (lb/VMT)	Controlled Annual Emission Factor (lb/VMT)	EF Basis	Max. Traffic Rate (VMT/day)	Uncontrolled Potential Emission Rate (lb/hr)	(tpy)	Controlled Potential Emission Rate (lb/hr)	(tpy)
PM	13.691	12.438	2.738	2.488	AP-42, Chp.13.2	2.8	1.57	6.25	0.31	1.25
PM10	3.649	3.315	0.730	0.663	AP-42, Chp.13.2	2.8	0.42	1.67	0.08	0.33
PM2.5	0.365	0.331	0.0730	0.0663	AP-42, Chp.13.2	2.8	0.04	0.17	0.008	0.03

APPENDIX B. REFERENCES AND PLOT PLAN

REGISTRATION RECORD SERIES
TEAL SHEETS

International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys

The Aluminum Association

1400 Crystal Drive, Suite 430, Arlington, VA 22209
www.aluminum.org

Revised: **August 2018**

Supersedes: **January 2015**

ISSN: 2377-6692

Use of the Information

CONTENTS

FOREWORD

Listed herein are designations and chemical composition limits for wrought aluminum and wrought aluminum alloys registered with The Aluminum Association. Numerical designations are assigned in accordance with the *Recommendation—International Designation System for Wrought Aluminum and Wrought Aluminum Alloys*, which is printed on pages 28 through 30. Additions may be made in accordance with the rules outlined in the Declaration of Accord printed on page 31, and alloys will be deleted when no longer in commercial use (see table of inactive alloys printed on pages 22-23).

Effective July/2015, the practice of registering experimental alloys has been discontinued and new experimental alloy designations shall not be granted. Prior to July/2015, designations for experimental alloys, defined by prefix "X," had been registered in accordance with the system defined in ANSI H35.1, "American National Standard Alloy and Temper Designation Systems for Aluminum." Previously registered and subsequently inactivated experimental alloys remain in the Previously Assigned but Presently Inactive Alloy Designation list. An experimental alloy composition shall retain the prefix "X" for the duration of its inactive status and can only be reactivated with removal of the experimental alloy status and prefix "X."

Some of the registered alloys may be the subject of patent or patent applications, and their listing herein is not to be construed in any way as the granting of a license under such patent right.

This registration record is not intended to address all regulatory requirements that may be imposed by local, national or international governing bodies. Regulatory requirements, which vary by region and end use, can further restrict the chemical composition within the registered limits. When applicable, inclusion of such requirements in the sales agreement is advised.

A list of the organizations that are signatories to the Declaration of Accord on the Recommendation is printed on pages ii-iii.

SIGNATORIES TO THE DECLARATION OF ACCORD

The following organizations are signatories to the Declaration of Accord on an International Alloy Designation System for Wrought Aluminum and Wrought Aluminum Alloys which is printed on page 31 of this publication.

The Aluminum Association Inc. — USA
1400 Crystal Drive
Suite 430
Arlington, VA 22202
USA
www.aluminum.org

AFA Association Francaise de l'Aluminium — FRANCE
17, rue de l'amiral Hamelin
75783 Paris
Cedex 16
FRANCE
www.aluminium-info.com

All-Russian Institute of Aviation Materials (VIAM) — RUSSIA
17 Radio Ulitza
105005 Moscow
RUSSIA
www.viam.ru

ALRO S.A. — ROMANIA
116 Pitesti Street
Slatina, Olt County
230048
ROMANIA
www.alro.ro

Aluminium Association of Canada — CANADA
1010 Sherbrooke Street West, Suite 1600
Montreal, Quebec H3A 2R7
CANADA
www.aac.aluminium.qc.ca

Aluminium Center Belgium — BELGIUM
Z.I. Research Park 310
B-1731 Zellik
BELGIUM
www.aluminiumcenter.be

Aluminium Federation Limited — UK
National Metalforming Centre
47 Birmingham Road
West Bromwich, West Midlands
B70 6PY
UNITED KINGDOM
www.alfed.org.uk

Aluminium Federation of South Africa — SOUTH AFRICA
P. O. Box 423
Isando, 1600
REPUBLIC OF SOUTH AFRICA
www.afsa.org.za

Aluminium – Verband Schweiz — SWITZERLAND
Hallenstrasse 15
Postfach 71
CH-8024 Zurich
SWITZERLAND
www.alu.ch

Associacão Brasileira do Aluminio—ABAL — BRAZIL
Rua HumbertoI, n° 220 - 4° .Andar
Vila Mariana - CEP: 04018-030
Sao Pãulo-SP
BRAZIL
www.abal.org.br

Association for the Dutch Metallurgic Industry (VNMI) — NETHERLANDS
P.O. Box 190
NL-2700 AD Zoetermeer
NETHERLANDS
www.vnmi.nl

Assomet - Associazione Nazionale Industrie Metalli non Ferrosi — ITALY
Via dei Missaglia, 97
I-20142 Milano
ITALY
www.assomet.it

Australian Aluminium Council Limited — AUSTRALIA
Level 1, Dickson Square
P.O. Box 63
Dickson, Canberra ACT 2602
AUSTRALIA
www.aluminium.org.au

Austrian Non-Ferrous Metals Federation — AUSTRIA
Wiedner Hauptstraße 63
1045 Vienna
AUSTRIA
www.nemetall.at

Centro Nacional de Investigaciones Metalurgicas (CENIM) — SPAIN
Avenida Gregorio del Amo, 8
Ciudad Universitaria
28040 Madrid
SPAIN
www.cenim.csic.es

China Nonferrous Metals Techno-Economic Research Institute — CHINA
No. 31 Suzhou Street
Haidian District
Bejing, 100080
PEOPLES REPUBLIC OF CHINA
www.cnsmq.com

European Aluminium Association — EAA
Avenue de Broqueville, 12
B-1150 Brussels
BELGIUM
www.alueurope.eu

Signatories (Continued)

European Organization for
Aerospace Standardization
Rue Montoyer 10/5
1000 Brussels
BELGIUM
www.asd-stan.org

ASD-STAN

Gesamtverband der Aluminium-
industrie e.V. (GDA)
Am Bonneshof 5
D-40474 Dusseldorf
GERMANY
www.aluinfo.de

GERMANY

Institute of Non-Ferrous Metals
Light Metals Divison
ul. Pilsudskiego 19
32-050 Skawina
POLAND
www.imn.gliwice.pl

POLAND

Instituto Mexicano del Alumino, A.C.
Francisco Petrarca
No. 133 Piso 9
MEXICO, D.F. 11560
www.imedal.org.mx

MEXICO

IRAM-Instituto Argentino De
Normalizacion
Peru 552/6
C1068AAB
Buenos Aires
ARGENTINA
www.iram.org.ar

ARGENTINA

Japan Aluminium Association
Tsukamoto-Sozan Building
2-15, Ginza 4-Chome
Chuo-ku, Tokyo 104-0061
JAPAN
www.aluminum.or.jp

JAPAN

The Swedish Aluminium Association
Svenskt Aluminium
Romfartuna Nortuna 1
SE-725 94 Västerås
SWEDEN
www.svensktaluminium.se

SWEDEN

CHEMICAL COMPOSITION LIMITS[1, 2]

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

NATURAL IMPURITY LIMITS FOR WROUGHT UNALLOYED ALUMINUM

Registered International Designation																						OTHERS[13]		Al
No. [17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
1050	1954	USA	0.25	0.40	0.05	0.05	0.05	…	…	0.05	0.03	…	…	…	…	…	…	…	0.05	…	…	0.03	…	99.50 [4]
1050A	1972	EAA	0.25	0.40	0.05	0.05	0.05	…	…	0.07	0.05	…	…	…	…	…	…	…	…	…	…	0.03	…	99.50 [4]
1060	1954	USA	0.25	0.35	0.05	0.03	0.03	…	…	0.05	0.03	…	…	…	…	…	…	…	0.05	…	…	0.03	…	99.60 [4]
1065	1973	USA	0.25	0.30	0.05	0.03	0.03	…	…	0.05	0.03	…	…	…	…	…	…	…	0.05	…	…	0.03	…	99.65 [4]
1070	1954	USA	0.20	0.25	0.04	0.03	0.03	…	…	0.04	0.03	…	…	…	…	…	…	…	0.05	…	[6]	0.03	…	99.70 [4]
1070A	1972	EAA	0.20	0.25	0.03	0.03	0.03	…	…	0.07	0.03	…	…	…	…	…	…	…	…	…	…	0.03	…	99.70 [4]
1080	1954	USA	0.15	0.15	0.03	0.02	0.02	…	…	0.03	0.03	…	…	…	0.03	…	…	…	0.05	…	…	0.02	…	99.80 [4]
1080A	1972	EAA	0.15	0.15	0.03	0.02	0.02	…	…	0.06	0.02	…	…	…	0.03	…	…	…	…	…	[6]	0.02	…	99.80 [4]
1085	1954	USA	0.10	0.12	0.03	0.02	0.02	…	…	0.03	0.02	…	…	…	0.03	…	…	…	0.05	…	…	0.01	…	99.85 [4]
1090	1954	USA	0.07	0.07	0.02	0.01	0.01	…	…	0.03	0.01	…	…	…	0.03	…	…	…	0.05	…	…	0.01	…	99.90 [4]
1098	1972	GERMANY	0.010	0.006	0.003	…	…	…	…	0.015	0.003	…	…	…	…	…	…	…	…	…	…	0.003	…	99.98 [5]

REGISTERED COMPOSITIONS

Registered International Designation																						OTHERS[13]		Al
No. [17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
1100	1954	USA	…	…	0.05-0.20	0.05	…	…	…	0.10	…	…	…	…	…	…	…	…	…	…	0.95 Si+Fe [6]	0.05	0.15	99.00 [4]
1100A	2005	JAPAN	…	…	0.05-0.20	0.05	0.10	…	…	0.10	0.10	…	…	…	…	…	…	…	…	…	1.00 Si+Fe	0.05	0.15	99.00 [4]
1200	1966	USA	…	…	0.05	0.05	…	…	…	0.10	0.05	…	…	…	…	…	…	…	…	…	1.00 Si+Fe[6]	0.05	0.15	99.00 [4]
1200A	1991	NORWAY	…	…	0.10	0.30	0.30	0.10	…	0.10	…	…	…	…	…	…	…	…	…	…	1.00 Si+Fe	0.05	0.15	99.00 [4]
1300[15]	2000	FRANCE	0.20	0.30	0.05	0.03	0.03	…	…	0.20-0.50	0.03	…	…	…	…	…	…	…	…	…	…	0.05	0.15	99.00 [4]
1110	1987	FRANCE	0.30	0.8	0.04	0.01	0.25	0.01	…	…	…	…	0.02	…	…	…	…	…	…	…	0.03 V+Ti	0.03	…	99.10 [4]
1120	1982	AUSTRALIA	0.10	0.40	0.05-0.35	0.01	0.20	0.01	…	0.05	…	…	0.05	…	0.03	…	…	…	…	…	0.02 V+Ti	0.03	0.10	99.20 [4]
1230[15]	1954	USA	…	…	0.10	0.05	0.05	…	…	0.10	0.03	…	…	…	…	…	…	…	0.05	…	0.70 Si+Fe	0.03	…	99.30 [4]
1230A	2005	JAPAN	…	…	0.10	0.05	0.05	…	…	0.05	…	…	…	…	…	…	…	…	…	…	0.70 Si+Fe	0.03	…	99.30 [4]
1235	1954	USA	…	…	0.05	0.05	0.05	…	…	0.10	0.06	…	…	…	…	…	…	…	0.05	…	0.65 Si+Fe	0.03	…	99.35 [4]
1435	1958	USA	0.15	0.30-0.50	0.02	0.05	0.05	…	…	0.10	0.03	…	…	…	…	…	…	…	0.05	…	…	0.03	…	99.35 [4]
1145	1954	USA	…	…	0.05	0.05	0.05	…	…	0.05	0.03	…	…	…	…	…	…	…	0.05	…	0.55 Si+Fe	0.03	…	99.45 [4]
1345	1956	USA	0.30	0.40	0.10	0.05	0.05	…	…	0.05	0.03	…	…	…	…	…	…	…	0.05	…	…	0.03	…	99.45 [4]
1445	1973	AUSTRALIA	…	…	0.04	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	0.50 Si+Fe+Cu	…	0.05	99.45 [4]
1150	1973	AUSTRALIA	…	…	0.05-0.20	0.05	0.05	…	…	0.05	0.03	…	…	…	…	…	…	…	…	…	0.45 Si+Fe	0.03	…	99.50 [4]
1350[11]	1975	USA	0.10	0.40	0.05	0.01	…	0.01	…	0.05	…	…	0.05	…	0.03	…	…	…	…	…	0.02 V+Ti	0.03	0.10	99.50 [4]
1350A	1979	GERMANY	0.25	0.40	0.02	…	0.05	…	…	0.05	…	…	…	…	…	…	…	…	…	…	0.03 Cr+Mn+Ti+V	0.03	…	99.50 [4]
1450	1990	EAA	0.25	0.40	0.05	0.05	0.05	…	…	0.07	0.10-0.20	…	…	…	…	…	…	…	…	…	[6]	0.03	…	99.50 [4]
1370	1976	FRANCE	0.10	0.25	0.02	0.01	0.02	0.01	…	0.04	…	…	0.02	…	0.03	…	…	…	…	…	0.02 V+Ti	0.02	0.10	99.70 [4]

See footnotes on page 18.

CHEMICAL COMPOSITION LIMITS[1, 2]

REGISTERED COMPOSITION—Continued

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

Registered International Designation																						OTHERS[13]		Al
No.[17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
1275	1986	SPAIN	0.08	0.12	0.05-0.10	0.02	0.02	…	…	0.03	0.02	…	…	…	0.03	…	…	…	0.03	…	…	0.01	…	99.75[4]
1185	1954	USA	…	…	0.01	0.02	0.02	…	…	0.03	0.02	…	…	…	0.03	…	…	…	0.05	…	0.15 Si+Fe	0.01	…	99.85[4]
1285	1954	USA	0.08	0.08	0.02	0.01	0.01	…	…	0.03	0.02	…	…	…	0.03	…	…	…	0.05	…	0.14 Si+Fe	0.01	…	99.85[4]
1385	1987	FRANCE	0.05	0.12	0.02	0.01	0.02	0.01	…	0.03	…	…	0.02	…	0.03	…	…	…	…	…	0.03 V+Ti	0.01	…	99.85[4]
1188	1954	USA	0.06	0.06	0.005	0.01	0.01	…	…	0.03	0.01	…	…	…	0.03	…	…	…	0.05	…	[6]	0.01	…	99.88[4]
1190	1987	FRANCE	0.05	0.07	0.01	0.01	0.01	0.01	…	0.02	…	…	0.01	…	0.02	…	…	…	…	…	0.01 V+Ti	0.01	…	99.90[4]
1290	2005	JAPAN	0.050	0.030	0.050	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	0.01	…	99.90[5]
1193	1964	USA	0.04	0.04	0.006	0.01	0.01	…	…	0.03	0.01	…	…	…	0.03	…	…	…	0.05	…	…	0.01	…	99.93[4]
1198	1990	FRANCE	0.010	0.006	0.006	0.006	…	…	…	0.010	0.006	…	…	…	0.006	…	…	…	…	…	…	0.003	…	99.98[5]
1199	1956	USA	0.006	0.006	0.006	0.002	0.006	…	…	0.006	0.002	…	…	…	0.005	…	…	…	0.005	…	…	0.002	…	99.99[5]
2001	1979	FRANCE	0.20	0.20	5.2-6.0	0.15-0.50	0.20-0.45	0.10	0.05	0.10	0.20	…	…	…	…	…	0.003	…	…	0.05	…	0.05	0.15	Rem.
2002	1975	FRANCE	0.35-0.8	0.30	1.5-2.5	0.20	0.50-1.0	0.20	…	0.20	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
2004	1980	UK	0.20	0.20	5.5-6.5	0.10	0.50	…	…	0.10	0.05	…	…	…	…	…	…	…	…	0.30-0.50	…	0.05	0.15	Rem.
2005	1983	ARGENTINA	0.8	0.7	3.5-5.0	1.0	0.20-1.0	0.10	0.20	0.50	0.20	…	…	0.20	…	…	1.0-2.0	…	…	…	…	0.05	0.15	Rem.
2006	1983	ARGENTINA	0.8-1.3	0.7	1.0-2.0	0.6-1.0	0.50-1.4	…	0.20	0.20	0.30	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
2007	1979	GERMANY	0.8	0.8	3.3-4.6	0.50-1.0	0.40-1.8	0.10	0.20	0.8	0.20	…	…	0.20	…	…	0.8-1.5	0.20	…	…	…	0.10	0.30	Rem.
2007A	2001	ITALY	0.8	0.8	3.3-4.6	0.20-1.0	0.40-1.8	0.10	0.20	0.8	0.20	…	…	0.20	…	…	0.05	0.8-1.5	…	…	…	0.10	0.30	Rem.
2007B	2006	SLOVENIA	0.8	0.7	3.3-4.6	0.50-1.0	0.40-1.8	0.10	0.10	0.8	0.20	…	…	0.10	…	…	0.10	0.40-1.9	…	…	…	0.05	0.15	Rem.
2008	1987	USA	0.50-0.8	0.40	0.7-1.1	0.30	0.25-0.50	0.10	…	0.25	0.10	…	…	…	…	…	…	…	0.05	…	…	0.05	0.15	Rem.
2009	1990	USA	0.25	0.05	3.2-4.4	…	1.0-1.6	…	…	0.10	…	…	…	…	…	…	…	…	…	…	0.6 O	0.05	0.15	Rem.
2010	1990	USA	0.50	0.50	0.7-1.3	0.10-0.40	0.40-1.0	0.15	…	0.30	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
2011	1954	USA	0.40	0.7	5.0-6.0	…	…	…	…	0.30	…	…	…	0.20-0.6	…	…	0.20-0.6	…	…	…	…	0.05	0.15	Rem.
2011A	1982	SWITZERLAND	0.40	0.50	4.5-6.0	…	…	…	…	0.30	…	…	…	0.20-0.6	…	…	0.20-0.6	…	…	…	…	0.05	0.15	Rem.
2111	1993	USA	0.40	0.7	5.0-6.0	…	…	…	…	0.30	…	…	…	0.20-0.8	…	…	…	0.10-0.50	…	…	…	0.05	0.15	Rem.
2111A	2001	ITALY	0.40	0.7	5.0-6.0	0.15	0.15	…	…	0.30	0.05	…	…	0.20-0.6	…	…	0.05	0.20-0.6	…	…	…	0.05	0.15	Rem.
2111B	2001	SWITZERLAND	0.30	0.50	4.6-6.0	0.05	0.05	…	…	…	…	…	…	0.30-0.6	…	…	…	0.30-0.7	…	…	…	0.05	0.15	Rem.
2012	1993	USA	0.40	0.7	4.0-5.5	…	…	…	…	0.30	…	…	…	0.20-0.7	…	…	…	0.20-0.6	…	…	…	0.05	0.15	Rem.
2013	2003	JAPAN	0.6-1.0	0.40	1.5-2.0	0.25	0.8-1.2	0.04-0.35	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
2014	1954	USA	0.50-1.2	0.7	3.9-5.0	0.40-1.2	0.20-0.8	0.10	…	0.25	0.15	…	…	…	…	…	…	…	…	…	[7]	0.05	0.15	Rem.
2014A	1976	AECMA	0.50-0.9	0.50	3.9-5.0	0.40-1.2	0.20-0.8	0.10	0.10	0.25	0.15	…	…	…	…	…	…	…	…	…	0.20 Zr+Ti	0.05	0.15	Rem.
2214	1954	USA	0.50-1.2	0.30	3.9-5.0	0.40-1.2	0.20-0.8	0.10	…	0.25	0.15	…	…	…	…	…	…	…	…	…	[7]	0.05	0.15	Rem.
2015	2003	SWITZERLAND	0.8	0.8	3.9-5.2	0.30-1.0	0.30-1.3	0.15	0.20	0.7	0.20	…	…	0.40	…	…	0.20	0.7-1.5	…	…	…	0.05	0.15	Rem.

See footnotes on page 18.

CHEMICAL COMPOSITION LIMITS[1, 2]

REGISTERED COMPOSITION—Continued

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

	Registered International Designation																						OTHERS[13]		Al
	No.[17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
	2016	2003	GERMANY	0.30-0.7	0.15	3.5-4.5	0.10-0.50	0.30-0.8	…	…	…	0.05-0.15	0.30-0.7	…	…	…	…	…	…	…	0.10-0.25	…	0.05	0.15	Rem.
	2017	1954	USA	0.20-0.8	0.7	3.5-4.5	0.40-1.0	0.40-0.8	0.10	…	0.25	0.15	…	…	…	…	…	…	…	…	…	[7]	0.05	0.15	Rem.
	2017A	1972	EAA	0.20-0.8	0.7	3.5-4.5	0.40-1.0	0.40-1.0	0.10	…	0.25	…	…	…	…	…	…	…	…	…	…	0.25 Zr+Ti	0.05	0.15	Rem.
	2117	1954	USA	0.8	0.7	2.2-3.0	0.20	0.20-0.50	0.10	…	0.25	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2018	1954	USA	0.9	1.0	3.5-4.5	0.20	0.45-0.9	0.10	1.7-2.3	0.25	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2218	1954	USA	0.9	1.0	3.5-4.5	0.20	1.2-1.8	0.10	1.7-2.3	0.25	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2618	1954	USA	0.10-0.25	0.9-1.3	1.9-2.7	…	1.3-1.8	…	0.9-1.2	0.10	0.04-0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2618A	1972	EAA	0.15-0.25	0.9-1.4	1.8-2.7	0.25	1.2-1.8	…	0.8-1.4	0.15	0.20	…	…	…	…	…	…	…	…	…	0.25 Zr+Ti	0.05	0.15	Rem.
	2219[8]	1954	USA	0.20	0.30	5.8-6.8	0.20-0.40	0.02	…	…	0.10	0.02-0.10	…	…	…	…	…	…	…	0.05-0.15	0.10-0.25	…	0.05	0.15	Rem.
	2319	1958	USA	0.20	0.30	5.8-6.8	0.20-0.40	0.02	…	…	0.10	0.10-0.20	…	…	…	…	…	…	…	0.05-0.15	0.10-0.25	[6]	0.05	0.15	Rem.
	2419	1972	USA	0.15	0.18	5.8-6.8	0.20-0.40	0.02	…	…	0.10	0.02-0.10	…	…	…	…	…	…	…	0.05-0.15	0.10-0.25	…	0.05	0.15	Rem.
	2519	1985	USA	0.25	0.30	5.3-6.4	0.10-0.50	0.05-0.40	…	…	0.10	0.02-0.10	…	…	…	…	…	…	…	0.05-0.15	0.10-0.25	0.40 Si+Fe	0.05	0.15	Rem.
	2021	1981	UK	0.20	0.30	5.8-6.8	0.20-0.40	0.02	…	…	0.10	0.02-0.10	…	…	…	…	…	…	0.03-0.08	0.05-0.15	0.10-0.25	0.05-0.20 Cd	0.05	0.15	Rem.
	2022	2004	FRANCE	0.15	0.20	4.5-5.5	0.15-0.50	0.10-0.45	0.05	…	0.05-0.30	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
+	2122	2015	USA	0.10	0.15	4.5-5.4	0.15-0.50	0.10-0.6	0.05	…	0.15	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2023	2004	FRANCE	0.10	0.15	3.6-4.5	0.30	1.0-1.6	0.10	…	…	0.05	…	…	…	…	…	…	…	…	0.05-0.15	0.01-0.06 Sc	0.05	0.15	Rem.
	2024	1954	USA	0.50	0.50	3.8-4.9	0.30-0.9	1.2-1.8	0.10	…	0.25	0.15	…	…	…	…	…	…	…	…	…	[7]	0.05	0.15	Rem.
	2024A	1996	FRANCE	0.15	0.20	3.7-4.5	0.15-0.8	1.2-1.5	0.10	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2124	1970	USA	0.20	0.30	3.8-4.9	0.30-0.9	1.2-1.8	0.10	…	0.25	0.15	…	…	…	…	…	…	…	…	…	[7]	0.05	0.15	Rem.
+	2124A	2015	USA	0.20	0.30	3.8-4.9	0.30-0.9	1.2-1.8	0.10	…	0.25	0.15	…	…	…	…	…	…	…	…	…	0.6 O	0.05	0.15	Rem.
	2224	1978	USA	0.12	0.15	3.8-4.4	0.30-0.9	1.2-1.8	0.10	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2224A	1997	RUSSIA	0.10	0.15	3.8-4.5	0.40-0.8	1.2-1.6	…	0.05	0.10	0.01-0.07	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2324	1978	USA	0.10	0.12	3.8-4.4	0.30-0.9	1.2-1.8	0.10	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2424	1994	USA	0.10	0.12	3.8-4.4	0.30-0.6	1.2-1.6	…	…	0.20	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2524	1995	USA	0.06	0.12	4.0-4.5	0.45-0.7	1.2-1.6	0.05	…	0.15	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2624	2009	USA	0.08	0.08	3.8-4.3	0.45-0.7	1.2-1.6	0.05	…	0.15	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2724	2010	USA	0.15	0.20	3.8-4.9	0.30-0.9	1.2-1.8	…	…	0.25	0.06	…	…	…	…	…	…	…	…	0.08-0.14	…	0.05	0.15	Rem.
	2824	2014	USA	0.08	0.11	3.7-4.3	0.50-0.9	1.1-1.6	0.05	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2025	1954	USA	0.50-1.2	1.0	3.9-5.0	0.40-1.2	0.05	0.10	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2026	1999	USA	0.05	0.07	3.6-4.3	0.30-0.8	1.0-1.6	…	…	0.10	0.06	…	…	…	…	…	…	…	…	0.05-0.25	…	0.05	0.15	Rem.
	2027	2001	FRANCE	0.12	0.15	3.9-4.9	0.50-1.2	1.0-1.5	…	…	0.20	0.08	…	…	…	…	…	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
	2028	2005	GERMANY	0.8	0.8	3.3-4.6	0.50-1.0	0.40-1.8	0.10	0.20	0.8	0.20	…	…	0.10-1.0	…	…	1.0	0.10-1.0	…	…	…	0.10	0.30	Rem.
	2028A	2006	SLOVENIA	0.8	0.7	3.3-4.5	0.20-1.0	0.50-1.3	0.10	0.10	0.50	0.20	…	…	0.50-0.7	…	…	0.20-0.40	…	…	…	…	0.05	0.15	Rem.
	2028B	2006	SLOVENIA	0.8	0.8	3.3.-4.6	0.50-1.0	0.40-1.8	0.10	0.10	0.8	0.20	…	…	0.50-0.7	…	…	0.20-0.40	…	…	…	…	0.05	0.15	Rem.
	2028C	2006	BELGIUM	0.8	0.7	3.3-5.0	0.20-1.0	0.50-1.3	0.10	…	0.50	0.20	…	…	0.40-1.0	…	…	0.05	0.20-1.0	…	…	…	0.10	0.30	Rem.
	2029	2013	USA	0.12	0.15	3.2-4.0	0.20-0.40	0.8-1.1	…	…	…	0.10	0.30-0.50	…	…	…	…	…	…	…	0.08-0.15	…	0.05	0.15	Rem.
	2030	1972	EAA	0.8	0.7	3.3-4.5	0.20-1.0	0.50-1.3	0.10	…	0.50	0.20	…	…	0.20	…	…	0.8-1.5	…	…	…	…	0.10	0.30	Rem.
	2031	1974	UK	0.50-1.3	0.6-1.2	1.8-2.8	0.50	0.6-1.2	…	0.6-1.4	0.20	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.

See footnotes on page 18.

CHEMICAL COMPOSITION LIMITS[1, 2]

REGISTERED COMPOSITION—Continued

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

	Registered International Designation																						OTHERS[13]		Al
	No.[17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
	2032	2005	JAPAN	0.50-1.3	0.6-1.5	1.5-2.5	0.20	1.2-1.8	…	0.6-1.4	0.20	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
+	2033	2017	ITALY	0.10-1.2	0.7	2.2-2.7	0.40-1.0	0.20-0.6	0.15	0.15	0.50	0.10	…	…	0.05-0.8	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2034	1983	USA	0.10	0.12	4.2-4.8	0.8-1.3	1.3-1.9	0.05	…	0.20	0.15	…	…	…	…	…	…	…	…	0.08-0.15	…	0.05	0.15	Rem.
	2036	1970	USA	0.50	0.50	2.2-3.0	0.10-0.40	0.30-0.6	0.10	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2037	1977	USA	0.50	0.50	1.4-2.2	0.10-0.40	0.30-0.8	0.10	…	0.25	0.15	…	…	…	…	…	…	…	0.05	…	…	0.05	0.15	Rem.
	2038	1980	USA	0.50-1.3	0.6	0.8-1.8	0.10-0.40	0.40-1.0	0.20	…	0.50	0.15	…	…	…	0.05	…	…	…	0.05	…	…	0.05	0.15	Rem.
	2039	1999	SWITZERLAND	0.20	0.30	4.5-5.5	0.20-0.50	0.40-0.8	…	…	…	0.15	0.05-0.50	…	…	…	…	…	…	…	0.10-0.25	…	0.05	0.15	Rem.
	2139	2004	FRANCE	0.10	0.15	4.5-5.5	0.20-0.6	0.20-0.8	0.05	…	0.25	0.15	0.15-0.6	…	…	…	…	…	…	0.05	…	…	0.05	0.15	Rem.
	2040	2003	USA	0.08	0.10	4.8-5.4	0.45-0.8	0.7-1.1	…	…	0.25	0.06	0.40-0.7	…	…	…	…	…	…	…	0.08-0.15	0.0001 Be	0.05	0.15	Rem.
	2041	2006	SLOVENIA	0.40	0.7	5.0-6.0	…	…	…	…	0.30	…	…	…	0.50-0.7	…	…	0.05	0.50-0.7	…	…	…	0.05	0.15	Rem.
+	2042	2015	FRANCE	0.10	0.15	4.5-5.5	0.15-0.50	0.10-0.45	0.05	…	0.15	0.10	…	…	…	…	…	…	…	…	0.08-0.16	…	0.05	0.15	Rem.
+	2043	2017	USA	0.08	0.10	2.5-3.1	0.30	0.10-0.6	...	…	0.30	0.10	0.10	…	…	…	1.4-1.9	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
	2044	2006	SLOVENIA	0.8	0.7	3.3-4.5	0.20-1.0	0.50-1.3	0.10	0.10	0.50	0.20	…	…	0.20-0.40	…	…	0.05	0.9-1.3	…	…	…	0.05	0.15	Rem.
	2045	2006	SLOVENIA	0.8	0.8	3.3-4.6	0.50-1.0	0.40-1.8	0.10	0.10	0.8	0.20	…	…	0.20-0.40	…	…	0.05	0.9-1.3	…	…	…	0.05	0.15	Rem.
	2050	2004	USA	0.08	0.10	3.2-3.9	0.20-0.50	0.20-0.6	0.05	0.05	0.25	0.10	0.20-0.7	…	…	0.05	0.7-1.3	…	…	0.05	0.06-0.14	…	0.05	0.15	Rem.
	2055	2011	USA	0.07	0.10	3.2-4.2	0.10-0.50	0.20-0.6	…	…	0.30-0.7	0.10	0.20-0.7	…	…	…	1.0-1.3	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
	2056	2003	FRANCE	0.10	0.12	3.3-4.3	0.10-0.50	0.6-1.4	…	…	0.40-0.8	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	2060	2011	USA	0.07	0.07	3.4-4.5	0.10-0.50	0.6-1.1	…	…	0.30-0.50	0.10	0.05-0.50	…	…	…	0.6-0.9	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
	2065	2012	FRANCE	0.10	0.10	3.8-4.7	0.15-0.50	0.25-0.8	…	…	0.30	0.10	0.15-0.50	…	…	…	0.8-1.5	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
	2070	2013	USA	0.12	0.15	2.9-3.8	0.10-0.50	0.05-0.40	…	…	0.10-0.50	0.10	…	…	…	…	1.0-1.4	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
+	2071	2016	USA	0.12	0.15	3.7-4.5	0.10-0.50	0.7-1.4	…	…	0.10-0.6	0.10	0.15	…	…	…	0.8-1.4	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
+	2073	2018	USA	0.12	0.15	3.0-4.0	0.10-0.50	0.7-1.4	…	…	0.10-0.6	0.10	0.15	…	…	…	1.0-1.7	…	…	…	0.07	…	0.05	0.15	Rem.
+	2074	2016	USA	0.10	0.10	2.6-3.3	0.10-0.50	0.30-0.7	…	…	0.20	0.10	0.05-0.30	…	…	…	0.6-0.9	…	…	…	…	…	0.05	0.15	Rem.
+	2075	2014	USA	0.10	0.10	4.1-4.6	0.10	0.30-0.8	0.05	0.05	0.20	0.05	0.10-0.30	…	…	…	0.7-1.1	…	…	…	0.08-0.16	…	0.05	0.15	Rem.
	2076	2012	France	0.10	0.10	2.0-2.7	0.15-0.50	0.20-0.8	…	…	0.30	0.10	0.15-0.40	…	…	…	1.2-1.8	…	…	…	0.05-0.16	…	0.05	0.15	Rem.
+	2081	2018	USA	0.12	0.15	3.0-4.0	0.10-0.50	0.40-1.0	…	…	0.10-0.6	0.10	0.15	…	…	…	0.50-1.0	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
+	2085	2014	USA	0.10	0.10	2.2-2.7	0.10	0.30-0.8	0.05	0.05	0.20	0.10	0.10-0.40	…	…	…	1.3-1.9	…	…	…	0.08-0.16	…	0.05	0.15	Rem.

See footnotes on page 18.

CHEMICAL COMPOSITION LIMITS[1, 2]

REGISTERED COMPOSITION—Continued

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

Registered International Designation																						OTHERS[13]		Al
No. [17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
2090	1984	USA	0.10	0.12	2.4-3.0	0.05	0.25	0.05	…	0.10	0.15	…	…	…	…	1.9-2.6	…	…	…	0.08-0.15	…	0.05	0.15	Rem.
2091	1985	FRANCE	0.20	0.30	1.8-2.5	0.10	1.1-1.9	0.10	…	0.25	0.10	…	…	…	…	1.7-2.3	…	…	…	0.04-0.16	…	0.05	0.15	Rem.
2094	1990	USA	0.12	0.15	4.4-5.2	0.25	0.25-0.8	…	…	0.25	0.10	0.25-0.6	…	…	…	0.7-1.4	…	…	…	0.04-0.18	…	0.05	0.15	Rem.
2095	1990	USA	0.12	0.15	3.9-4.6	0.25	0.25-0.8	…	…	0.25	0.10	0.25-0.6	…	…	…	0.7-1.5	…	…	…	0.04-0.18	…	0.05	0.15	Rem.
2195	1992	USA	0.12	0.15	3.7-4.3	0.25	0.25-0.8	…	…	0.25	0.10	0.25-0.6	…	…	…	0.8-1.2	…	…	…	0.08-0.16	…	0.05	0.15	Rem.
2295	2013	USA	0.08	0.08	3.9-4.5	0.10	0.25-0.8	…	…	0.25	0.10	0.10-0.50	…	…	…	0.9-1.3	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
+ 2395	2014	USA	0.08	0.10	3.6-4.3	0.35	0.25-0.8	…	…	0.25	0.10	0.10-0.45	…	…	…	0.9-1.4	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
2196	2000	USA	0.12	0.15	2.5-3.3	0.35	0.25-0.8	…	…	0.35	0.10	0.25-0.6	…	…	…	1.4-2.1	…	…	…	0.04-0.18	…	0.05	0.15	Rem.
2296	2010	FRANCE	0.12	0.15	2.1-2.8	0.05-0.50	0.20-0.8	…	...	0.25	0.10	0.25-0.6	…	…	…	1.3-1.9	…	…	…	0.04-0.18	…	0.05	0.15	Rem.
2097	1993	USA	0.12	0.15	2.5-3.1	0.10-0.6	0.35	…	…	0.35	0.15	…	…	…	…	1.2-1.8	…	…	…	0.08-0.16	…	0.05	0.15	Rem.
2197	1993	USA	0.10	0.10	2.5-3.1	0.10-0.50	0.25	…	…	0.05	0.12	…	…	…	…	1.3-1.7	…	…	…	0.08-0.15	…	0.05	0.15	Rem.
2297	1997	USA	0.10	0.10	2.5-3.1	0.10-0.50	0.25	…	…	0.05	0.12	…	…	…	…	1.1-1.7	…	…	…	0.08-0.15	…	0.05	0.15	Rem.
2397	2002	USA	0.10	0.10	2.5-3.1	0.10-0.50	0.25	…	…	0.05-0.15	0.12	…	…	…	…	1.1-1.7	…	…	…	0.08-0.15	…	0.05	0.15	Rem.
2098	2000	USA	0.12	0.15	3.2-3.8	0.35	0.25-0.8	…	…	0.35	0.10	0.25-0.6	…	…	…	0.8-1.3	…	…	….	0.04-0.18	…	0.05	0.15	Rem.
2198	2005	USA	0.08	0.10	2.9-3.5	0.50	0.25-0.8	0.05	…	0.35	0.10	0.10-0.50	…	…	…	0.8-1.1	…	…	…	0.04-0.18	…	0.05	0.15	Rem.
2099	2003	USA	0.05	0.07	2.4-3.0	0.10-0.50	0.10-0.50	…	…	0.40-1.0	0.10	…	…	…	…	1.6-2.0	…	…	…	0.05-0.12	0.0001 Be	0.05	0.15	Rem.
2199	2005	USA	0.05	0.07	2.3-2.9	0.10-0.50	0.05-0.40	…	…	0.20-0.9	0.10	…	…	…	…	1.4-1.8	…	…	…	0.05-0.12	0.0001 Be	0.05	0.12	Rem.
+ 3001	2016	KOREA	0.01-0.20	0.05-0.50	0.15-0.45	0.6-1.2	…	…	…	…	0.01-0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3002	1961	USA	0.08	0.10	0.15	0.05-0.25	0.05-0.20	…	…	0.05	0.03	…	…	…	…	…	…	…	0.05	…	…	0.03	0.10	Rem.
3102	1972	USA	0.40	0.7	0.10	0.05-0.40	…	…	…	0.30	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3003	1954	USA	0.6	0.7	0.05-0.20	1.0-1.5	…	…	…	0.10	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3103	1972	EAA	0.50	0.7	0.10	0.9-1.5	0.30	0.10	…	0.20	…	…	…	…	…	…	…	…	…	…	0.10 Zr+Ti [6]	0.05	0.15	Rem.
3103A	1991	NORWAY	0.50	0.7	0.10	0.7-1.4	0.30	0.10	…	0.20	…	…	…	…	…	…	…	…	…	…	0.10 Zr+Ti	0.05	0.15	Rem.
3103B	2002	USA	0.50-1.3	0.8	0.50	0.7-1.3	0.50	…	…	0.50	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3203	1973	AUSTRALIA	0.6	0.7	0.05	1.0-1.5	…	…	…	0.10	…	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
3403	2001	USA	1.3	0.8	0.50	0.8-1.5	0.6	0.10	…	0.40	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3004	1954	USA	0.30	0.7	0.25	1.0-1.5	0.8-1.3	…	…	0.25	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3004A	1985	AUSTRALIA	0.40	0.7	0.25	0.8-1.5	0.8-1.5	0.10	…	0.25	0.05	…	…	…	…	…	0.03	…	…	…	…	0.05	0.15	Rem.
3104	1978	USA	0.6	0.8	0.05-0.25	0.8-1.4	0.8-1.3	…	…	0.25	0.10	…	…	…	0.05	…	…	…	0.05	…	…	0.05	0.15	Rem.
3204	1991	USA	0.30	0.7	0.10-0.25	0.8-1.5	0.8-1.5	…	…	0.25	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3304	2001	USA	0.7	0.8	0.6	0.8-1.4	0.8-1.4	0.10	…	0.40	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3005	1954	USA	0.6	0.7	0.30	1.0-1.5	0.20-0.6	0.10	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3005A	1997	NORWAY	0.7	0.8	0.30	1.0-1.5	0.20-0.6	0.10	…	0.40	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3105	1960	USA	0.6	0.7	0.30	0.30-0.8	0.20-0.8	0.20	…	0.40	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3105A	1990	FRANCE	0.6	0.7	0.30	0.30-0.8	0.20-0.8	0.20	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3105B	1997	NORWAY	0.7	0.9	0.30	0.30-0.9	0.20-0.8	0.20	…	0.50	0.10	…	…	…	…	…	0.10	…	…	…	…	0.05	0.15	Rem.
3007	1976	USA	0.50	0.7	0.05-0.30	0.30-0.8	0.6	0.20	…	0.40	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.

See footnotes on page 18.

CHEMICAL COMPOSITION LIMITS[1, 2]

REGISTERED COMPOSITION—Continued

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

Registered International Designation																						OTHERS[13]		Al
No. [17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
3107	1977	SPAIN	0.6	0.7	0.05-0.15	0.40-0.9	…	…	…	0.20	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3207	1979	GERMANY	0.30	0.45	0.10	0.40-0.8	0.10	…	…	0.10	…	…	…	…	…	…	…	…	…	…	…	0.05	0.10	Rem.
3207A	1990	NORWAY	0.35	0.6	0.25	0.30-0.8	0.40	0.20	…	0.25	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3307	1986	USA	0.6	0.8	0.30	0.50-0.9	0.30	0.20	…	0.40	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3009	1978	GERMANY	1.0-1.8	0.7	0.10	1.2-1.8	0.10	0.05	0.05	0.05	0.10	…	…	…	…	…	…	…	…	0.10	…	0.05	0.15	Rem.
3010	1978	USA	0.10	0.20	0.03	0.20-0.9	…	0.05-0.40	…	0.05	0.05	…	…	…	…	…	…	…	0.05	…	…	0.03	0.10	Rem.
3110	2004	USA	0.25	0.05-0.35	0.05	0.30-0.7	0.05	0.05-0.25	…	0.05	0.05-0.30	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3011	1978	USA	0.40	0.7	0.05-0.20	0.8-1.2	…	0.10-0.40	…	0.10	0.10	…	…	…	…	…	…	…	…	0.10-0.30	…	0.05	0.15	Rem.
3012	1983	ARGENTINA	0.6	0.7	0.10	0.50-1.1	0.10	0.20	…	0.10	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3012A	2006	CANADA	0.30	0.20	0.05	0.7-1.2	0.05	0.05	0.05	0.05	0.05	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3013	1983	ARGENTINA	0.6	1.0	0.50	0.9-1.4	0.20-0.6	…	…	0.50-1.0		…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3014	1993	ARGENTINA	0.6	1.0	0.50	1.0-1.5	0.10	…	…	0.50-1.0	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3015	1986	USA	0.6	0.8	0.30	0.50-0.9	0.20-0.7	0.10	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3016	1986	USA	0.6	0.8	0.30	0.50-0.9	0.50-0.8	0.10	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3017	1989	NETHERLANDS	0.25	0.25-0.45	0.25-0.40	0.8-1.2	0.10	0.15	…	0.10	0.05	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3019	2000	ROMANIA	0.6	0.7	0.9	0.30-0.9	0.20-0.9	0.20	0.10	0.20-0.9	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3020	1998	USA	0.50	0.6	0.10	0.6-1.2	0.20	0.20	…	0.05-0.50	0.05-0.25	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3021	2012	JAPAN	0.50	0.7	0.20-0.6	0.05-0.8	0.10	0.10	…	0.10	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3025	1997	USA	0.6	0.50-0.9	0.30	0.40-1.0	0.20-0.8	0.20	0.05	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3026	2003	USA	0.25	0.10-0.40	0.05	0.40-0.9	0.10	0.05	…	0.05-0.30	0.05-0.30	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3030	1996	USA	0.15	0.35	0.10	0.10-0.7	0.05	0.05	…	0.05-0.50	0.05-0.35	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3130	2002	USA	0.15	0.20	0.05	0.10-0.40	0.05	…	…	0.05-0.30	0.05	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3065	2008	USA	0.30	0.30	0.40-0.8	0.6-0.9	0.25	…	0.05	0.05	0.05	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4004[15]	1971	USA	9.0-10.5	0.8	0.25	0.10	1.0-2.0	…	…	0.20	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4104	1974	USA	9.0-10.5	0.8	0.25	0.10	1.0-2.0	…	…	0.20	…	…	…	0.02-0.20	…	…	…	…	…	…	…	0.05	0.15	Rem.
4006	1977	FRANCE	0.8-1.2	0.50-0.8	0.10	0.05	0.01	0.20	…	0.05	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4007	1978	FRANCE	1.0-1.7	0.40-1.0	0.20	0.8-1.5	0.20	0.05-0.25	0.15-0.7	0.10	0.10	…	…	…	…	…	…	…	…	…	0.05 Co	0.05	0.15	Rem.
4008	1985	USA	6.5-7.5	0.09	0.05	0.05	0.30-0.45	…	…	0.05	0.04-0.15	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
4009	1987	USA	4.5-5.5	0.20	1.0-1.5	0.10	0.45-0.6	…	…	0.10	0.20	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
4010	1988	USA	6.5-7.5	0.20	0.20	0.10	0.30-0.45	…	…	0.10	0.20	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.

See footnotes on page 18.

CHEMICAL COMPOSITION LIMITS[1, 2]

REGISTERED COMPOSITION—Continued

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

Registered International Designation																						OTHERS[13]		Al
No. [17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
4013	1988	USA	3.5-4.5	0.35	0.05-0.20	0.03	0.05-0.20	…	…	0.05	0.02	…	…	0.6-1.5	…	…	…	…	…	…	0.05 Cd	0.05	0.15	Rem.
4014	1989	NORWAY	1.4-2.2	0.7	0.20	0.35	0.30-0.8	…	…	0.20	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4015	1989	NORWAY	1.4-2.2	0.7	0.20	0.6-1.2	0.10-0.50	…	…	0.20	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4015A	2007	USA	1.4-2.2	0.7	0.35	0.6-1.2	0.10-0.50	0.05	…	0.20	0.05	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4115	2006	SW\EDEN	1.8-2.2	0.7	0.10-0.50	0.6-1.2	0.10-0.50	…	…	0.20	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4016	1993	NORWAY	1.4-2.2	0.7	0.20	0.6-1.2	0.10	…	…	0.50-1.3	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4017	1995	NORWAY	0.6-1.6	0.7	0.10-0.50	0.6-1.2	0.10-0.50	…	…	0.20	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4018	1995	GERMANY	6.5-7.5	0.20	0.05	0.10	0.50-0.8	…	…	0.10	0.20	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
4019	1999	UK	18.5-21.5	4.6-5.4	…	…	…	…	1.8-2.2	…	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4020	2005	AUSTRIA	2.5-3.5	0.20	0.03	0.8-1.2	0.01	0.01	…	…	0.005	…	0.005	…	…	…	…	…	…	0.01	0.005 Na, 0.005 P [6]	0.02	0.10	Rem.
4021	2011	USA	3.3-4.3	0.20-0.50	0.15	0.40-0.7	0.6-1.1	0.15	…	0.25	0.10	…	…	…	…	…	0.03	…	…	…	…	0.05	0.15	Rem.
+ 4025	2017	USA	1.2-2.2	0.7	0.30-0.7	0.6-1.2	0.10-0.50	…	…	0.20	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4026	2001	USA	9.0-11.5	0.50	2.5-3.5	…	0.7-1.4	…	…	0.10	0.05	…	…	1.0-2.0	…	…	…	…	…	…	…	0.05	0.15	Rem.
4032	1954	USA	11.0-13.5	1.0	0.50-1.3	…	0.8-1.3	0.10	0.50-1.3	0.25	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4043	1954	USA	4.5-6.0	0.8	0.30	0.05	0.05	…	…	0.10	0.20	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
4043A	1976	EAA	4.5-6.0	0.6	0.30	0.15	0.20	…	…	0.10	0.15	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
4143	2010	USA	4.7-6.0	0.8	0.30	0.05	0.15-0.30	…	…	0.10	0.20	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
4343	1954	USA	6.8-8.2	0.8	0.25	0.10	…	…	…	0.20		…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4643	1963	USA	3.6-4.6	0.8	0.10	0.05	0.10-0.30	…	…	0.10	0.15	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
4943	2011	USA	5.0-6.0	0.40	0.10	0.05	0.10-0.50	…	…	0.10	0.15	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
4044[15]	1969	USA	7.8-9.2	0.8	0.25	0.10	…	…	…	0.20	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4045	1964	USA	9.0-11.0	0.8	0.30	0.05	0.05	…	…	0.10	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4145	1957	USA	9.3-10.7	0.8	3.3-4.7	0.15	0.15	0.15		0.20	…	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
4145A	1976	UK	9.0-11.0	0.6	3.0-5.0	0.15	0.10	…	…	0.20	0.15	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
4046	1990	EAA	9.0-11.0	0.50	0.03	0.40	0.20-0.50	…	…	0.10	0.15	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
4047	1964	USA	11.0-13.0	0.8	0.30	0.15	0.10	…	…	0.20	…	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
4047A	1976	EAA	11.0-13.0	0.6	0.30	0.15	0.10	…	…	0.20	0.15	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
4147	1989	USA	11.0-13.0	0.8	0.25	0.10	0.10-0.50	…	…	0.20	…	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
+ 4060	2017	USA	4.0-5.0	0.20-0.40	0.05-0.35	0.05-0.25	0.20-0.50	0.05-0.25	…	0.10	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5005	1954	USA	0.30	0.7	0.20	0.20	0.50-1.1	0.10	…	0.25	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5005A	1979	GERMANY	0.30	0.45	0.05	0.15	0.7-1.1	0.10	…	0.20	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5205	1967	USA	0.15	0.7	0.03-0.10	0.10	0.6-1.0	0.10	…	0.05	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5305	1990	EAA	0.08	0.08	…	0.03	0.7-1.1	…	…	0.05	0.02	…	…	…	…	…	…	…	…	…	…	0.02	…	Rem.
5505	1990	EAA	0.06	0.04	…	0.03	0.8-1.1	…	…	0.04	0.01	…	…	…	…	…	…	…	…	…	…	0.01	…	Rem.
5605	1990	EAA	0.01	0.008	…	…	0.8-1.1	…	…	0.01	0.008	…	…	…	…	…	…	…	…	…	0.008 Fe+Ti	0.003	…	Rem.

See footnotes on page 18.

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

Registered International Designation																						OTHERS[13]		Al
No. [17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
5006	1997	USA	0.40	0.8	0.10	0.40-0.8	0.8-1.3	0.10	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5106	2001	USA	0.40	0.7	0.30	0.40-0.7	0.8-1.2	0.10	…	0.10	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5010	1961	USA	0.40	0.7	0.25	0.10-0.30	0.20-0.6	0.15	…	0.30	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5110	1990	EAA	0.08	0.08	…	0.03	0.30-0.6	…	…	0.05	0.02	…	…	…	…	…	…	…	…	…	…	0.02	…	Rem.
5110A	2005	JAPAN	0.15	0.25	0.20	0.20	0.20-0.6	…	…	0.03	…	…	…	…	…	…	…	…	…	…	…	0.05	0.10	Rem.
5210	1990	EAA	0.06	0.04	…	0.03	0.35-0.6	…	…	0.04	0.01	…	…	…	…	…	…	…	…	…	…	0.01	…	Rem.
5310	1990	EAA	0.01	0.008	…	…	0.35-0.6	…	…	0.01	0.008	…	…	…	…	…	…	…	…	…	0.008 Fe+Ti	0.003	…	Rem.
5016	1982	USA	0.25	0.6	0.20	0.40-0.7	1.4-1.9	0.10	…	0.15	0.05	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5017	1986	USA	0.40	0.7	0.18-0.28	0.6-0.8	1.9-2.2	…	…	…	0.09	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5018	1992	GERMANY	0.25	0.40	0.05	0.20-0.6	2.6-3.6	0.30	…	0.20	0.15	…	…	…	…	…	…	…	…	…	0.20-0.6 Mn+Cr[6]	0.05	0.15	Rem.
5018A	1999	ROMANIA	0.40	0.40	0.10	0.35-0.50	3.0-3.6	0.30	…	0.20	0.15	…	…	…	…	…	…	…	…	…	0.35-0.7 Mn+Cr	0.05	0.15	Rem.
+ 5018B	2018	USA	0.25	0.40	0.10	0.40-0.7	2.9-3.6	0.30	…	0.20	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5019[14]	1972	EAA	0.40	0.50	0.10	0.10-0.6	4.5-5.6	0.20	…	0.20	0.20	…	…	…	…	…	…	…	…	…	0.10-0.6 Mn+Cr	0.05	0.15	Rem.
5019A	1998	USA	0.20	0.35	0.15	0.20-0.50	4.4-5.4	0.10	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5119	1992	GERMANY	0.25	0.40	0.05	0.20-0.6	4.5-5.6	0.30	…	0.20	0.15	…	…	…	…	…	…	…	…	…	0.20-0.6 Mn+Cr[6]	0.05	0.15	Rem.
5119A	2001	EAA	0.25	0.40	0.05	0.20-0.6	4.5-5.6	0.30	…	0.20	0.15	…	…	…	…	…	…	…	…	…	0.20-0.6 Mn+Cr[16]	0.05	0.15	Rem.
5021	1993	NORWAY	0.40	0.50	0.15	0.10-0.50	2.2-2.8	0.15	…	0.15	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5022	1995	JAPAN	0.25	0.40	0.20-0.50	0.20	3.5-4.9	0.10	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5023	1995	JAPAN	0.25	0.40	0.20-0.50	0.20	5.0-6.2	0.10	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5024	2008	GERMANY	0.25	0.40	0.20	0.20	3.9-5.1	0.10	…	0.25	0.20	…	…	…	…	…	…	…	…	0.05-0.20	0.10-0.40Sc	0.05	0.15	Rem.
5026	2001	GERMANY	0.55-1.4	0.20-1.0	0.10-0.8	0.6-1.8	3.9-4.9	0.30	…	1.0	0.20	…	…	…	…	…	…	…	…	0.30	…	0.05	0.15	Rem.
5027	2002	GERMANY	0.05-0.20	0.20-0.40	0.05-0.15	0.40-0.8	4.7-5.4	0.10	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5028	2014	GERMANY	0.30	0.40	0.20	0.30-1.0	3.2-4.8	0.05-0.15	…	0.05-0.50	0.05-0.15	…	…	…	…	…	…	…	…	0.05-0.15	0.02-0.40 Sc	0.05	0.15	Rem.
5040	1961	USA	0.30	0.7	0.25	0.9-1.4	1.0-1.5	0.10-0.30	…	0.25	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5140	2001	USA	0.7	0.6	0.6	0.7-1.3	1.1-1.5	0.10	…	0.40	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5041	2005	JAPAN	0.40	0.40	0.10	0.30-1.0	3.0-4.0	0.50	…	0.10	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5042	1980	USA	0.20	0.35	0.15	0.20-0.50	3.0-4.0	0.10	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5043	1982	USA	0.40	0.7	0.05-0.35	0.7-1.2	0.7-1.3	0.05	…	0.25	0.10	…	…	…	0.05	…	…	…	0.05	…	…	0.05	0.15	Rem.
5049	1979	EAA	0.40	0.50	0.10	0.50-1.1	1.6-2.5	0.30	…	0.20	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5149	1990	EAA	0.25	0.40	0.05	0.50-1.1	1.6-2.5	0.30	…	0.20	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5249	1990	EAA	0.25	0.40	0.05	0.50-1.1	1.6-2.5	0.30	…	0.20	0.15	…	…	…	…	…	…	…	…	0.10-0.20	[6]	0.05	0.15	Rem.
5349	1992	USA	0.40	0.7	0.18-0.28	0.6-1.2	1.7-2.6	…	…	0.20	0.09	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5449	1994	BELGIUM	0.40	0.7	0.30	0.6-1.1	1.6-2.6	0.30	…	0.30	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5449A	2010	EAA	0.6	1.2	0.30	0.6-1.1	1.6-2.6	0.30	0.10	0.30	0.10	…	…	…	…	…	…	0.10	…	…	…	0.05	0.15	Rem.
5050	1954	USA	0.40	0.7	0.20	0.10	1.1-1.8	0.10	…	0.25	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.

See footnotes on page 18.

CHEMICAL COMPOSITION LIMITS[1, 2]

REGISTERED COMPOSITION—Continued

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

Registered International Designation																						OTHERS[13]		Al
No. [17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
5050A	1973	AUSTRALIA	0.40	0.7	0.20	0.30	1.1-1.8	0.10	…	0.25	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5050C	2012	BRAZIL	0.25	0.6	0.50	0.20	1.2-1.8	0.10	…	0.50	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5150	1972	FRANCE	0.08	0.10	0.10	0.03	1.3-1.7	…	…	0.10	0.06	…	…	…	…	…	…	…	…	…	…	0.03	0.10	Rem.
5051	1967	USA	0.40	0.7	0.25	0.20	1.7-2.2	0.10	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5051A	1983	GERMANY	0.30	0.45	0.05	0.25	1.4-2.1	0.30	…	0.20	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5151	1970	USA	0.20	0.35	0.15	0.10	1.5-2.1	0.10	…	0.15	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5251	1972	EAA	0.40	0.50	0.15	0.10-0.50	1.7-2.4	0.15	…	0.15	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5251A	1990	ARGENTINA	0.50	0.7	0.25	0.20-0.7	1.6-2.2	0.10	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5351	1978	USA	0.08	0.10	0.10	0.10	1.6-2.2	…	…	0.05	…	…	…	…	…	…	…	…	0.05	…	…	0.03	0.10	Rem.
5451	1981	USA	0.25	0.40	0.10	0.10	1.8-2.4	0.15-0.35	0.05	0.10	0.05	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5052	1954	USA	0.25	0.40	0.10	0.10	2.2-2.8	0.15-0.35	…	0.10	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5252	1961	USA	0.08	0.10	0.10	0.10	2.2-2.8	…	…	0.05	…	…	…	…	…	…	…	…	0.05	…	…	0.03	0.10	Rem.
5352	1971	USA	…	…	0.10	0.10	2.2-2.8	0.10	…	0.10	0.10	…	…	…	…	…	…	…	…	…	0.45 Si+Fe	0.05	0.15	Rem.
5154[8]	1954	USA	0.25	0.40	0.10	0.10	3.1-3.9	0.15-0.35	…	0.20	0.20	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
5154A	1972	UK	0.50	0.50	0.10	0.50	3.1-3.9	0.25	…	0.20	0.20	…	…	…	…	…	…	…	…	…	0.10-0.50 Mn+Cr[6]	0.05	0.15	Rem.
5154B	1978	ITALY	0.35	0.45	0.05	0.15-0.45	3.2-3.8	0.10	0.01	0.15	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5154C	2008	CHINA	0.20	0.30	0.10	0.05-0.25	3.2-3.7	0.01	…	0.01	0.01	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5254	1954	USA	…	…	0.05	0.01	3.1-3.9	0.15-0.35	…	0.20	0.05	…	…	…	…	…	…	…	…	…	0.45 Si+Fe	0.05	0.15	Rem.
5354	1990	EAA	0.25	0.40	0.05	0.50-1.0	2.4-3.0	0.05-0.20	…	0.25	0.15	…	…	…	…	…	…	…	…	0.10-0.20	…	0.05	0.15	Rem.
5454	1957	USA	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	…	0.25	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5554	1958	USA	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	…	0.25	0.05-0.20	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
5654	1968	USA	…	…	0.05	0.01	3.1-3.9	0.15-0.35	…	0.20	0.05-0.15	…	…	…	…	…	…	…	…	…	0.45 Si+Fe[6]	0.05	0.15	Rem.
5654A	2001	EAA	…	…	0.05	0.01	3.1-3.9	0.15-0.35	…	0.20	0.05-0.15	…	…	…	…	…	…	…	…	…	0.45 Si+Fe[16]	0.05	0.15	Rem.
5754	1970	USA	0.40	0.40	0.10	0.50	2.6-3.6	0.30	…	0.20	0.15	…	…	…	…	…	…	…	…	…	0.10-0.6 Mn+Cr[6]	0.05	0.15	Rem.
5854[19]	2009	GERMANY	0.40	0.40	0.10	0.50	2.8-3.6	0.30	…	0.20	0.15	…	…	…	…	0.0009	0.01	…	…	0.05-0.30	0.0009 Ca 0.0009 Na 0.10-0.6 Mn+Cr	0.05	0.15	Rem.
5954	1988	USA	0.25	0.40	0.10	0.10	3.3-4.1	0.10	…	0.20	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5056	1954	USA	0.30	0.40	0.10	0.05-0.20	4.5-5.6	0.05-0.20	…	0.10	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5356	1954	USA	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	…	0.10	0.06-0.20	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
5356A	2001	EAA	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	…	0.10	0.06-0.20	…	…	…	…	…	…	…	…	…	[16]	0.05	0.15	Rem.
5456	1956	USA	0.25	0.40	0.10	0.50-1.0	4.7-5.5	0.05-0.20	…	0.25	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5456A	1992	GERMANY	0.25	0.40	0.05	0.7-1.1	4.5-5.2	0.05-0.25	…	0.25	0.15	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
5456B	2001	EAA	0.25	0.40	0.05	0.7-1.1	4.5-5.2	0.05-0.25	…	0.25	0.15	…	…	…	…	…	…	…	…	…	[16]	0.05	0.15	Rem.
5556	1956	USA	0.25	0.40	0.10	0.50-1.0	4.7-5.5	0.05-0.20	…	0.25	0.05-0.20	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
5556A	1972	UK	0.25	0.40	0.10	0.6-1.0	5.0-5.5	0.05-0.20	…	0.20	0.05-0.20	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
5556B	2001	EAA	0.25	0.40	0.10	0.6-1.0	5.0-5.5	0.05-0.20	…	0.20	0.05-0.20	…	…	…	…	…	…	…	…	…	[16]	0.05	0.15	Rem.
5556C	2001	FRANCE	0.25	0.40	0.10	0.50-1.0	4.7-5.5	0.05-0.20	…	0.25	0.05-0.20	…	…	…	…	…	…	…	…	…	[16]	0.05	0.15	Rem.
5257[8]	1961	USA	0.08	0.10	0.10	0.03	0.20-0.6	…	…	0.03	…	…	…	…	…	…	…	…	…	…	…	0.02	0.05	Rem.
5457	1957	USA	0.08	0.10	0.20	0.15-0.45	0.8-1.2	…	…	0.05	…	…	…	…	…	…	…	…	0.05	…	…	0.03	0.10	Rem.
5557	1977	USA	0.10	0.12	0.15	0.10-0.40	0.40-0.8	…	…	…	…	…	…	…	…	…	…	…	0.05	…	…	0.03	0.10	Rem.
5657	1960	USA	0.08	0.10	0.10	0.03	0.6-1.0	…	…	0.05	…	…	…	…	0.03	…	…	…	0.05	…	…	0.02	0.05	Rem.
5058	1991	GERMANY	0.40	0.50	0.10	0.20	4.5-5.6	0.10	…	0.20	0.20	…	…	…	…	…	1.2-1.8	…	…	…	…	0.05	0.15	Rem.
5059	1999	GERMANY	0.45	0.50	0.25	0.6-1.2	5.0-6.0	0.25	…	0.40-0.9	0.20	…	…	…	…	…	…	…	…	0.05-0.25	…	0.05	0.15	Rem.
5070	2003	BELGIUM	0.25	0.40	0.25	0.40-0.8	3.5-4.5	0.30	…	0.40-0.8	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.

See footnotes on page 18.

CHEMICAL COMPOSITION LIMITS[1, 2]

REGISTERED COMPOSITION—Continued

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

Registered International Designation																						OTHERS[13]		Al
No. [17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
5180	1963	USA	…	…	0.10	0.20-0.7	3.5-4.5	0.10	…	1.7-2.8	0.06-0.20	…	…	…	…	…	…	…	…	0.08-0.25	0.35 Si+Fe [6]	0.05	0.15	Rem.
5180A	2001	FRANCE	…	…	0.10	0.20-0.7	3.5-4.5	0.10	…	1.7-2.8	0.06-0.20	…	…	…	…	…	…	…	…	0.08-0.25	0.35 Si+Fe [16]	0.05	0.15	Rem.
5082	1963	USA	0.20	0.35	0.15	0.15	4.0-5.0	0.15	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5182	1967	USA	0.20	0.35	0.15	0.20-0.50	4.0-5.0	0.10	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5083	1954	USA	0.40	0.40	0.10	0.40-1.0	4.0-4.9	0.05-0.25	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5183	1957	USA	0.40	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	…	0.25	0.15	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
5183A	2001	EAA	0.40	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	…	0.25	0.15	…	…	…	…	…	…	…	…	…	[16]	0.05	0.15	Rem.
5283	1976	FRANCE	0.30	0.30	0.03	0.50-1.0	4.5-5.1	0.05	0.03	0.10	0.03	…	…	…	…	…	…	…	…	0.05	…	0.05	0.15	Rem.
5283A	1987	EAA	0.30	0.30	0.03	0.50-1.0	4.5-5.1	0.05	0.03	0.10	0.03	…	…	…	…	…	0.003	…	…	0.05	…	0.05	0.15	Rem.
5283B	1999	USA	0.15	0.35	0.15	0.30-0.9	4.2-5.2	0.10	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5383	1995	FRANCE	0.25	0.25	0.20	0.7-1.0	4.0-5.2	0.25	…	0.40	0.15	…	…	…	…	…	…	…	…	0.20	…	0.05	0.15	Rem.
5483	2001	USA	0.30	0.25	0.10	0.7-1.0	4.3-5.2	0.15	…	0.40	0.15	…	…	…	…	…	…	…	…	0.05-0.20	…	0.05	0.15	Rem.
5086	1954	USA	0.40	0.50	0.10	0.20-0.7	3.5-4.5	0.05-0.25	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5186	1996	FRANCE	0.40	0.45	0.25	0.20-0.50	3.8-4.8	0.15	…	0.40	0.15	…	…	…	…	…	…	…	…	0.05	…	0.05	0.15	Rem.
5087	1990	EAA	0.25	0.40	0.05	0.7-1.1	4.5-5.2	0.05-0.25	…	0.25	0.15	…	…	…	…	…	…	…	…	0.10-0.20	[6]	0.05	0.15	Rem.
5187	2001	EAA	0.25	0.40	0.05	0.7-1.1	4.5-5.2	0.05-0.25	…	0.25	0.15	…	…	…	…	…	…	…	…	0.10-0.20	[16]	0.05	0.15	Rem.
5088	2002	FRANCE	0.20	0.10-0.35	0.25	0.20-0.50	4.7-5.5	0.15	…	0.20-0.40	…	…	…	…	…	…	…	…	…	0.15	…	0.05	0.15	Rem.
6101	1955	USA	0.30-0.7	0.50	0.10	0.03	0.35-0.8	0.03	…	0.10	…	…	0.06	…	…	…	…	…	…	…	…	0.03	0.10	Rem.
6101A	1974	UK	0.30-0.7	0.40	0.05	…	0.40-0.9	…	…	…	…	…	…	…	…	…	…	…	…	…	…	0.03	0.10	Rem.
6101B	1979	GERMANY	0.30-0.6	0.10-0.30	0.05	0.05	0.35-0.6	…	…	0.10	…	…	…	…	…	…	…	…	…	…	…	0.03	0.10	Rem.
6201	1960	USA	0.50-0.9	0.50	0.10	0.03	0.6-0.9	0.03	…	0.10	…	…	0.06	…	…	…	…	…	…	…	…	0.03	0.10	Rem.
6201A	1973	AUSTRALIA	0.50-0.7	0.50	0.04		0.6-0.9	…	…	…	…	…	0.06	…	…	…	…	…	…	…	…	0.03	0.10	Rem.
6401	1990	EAA	0.35-0.7	0.04	0.05-0.20	0.03	0.35-0.7	…	…	0.04	0.01	…	…	…	…	…	…	…	…	…	…	0.01		Rem.
6501	2005	SWITZERLAND	0.20-0.6	0.35	0.20	0.05-0.20	0.20-0.6	0.05	…	0.15	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6002	1983	ITALY	0.6-0.9	0.25	0.10-0.25	0.10-0.20	0.45-0.7	0.05	…	…	0.08	…	…	…	…	…	…	…	…	0.09-0.14	…	0.05	0.15	Rem.
6003[15]	1954	USA	0.35-1.0	0.6	0.10	0.8	0.8-1.5	0.35	…	0.20	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6103	1984	AUSTRALIA	0.35-1.0	0.6	0.20-0.30	0.8	0.8-1.5	0.35	…	0.20	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6005	1962	USA	0.6-0.9	0.35	0.10	0.10	0.40-0.6	0.10	…	0.10	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6005A	1972	FRANCE	0.50-0.9	0.35	0.30	0.50	0.40-0.7	0.30	…	0.20	0.10	…	…	…	…	…	…	…	…	…	0.12-0.50 Mn+Cr	0.05	0.15	Rem.
6005B	1989	NETHERLANDS	0.45-0.8	0.30	0.10	0.10	0.40-0.8	0.10	…	0.10	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6005C	2005	JAPAN	0.40-0.9	0.35	0.35	0.50	0.40-0.8	0.30	…	0.25	0.10	…	…	…	…	…	…	…	…	…	0.50 Mn+Cr	0.05	0.15	Rem.
6105	1965	USA	0.6-1.0	0.35	0.10	0.15	0.45-0.8	0.10	…	0.10	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6205	1970	USA	0.6-0.9	0.7	0.20	0.05-0.15	0.40-0.6	0.05-0.15	…	0.25	0.15	…	…	…	…	…	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
6305	2012	USA	0.6-1.0	0.35	0.10	0.15	0.45-0.8	0.15	…	0.10	0.10	…	…	…	…	…	…	…	…	…	0.12-0.20 Mn+Cr	0.05	0.15	Rem.
6006	1971	USA	0.20-0.6	0.35	0.15-0.30	0.05-0.20	0.45-0.9	0.10	…	0.10	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6106	1979	FRANCE	0.30-0.6	0.35	0.25	0.05-0.20	0.40-0.8	0.20	…	0.10	…	…	…	…	…	…	…	…	…	…	…	0.05	0.10	Rem.
6206	1984	USA	0.35-0.7	0.35	0.20-0.50	0.13-0.30	0.45-0.8	0.10	…	0.20	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6306	1991	USA	0.20-0.6	0.10	0.05-0.16	0.10-0.40	0.45-0.9	…	…	0.05	0.05	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6008	1983	SWITZERLAND	0.50-0.9	0.35	0.30	0.30	0.40-0.7	0.30	…	0.20	0.10	…	…	…	…	…	…	…	0.05-0.20	…	…	0.05	0.15	Rem.
6009	1976	USA	0.6-1.0	0.50	0.15-0.6	0.20-0.8	0.40-0.8	0.10	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.

See footnotes on page 18.

CHEMICAL COMPOSITION LIMITS[1, 2]

REGISTERED COMPOSITION—Continued

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

Registered International Designation																						OTHERS[13]		Al
No. [17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
6010	1976	USA	0.8-1.2	0.50	0.15-0.6	0.20-0.8	0.6-1.0	0.10	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6110	1979	USA	0.7-1.5	0.8	0.20-0.7	0.20-0.7	0.50-1.1	0.04-0.25	…	0.30	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6110A	1996	GERMANY	0.7-1.1	0.50	0.30-0.8	0.30-0.9	0.7-1.1	0.05-0.25	…	0.20	…	…	…	…	…	…	…	…	…	…	0.20 Zr+Ti	0.05	0.15	Rem.
6011	1954	USA	0.6-1.2	1.0	0.40-0.9	0.8	0.6-1.2	0.30	0.20	1.5	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6111	1982	USA	0.6-1.1	0.40	0.50-0.9	0.10-0.45	0.50-1.0	0.10	…	0.15	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6012	1979	GERMANY	0.6-1.4	0.50	0.10	0.40-1.0	0.6-1.2	0.30	…	0.30	0.20	…	…	0.7	…	…	0.40-2.0	…	…	…	…	0.05	0.15	Rem.
6012A	1999	ITALY	0.6-1.4	0.50	0.40	0.20-1.0	0.6-1.2	0.30	…	0.30	0.20	…	…	0.7	…	…	…	0.40-2.0	…	…	…	0.05	0.15	Rem.
6013	1983	USA	0.6-1.0	0.50	0.6-1.1	0.20-0.8	0.8-1.2	0.10	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6113	1991	USA	0.6-1.0	0.30	0.6-1.1	0.10-0.6	0.8-1.2	0.10	…	0.25	0.10	…	…	…	…	…	…	…	…	…	0.05-0.50 O	0.05	0.15	Rem.
6014	1983	SWITZERLAND	0.30-0.6	0.35	0.25	0.05-0.20	0.40-0.8	0.20	…	0.10	0.10	…	…	…	…	…	…	…	0.05-0.20	…	…	0.05	0.15	Rem.
6015	1984	ITALY	0.20-0.40	0.10-0.30	0.10-0.25	0.10	0.8-1.1	0.10	…	0.10	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6016	1984	SWITZERLAND	1.0-1.5	0.50	0.20	0.20	0.25-0.6	0.10	…	0.20	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6016A	1995	FRANCE	0.9-1.5	0.50	0.25	0.20	0.20-0.6	0.10	…	0.20	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6116	1996	SWITZERLAND	0.9-1.3	0.25	0.20	0.15	0.25-0.6	0.15	…	0.20	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6018	1991	SWITZERLAND	0.50-1.2	0.7	0.15-0.40	0.30-0.8	0.6-1.2	0.10	…	0.30	0.20	…	…	0.40-0.7	…	…	0.40-1.2	…	…	…	…	0.05	0.15	Rem.
6019	1996	USA	0.6-1.0	0.50	0.20-0.6	0.10	0.8-1.2	0.05-0.35	…	0.40-1.0	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6020	1995	USA	0.40-0.9	0.50	0.30-0.9	0.35	0.6-1.2	0.15	…	0.20	0.15	…	…	…	…	…	0.05	0.9-1.5	…	…	…	0.05	0.15	Rem.
6021	2000	GERMANY	0.6-1.5	0.40	0.20	0.40-1.0	0.8-1.5	0.25	…	0.20	0.10	…	…	…	…	…	…	0.6-1.5	…	…	…	0.05	0.15	Rem.
6022	1995	USA	0.8-1.5	0.05-0.20	0.01-0.11	0.02-0.10	0.45-0.7	0.10	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6023	2001	SWITZERLAND	0.6-1.4	0.50	0.20-0.50	0.20-0.6	0.40-0.9	…	...	…	…	…	…	0.30-0.8	…	…	…	0.6-1.2	…	…	…	0.05	0.15	Rem.
6024	2001	KOREA	0.7-1.3	0.05-0.7	0.30-0.9	0.30-1.2	0.30-1.0	0.20	…	0.20	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6025	2002	GERMANY	0.8-1.5	0.7	0.20-0.7	0.6-1.4	2.1-3.0	0.20	…	0.50	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6026	2004	ITALY	0.6-1.4	0.7	0.20-0.50	0.20-1.0	0.6-1.2	0.30	…	0.30	0.20	…	…	0.50-1.5	…	…	0.40	0.05	…	…	…	0.05	0.15	Rem.
6027	2010	CHINA	0.55-0.8	0.30	0.15	0.10-0.30	0.8-1.1	0.10	…	0.10-0.30	0.15	…	…	…	…	…	…	…	…	…	…	0.15	0.15	Rem.
6028	2006	SLOVENIA	1.0-1.3	0.50	0.25-0.40	0.6-0.9	0.7-1.0	0.04-0.10	…	0.30	0.20	…	…	0.6-0.8	…	…	…	0.6-0.8	…	…	…	0.05	0.15	Rem.
6031	2014	USA	0.50-0.8	0.25	0.10-0.25	0.40-0.6	0.6-0.8	0.10-0.20	…	0.05	0.05	…	…	…	…	…	…	…	…	…	…	0.03	0.15	Rem.
6032	2014	USA	0.45-0.7	0.25	0.03	0.10-0.20	0.45-0.7	0.03	…	0.05	0.08-0.12	…	…	…	…	…	…	…	…	…	…	0.03	0.15	Rem.
6033	2002	USA	0.8-1.3	0.50	0.40-1.0	0.05	0.7-1.3	0.10	…	0.50-1.0	0.15	…	…	0.30-1.0	…	…	0.05	…	…	…	…	0.05	0.15	Rem.
6040	2002	USA	0.40-0.8	0.7	0.20-0.8	0.15	0.8-1.2	0.15	…	0.25	0.15	…	…	0.15-0.7	…	…	…	0.30-1.2	…	…	…	0.05	0.15	Rem.
6041	2006	USA	0.50-0.9	0.15-0.7	0.15-0.6	0.05-0.20	0.8-1.2	0.05-0.15	…	0.25	0.15	…	…	0.30-0.9	…	…	…	0.35-1.2	…	…	…	0.05	0.15	Rem.
6042	2006	USA	0.50-1.2	0.7	0.20-0.6	0.40	0.7-1.2	0.04-0.35	…	0.25	0.15	…	…	0.20-0.8	…	…	0.15-0.40	…	…	…	…	0.05	0.15	Rem.

See footnotes on page 18.

CHEMICAL COMPOSITION LIMITS[1, 2]

REGISTERED COMPOSITION—Continued

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

	Registered International Designation																						OTHERS[13]		Al
	No. [17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
	6043	2006	CHINA	0.40-0.9	0.50	0.30-0.9	0.35	0.6-1.2	0.15	…	0.20	0.15	…	…	0.40-0.7	…	…	…	0.20-0.40	…	…	…	0.05	0.15	Rem.
+	6050	2016	USA	1.2-1.8	1.3-1.8	0.15-0.50	0.20-0.7	0.50-0.9	0.05-0.25	0.20-1.0	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6151	1954	USA	0.6-1.2	1.0	0.35	0.20	0.45-0.8	0.15-0.35	…	0.25	0.15	…	...	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6351	1958	USA	0.7-1.3	0.50	0.10	0.40-0.8	0.40-0.8	…	…	0.20	0.20	…	…	…	…	…	…	…	…	…	..	0.05	0.15	Rem.
	6351A	1988	FRANCE	0.7-1.3	0.50	0.10	0.40-0.8	0.40-0.8	…	…	0.20	0.20	…	…	…	…	…	0.003	…	…	…	…	0.05	0.15	Rem.
	6451	2005	USA	0.6-1.0	0.40	0.40	0.05-0.40	0.40-0.8	0.10	…	0.15	…	…	…	…	…	…	…	…	0.10	…	…	0.05	0.15	Rem.
	6951	1954	USA	0.20-0.50	0.8	0.15-0.40	0.10	0.40-0.8	…	…	0.20	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6053	1954	USA	[9]	0.35	0.10	…	1.1-1.4	0.15-0.35	…	0.10	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6055	2012	USA	0.6-1.2	0.30	0.50-1.0	0.10	0.7-1.1	0.20-0.30	…	0.55-0.9	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6056	1988	FRANCE	0.7-1.3	0.50	0.50-1.1	0.40-1.0	0.6-1.2	0.25	…	0.10-0.7	…	…	…	…	…	…	…	…	…	…	0.20 Zr+Ti	0.05	0.15	Rem.
	6156	2003	FRANCE	0.7-1.3	0.20	0.7-1.1	0.40-0.7	0.6-1.2	0.25	…	0.10-0.7	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6060	1972	EAA	0.30-0.6	0.10-0.30	0.10	0.10	0.35-0.6	0.05	…	0.15	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6160	1993	USA	0.30-0.6	0.15	0.20	0.05	0.35-0.6	0.05	…	0.05	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6260	1996	USA	0.40-0.6	0.15-0.40	0.10	0.03	0.45-0.7	0.03	…	0.05	0.10	…	…	…	…	…	…	…	0.10-0.25	0.05	…	0.05	0.15	Rem.
	6360	2001	USA	0.35-0.8	0.10-0.30	0.15	0.02-0.15	0.25-0.45	0.05	…	0.10	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6460	2001	USA	0.30-0.7	0.15	0.20	0.20	0.20-0.6	0.05	…	0.05	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6460B	2010	BRAZIL	0.20-0.7	0.20	0.10	0.10	0.20-0.40	0.03	…	0.04	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6560	2001	USA	0.30-0.7	0.10-0.30	0.05-0.20	0.20	0.20-0.6	0.05	…	0.15	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6660	2011	USA	0.40-0.8	0.15-0.30	0.10	0.03-0.20	0.30-0.6	0.05	0.05	0.10	0.10	…	…	…	0.05	…	…	…	0.05	…	…	0.05	0.15	Rem.
	6061	1954	USA	0.40-0.8	0.7	0.15-0.40	0.15	0.8-1.2	0.04-0.35	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6061A	1991	EAA	0.40-0.8	0.7	0.15-0.40	0.15	0.8-1.2	0.04-0.35	…	0.25	0.15	…	…	…	…	…	0.003	…	…	…	…	0.05	0.15	Rem.
+	6061B	2015	USA	0.40-0.8	0.7	0.15-0.40	0.15	0.8-1.2	0.04-0.35	…	0.25	0.15	…	…	…	…	…	…	…	…	…	0.6 O	0.05	0.15	Rem.
	6261	1968	USA	0.40-0.7	0.40	0.15-0.40	0.20-0.35	0.7-1.0	0.10	…	0.20	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6361	2013	USA	0.6-0.9	0.40	0.20-0.50	0.10-0.20	1.0-1.4	0.10-0.30	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6162	1959	USA	0.40-0.8	0.50	0.20	0.10	0.7-1.1	0.10	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6262	1960	USA	0.40-0.8	0.7	0.15-0.40	0.15	0.8-1.2	0.04-0.14	…	0.25	0.15	…	…	0.40-0.7	…	…	0.40-0.7	…	…	…	…	0.05	0.15	Rem.
	6262A	2005	BELGIUM	0.40-0.8	0.7	0.15-0.40	0.15	0.8-1.2	0.04-0.14	…	0.25	0.10	…	…	0.40-0.9	…	…	…	0.40-1.0	…	…	…	0.05	0.15	Rem.
	6063	1954	USA	0.20-0.6	0.35	0.10	0.10	0.45-0.9	0.10	…	0.10	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6063A	1979	UK	0.30-0.6	0.15-0.35	0.10	0.15	0.6-0.9	0.05	…	0.15	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6463	1957	USA	0.20-0.6	0.15	0.20	0.05	0.45-0.9	…	…	0.05	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6463A	1973	AUSTRALIA	0.20-0.6	0.15	0.25	0.05	0.30-0.9	…	…	0.05	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6763	1972	USA	0.20-0.6	0.08	0.04-0.16	0.03	0.45-0.9	…	…	0.03	…	…	…	…	…	…	…	…	0.05	…	…	0.03	0.10	Rem.
	6963	1994	USA	0.40-0.6	0.25	0.15-0.25	0.05	0.35-0.7	0.10	…	0.10	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6064	2006	SLOVENIA	0.40-0.8	0.7	0.15-0.40	0.15	0.8-1.2	0.05-0.14	…	0.25	0.15	…	…	0.50-0.7	…	…	0.20-0.40	…	…	…	…	0.05	0.15	Rem.
	6064A	2007	SWITZERLAND	0.40-0.8	0.7	0.15-0.40	0.15	0.8-1.2	0.04-0.14	…	0.25	0.15	…	…	0.40-0.8	…	…	0.20-0.40	…	…	…	…	0.05	0.15	Rem.
	6065	2005	BELGIUM	0.40-0.8	0.7	0.15-0.40	0.15	0.8-1.2	0.15	…	0.25	0.10	…	…	0.50-1.5	…	…	0.05	…	…	0.15	…	0.05	0.15	Rem.
	6066	1954	USA	0.9-1.8	0.50	0.7-1.2	0.6-1.1	0.8-1.4	0.40	…	0.25	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
	6068	2009	SWITZERLAND	0.6-1.4	0.50	0.10	0.40-1.0	0.6-1.2	0.30	0.05	0.30	0.20	…	…	0.6-1.1	0.03	…	0.20-0.40	…	0.05	…	…	0.05	0.15	Rem.
	6069	1994	USA	0.6-1.2	0.40	0.55-1.0	0.05	1.2-1.6	0.05-0.30	…	0.05	0.10	…	…	…	…	…	…	…	0.10-0.30	…	0.05 Sr	0.05	0.15	Rem.

See footnotes on page 18.

CHEMICAL COMPOSITION LIMITS[1, 2]

REGISTERED COMPOSITION—Continued

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

Registered International Designation																						OTHERS[13]		Al
No.[17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
6070	1962	USA	1.0-1.7	0.50	0.15-0.40	0.40-1.0	0.50-1.2	0.10	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6081	1972	FRANCE	0.7-1.1	0.50	0.10	0.10-0.45	0.6-1.0	0.10	…	0.20	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6181	1972	EAA	0.8-1.2	0.45	0.10	0.15	0.6-1.0	0.10	…	0.20	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6181A	1997	SWITZERLAND	0.7-1.1	0.15-0.50	0.25	0.40	0.6-1.0	0.15	…	0.30	0.25	…	…	…	…	…	…	…	0.10	…	…	0.05	0.15	Rem.
6082	1972	EAA	0.7-1.3	0.50	0.10	0.40-1.0	0.6-1.2	0.25	…	0.20	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6082A	1987	FRANCE	0.7-1.3	0.50	0.10	0.40-1.0	0.6-1.2	0.25	…	0.20	0.10	…	…	…	…	…	0.003	…	…	…	…	0.05	0.15	Rem.
6182	2005	BELGIUM	0.9-1.3	0.50	0.10	0.50-1.0	0.7-1.2	0.25	…	0.20	0.10	…	…	…	…	…	…	…	…	0.05-0.20	…	0.05	0.15	Rem.
+ 6086	2017	SLOVENIA	1.3-1.7	0.14-0.25	0.10-0.8	0.6-0.9	0.8-1.1	0.15-0.25	…	0.20	0.10	…	…	…	…	…	…	…	…	0.15-0.25	…	0.05	0.15	Rem.
6091	1992	USA	0.40-0.8	0.7	0.15-0.40	0.15	0.8-1.2	0.15	…	0.25	0.15	…	…	…	…	…	…	…	…	…	0.05-0.50 O	0.05	0.15	Rem.
6092	1992	USA	0.40-0.8	0.30	0.7-1.0	0.15	0.8-1.2	0.15	…	0.25	0.15	…	…	…	…	…	…	…	…	…	0.05-0.50 O	0.05	0.15	Rem.
+ 6099	2016	USA	0.8-1.2	0.7	0.10-0.7	0.10-0.40	0.7-1.2	0.04-0.35	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7003	1975	JAPAN	0.30	0.35	0.20	0.30	0.50-1.0	0.20	…	5.0-6.5	0.20	…	…	…	…	…	…	…	…	0.05-0.25	…	0.05	0.15	Rem.
7004	1964	USA	0.25	0.35	0.05	0.20-0.7	1.0-2.0	0.05	…	3.8-4.6	0.05	…	…	…	…	…	…	…	…	0.10-0.20	…	0.05	0.15	Rem.
7204	2005	JAPAN	0.30	0.35	0.20	0.20-0.7	1.0-2.0	0.30	…	4.0-5.0	0.20	…	…	…	…	…	…	…	0.10	0.25	…	0.05	0.15	Rem.
7005	1962	USA	0.35	0.40	0.10	0.20-0.7	1.0-1.8	0.06-0.20	…	4.0-5.0	0.01-0.06	…	…	…	…	…	…	…	…	0.08-0.20	…	0.05	0.15	Rem.
7108[15]	1983	USA	0.10	0.10	0.05	0.05	0.7-1.4	…	…	4.5-5.5	0.05	…	…	…	…	…	…	…	…	0.12-0.25	…	0.05	0.15	Rem.
7108A	1987	NORWAY	0.20	0.30	0.05	0.05	0.7-1.5	0.04	…	4.8-5.8	0.03	…	…	…	0.03	…	…	…	…	0.15-0.25	…	0.05	0.15	Rem.
7009	1974	GERMANY	0.20	0.20	0.6-1.3	0.10	2.1-2.9	0.10-0.25	…	5.5-6.5	0.20	0.25-0.40	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7010	1975	UK	0.12	0.15	1.5-2.0	0.10	2.1-2.6	0.05	0.05	5.7-6.7	0.06	…	…	…	…	…	…	…	…	0.10-0.16	…	0.05	0.15	Rem.
7012	1975	ITALY	0.15	0.25	0.8-1.2	0.08-0.15	1.8-2.2	0.04	…	5.8-6.5	0.02-0.08	…	…	…	…	…	…	…	…	0.10-0.18	…	0.05	0.15	Rem.
7014	1977	UK	0.50	0.50	0.30-0.7	0.30-0.7	2.2-3.2	…	0.10	5.2-6.2	…	…	…	…	…	…	…	…	…	…	0.20 Zr+Ti	0.05	0.15	Rem.
7015	1977	SPAIN	0.20	0.30	0.06-0.15	0.10	1.3-2.1	0.15	…	4.6-5.2	0.10	…	…	…	…	…	…	…	…	0.10-0.20	…	0.05	0.15	Rem.
7016	1972	USA	0.10	0.12	0.45-1.0	0.03	0.8-1.4	…	…	4.0-5.0	0.03	…	…	…	…	…	…	…	0.05	…	…	0.03	0.10	Rem.
7116	1975	USA	0.15	0.30	0.50-1.1	0.05	0.8-1.4	…	…	4.2-5.2	0.05	…	…	…	0.03	…	…	…	0.05	…	…	0.05	0.15	Rem.
7017	1978	UK	0.35	0.45	0.20	0.05-0.50	2.0-3.0	0.35	0.10	4.0-5.2	0.15	…	…	…	…	…	…	…	…	0.10-0.25	0.15 min Mn+Cr	0.05	0.15	Rem.
7018	1978	UK	0.35	0.45	0.20	0.15-0.50	0.7-1.5	0.20	0.10	4.5-5.5	0.15	…	…	…	…	…	…	…	…	0.10-0.25	…	0.05	0.15	Rem.
7019	1978	UK	0.35	0.45	0.20	0.15-0.50	1.5-2.5	0.20	0.10	3.5-4.5	0.15	…	…	…	…	…	…	…	…	0.10-0.25	…	0.05	0.15	Rem.
7019A	1983	ARGENTINA	0.30	0.40	0.10	0.10-0.6	1.5-2.5	0.05-0.35	…	3.0-5.0	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7020	1972	EAA	0.35	0.40	0.20	0.05-0.50	1.0-1.4	0.10-0.35	…	4.0-5.0	…	…	…	…	…	…	…	…	…	0.08-0.20	0.08-0.25 Zr+Ti	0.05	0.15	Rem.
7021	1976	USA	0.25	0.40	0.25	0.10	1.2-1.8	0.05	…	5.0-6.0	0.10	…	…	…	…	…	…	…	…	0.08-0.18	…	0.05	0.15	Rem.

See footnotes on page 18.

CHEMICAL COMPOSITION LIMITS[1, 2]

REGISTERED COMPOSITION—Continued

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

Registered International Designation																						OTHERS[13]		Al
No. [17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
7022	1979	EAA	0.50	0.50	0.50-1.0	0.10-0.40	2.6-3.7	0.10-0.30	…	4.3-5.2	…	…	…	…	…	…	…	…	…	…	0.20 Zr+Ti	0.05	0.15	Rem.
7122	2000	SWITZERLAND	0.25	0.35	0.50-1.0	0.10	2.6-3.7	0.10	…	4.3-5.2	0.15	…	…	…	…	…	…	…	…	0.10-0.25	…	0.05	0.15	Rem.
7023	1983	ARGENTINA	0.50	0.50	0.50-1.0	0.10-0.6	2.0-3.0	0.05-0.35	…	4.0-6.0	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7024	1983	ARGENTINA	0.30	0.40	0.10	0.10-0.6	0.50-1.0	0.05-0.35	…	3.0-5.0	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7025	1983	ARGENTINA	0.30	0.40	0.10	0.10-0.6	0.8-1.5	0.05-0.35	…	3.0-5.0	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7026	1983	ITALY	0.08	0.12	0.6-0.9	0.05-0.20	1.5-1.9	…	…	4.6-5.2	0.05	…	…	…	…	…	…	…	…	0.09-0.14	…	0.03	0.10	Rem.
7028	1987	SPAIN	0.35	0.50	0.10-0.30	0.15-0.6	1.5-2.3	0.20	…	4.5-5.2	0.05	…	…	…	…	…	…	…	…	…	0.08-0.25 Zr+Ti	0.05	0.15	Rem.
7029	1975	USA	0.10	0.12	0.50-0.9	0.03	1.3-2.0	…	…	4.2-5.2	0.05	…	…	…	…	…	…	…	0.05	…	…	0.03	0.10	Rem.
7129	1977	USA	0.15	0.30	0.50-0.9	0.10	1.3-2.0	0.10	…	4.2-5.2	0.05	…	…	…	0.03	…	…	…	0.05	…	…	0.05	0.15	Rem.
7229	1988	USA	0.06	0.08	0.50-0.9	0.03	1.3-2.0	…	…	4.2-5.2	0.05	…	…	…	…	…	…	…	0.05	…	…	0.03	0.10	Rem.
7030	1987	NORWAY	0.20	0.30	0.20-0.40	0.05	1.0-1.5	0.04	…	4.8-5.9	0.03	…	…	…	0.03	…	…	…	…	0.03	…	0.05	0.15	Rem.
7031	1988	USA	0.30	0.8-1.4	0.10	0.10-0.40	0.10	…	…	0.8-1.8	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7032	1995	USA	0.10	0.12	1.7-2.3	0.05	1.5-2.5	0.15-0.25	…	5.5-6.5	0.10	…	…	0.01	…	…	0.01	…	…	…	…	0.05	0.15	Rem.
7033	1996	USA	0.15	0.30	0.7-1.3	0.10	1.3-2.2	0.20	…	4.6-5.6	0.10	…	…	…	0.03	…	…	…	0.05	0.08-0.15	…	0.05	0.15	Rem.
7034	1999	UK	0.10	0.12	0.8-1.2	0.25	2.0-3.0	0.20	…	11.0-12.0	…	…	…	…	…	…	…	…	…	0.08-0.30	…	0.05	0.15	Rem.
7035	2003	SWITZERLAND	0.15	0.25	0.05-0.30	0.10	2.5-3.5	0.05	…	4.3-5.5	0.02-0.05	…	…	…	…	…	…	…	…	0.08-0.20	…	0.05	0.15	Rem.
7035A	2008	FRANCE	0.15	0.25	0.05-0.30	0.10	2.5-3.5	0.05	…	4.3-5.5	0.02-0.05	…	…	…	…	…	…	…	…	0.04-0.20	…	0.05	0.15	Rem.
7036	2004	USA	0.12	0.15	1.9-2.5	0.05	1.8-2.5	0.08-0.13	…	8.4-9.4	0.10	…	…	…	…	…	…	…	…	0.10-0.20	…	0.05	0.15	Rem.
7136	2004	USA	0.12	0.15	1.9-2.5	0.05	1.8-2.5	0.05	…	8.4-9.4	0.10	…	…	…	…	…	…	…	…	0.10-0.20	…	0.05	0.15	Rem.
7037	2006	GERMANY	0.10	0.10	0.6-1.1	0.50	1.3-2.1	0.04	…	7.8-9.0	0.10	…	…	…	…	…	…	…	…	0.06-0.25	…	0.05	0.15	Rem.
7039	1962	USA	0.30	0.40	0.10	0.10-0.40	2.3-3.3	0.15-0.25	…	3.5-4.5	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7040	1996	FRANCE	0.10	0.13	1.5-2.3	0.04	1.7-2.4	0.04	…	5.7-6.7	0.06	…	…	…	…	…	…	…	…	0.05-0.12	…	0.05	0.15	Rem.
7140	2005	FRANCE	0.10	0.13	1.3-2.3	0.04	1.5-2.4	0.04	…	6.2-7.0	0.06	…	…	…	…	…	…	…	…	0.05-0.12	…	0.05	0.15	Rem.
7041	2008	FRANCE	0.15	0.25	0.40-0.9	0.04	1.5-2.3	0.04	…	5.7-6.7	0.06	…	…	…	…	…	…	…	…	0.05-0.12	…	0.05	0.15	Rem.
7042	2009	USA	0.20	0.20	1.3-1.9	0.20-0.40	2.0-2.8	0.05	…	6.5-7.9	…	…	…	…	…	…	…	…	…	0.11-0.20	0.18-.050 Sc	0.05	0.15	Rem.
7046	1973	USA	0.20	0.40	0.25	0.30	1.0-1.6	0.20	…	6.6-7.6	0.06	…	…	…	…	…	…	…	…	0.10-0.18	…	0.05	0.15	Rem.
7046A	1999	NORWAY	0.20	0.40	0.35	0.30	0.8-1.6	0.20	…	6.1-7.3	0.06	…	…	…	…	…	…	…	…	0.10-0.25	…	0.05	0.15	Rem.
7047	2010	USA	0.12	0.15	0.04	0.04	1.3-1.8	0.05	…	7.0-8.0	0.08	0.25-0.50	…	…	…	…	…	…	…	0.07-0.13	…	0.05	0.15	Rem.
7049	1968	USA	0.25	0.35	1.2-1.9	0.20	2.0-2.9	0.10-0.22	…	7.2-8.2	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7049A	1972	FRANCE	0.40	0.50	1.2-1.9	0.50	2.1-3.1	0.05-0.25	…	7.2-8.4	…	…	…	…	…	…	…	…	…	…	0.25 Zr+Ti	0.05	0.15	Rem.
7149	1975	USA	0.15	0.20	1.2-1.9	0.20	2.0-2.9	0.10-0.22	…	7.2-8.2	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7249	1992	USA	0.10	0.12	1.3-1.9	0.10	2.0-2.4	0.12-0.18	…	7.5-8.2	0.06	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.

See footnotes on page 18.

CHEMICAL COMPOSITION LIMITS[1, 2]

REGISTERED COMPOSITION—Continued

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

Registered International Designation																						OTHERS[13]		Al
No. [17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
7349	1994	FRANCE	0.12	0.15	1.4-2.1	0.20	1.8-2.7	0.10-0.22	…	7.5-8.7	…	…	…	…	…	…	…	…	…	…	0.25 Zr+Ti	0.05	0.15	Rem.
7449	1994	FRANCE	0.12	0.15	1.4-2.1	0.20	1.8-2.7	…	…	7.5-8.7	…	…	…	…	…	…	…	…	…	…	0.25 Zr+Ti	0.05	0.15	Rem.
7050	1971	USA	0.12	0.15	2.0-2.6	0.10	1.9-2.6	0.04	…	5.7-6.7	0.06	…	…	…	…	…	…	…	…	0.08-0.15	…	0.05	0.15	Rem.
7050A	1996	FRANCE	0.12	0.15	1.7-2.4	0.04	1.7-2.6	0.04	0.03	5.7-6.9	0.06	…	…	…	…	…	…	…	…	0.05-0.12	…	0.05	0.15	Rem.
7150	1978	USA	0.12	0.15	1.9-2.5	0.10	2.0-2.7	0.04	…	5.9-6.9	0.06	…	…	…	…	…	…	…	…	0.08-0.15	…	0.05	0.15	Rem.
7055	1991	USA	0.10	0.15	2.0-2.6	0.05	1.8-2.3	0.04	…	7.6-8.4	0.06	…	…	…	…	…	…	…	…	0.08-0.25	…	0.05	0.15	Rem.
7155	2008	USA	0.25	0.25	2.0-2.6	0.10	1.8-2.3	0.05	…	7.6-8.4	0.10	…	…	…	…	…	…	…	…	0.08-0.15	…	0.05	0.15	Rem.
7255	2009	USA	0.06	0.09	2.0-2.6	0.05	1.8-2.3	0.04	…	7.6-8.4	0.06	…	…	…	…	…	…	…	…	0.08-0.15	…	0.05	0.15	Rem.
7056	2004	FRANCE	0.10	0.12	1.2-1.9	0.20	1.5-2.3	…	…	8.5-9.7	0.08	…	…	…	…	…	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
7060	1986	FRANCE	0.15	0.20	1.8-2.6	0.20	1.3-2.1	0.15-0.25	…	6.1-7.5	0.05	…	…	…	…	…	0.003	…	…	0.05	…	0.05	0.15	Rem.
+ 7160	2017	USA	0.10	0.10	1.9-2.5	0.05	1.0-2.0	…	…	6.7-7.3	0.06	…	…	…	…	…	…	…	…	0.04-0.15	…	0.05	0.15	Rem.
7064	1985	USA	0.12	0.15	1.8-2.4	…	1.9-2.9	0.06-0.25	…	6.8-8.0	…	…	…	…	…	…	…	…	…	0.10-0.50	0.10-0.40 Co, 0.05-0.30 O	0.05	0.15	Rem.
7065	2012	USA	0.06	0.08	1.9-2.3	0.04	1.5-1.8	0.04	…	7.1-8.3	0.06	…	…	…	…	…	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
7068	1996	USA	0.12	0.15	1.6-2.4	0.10	2.2-3.0	0.05	…	7.3-8.3	0.10	…	…	…	…	…	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
7168	2002	USA	0.10	0.12	1.6-2.4	0.05	2.0-2.8	0.04	…	7.8-8.8	0.10	…	…	…	…	…	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
7072[15]	1954	USA	…	…	0.10	0.10	0.10	…	…	0.8-1.3	…	…	…	…	…	…	…	…	…	…	0.7 Si+Fe	0.05	0.15	Rem.
7075	1954	USA	0.40	0.50	1.2-2.0	0.30	2.1-2.9	0.18-0.28	…	5.1-6.1	0.20	…	…	…	…	…	…	…	…	…	[10]	0.05	0.15	Rem.
7175	1957	USA	0.15	0.20	1.2-2.0	0.10	2.1-2.9	0.18-0.28	…	5.1-6.1	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7475	1969	USA	0.10	0.12	1.2-1.9	0.06	1.9-2.6	0.18-0.25	…	5.2-6.2	0.06	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7076	1954	USA	0.40	0.6	0.30-1.0	0.30-0.8	1.2-2.0	…	…	7.0-8.0	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7178[8]	1954	USA	0.40	0.50	1.6-2.4	0.30	2.4-3.1	0.18-0.28	…	6.3-7.3	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7278	1981	NORWAY	0.15	0.20	1.6-2.2	0.02	2.5-3.2	0.17-0.25	…	6.6-7.4	0.03	…	…	…	0.03	…	…	…	0.05	…	…	0.03	0.10	Rem.
7278A	1991	SWITZERLAND	0.12	0.15	1.3-2.1	0.25	2.3-3.2	0.05	…	6.4-7.4	0.05	…	…	…	…	…	…	…	…	0.05-0.25	…	0.05	0.15	Rem.
7081	2005	GERMANY	0.12	0.15	1.2-1.8	0.25	1.8-2.2	0.04	…	6.9-7.5	0.06	…	…	…	…	…	…	…	…	0.06-0.15	…	0.05	0.15	Rem.
7181	2009	GERMANY	0.08	0.10	1.2-1.9	0.15	1.7-2.2	0.04	…	6.7-7.9	0.06	…	…	…	…	…	…	…	…	0.08-0.18	…	0.05	0.15	Rem.
7085	2002	USA	0.06	0.08	1.3-2.0	0.04	1.2-1.8	0.04	…	7.0-8.0	0.06	…	…	…	…	…	…	…	…	0.08-0.15	…	0.05	0.15	Rem.
7185	2010	USA	0.25	0.25	1.3-2.0	0.10	1.2-1.8	0.10	…	7.0-8.2	0.06	…	…	…	…	…	…	…	…	0.08-0.15	…	0.05	0.15	Rem.
7090	1980	USA	0.12	0.15	0.6-1.3	…	2.0-3.0	…	…	7.3-8.7	…	…	…	…	…	…	…	…	…	…	1.0-1.9 Co, 0.20-0.50 O	0.05	0.15	Rem.
7093	1990	USA	0.12	0.15	1.1-1.9	…	2.0-3.0	…	0.04-0.16	8.3-9.7	…	…	…	…	…	…	…	…	…	0.08-0.20	0.05-0.50 O	0.05	0.15	Rem.
7095	2005	USA	0.10	0.12	2.0-2.8	0.05	1.4-2.0	…	…	8.6-9.8	0.06	…	…	…	…	…	…	…	…	0.08-0.15	…	0.05	0.15	Rem.
+ 7097	2015	USA	0.12	0.15	0.8-1.6	0.04	1.6-2.6	0.04	…	7.4-8.4	0.06	…	…	…	…	…	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
7099	2011	USA	0.12	0.15	1.4-2.1	0.04	1.6-2.3	0.04	…	7.4-8.4	0.06	…	…	…	…	…	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
7199	2014	USA	0.10	0.12	1.4-2.1	0.04	1.6-2.3	0.04	…	7.4-8.4	0.06	…	…	…	…	…	…	…	…	0.05-0.15	…	0.05	0.15	Rem.
8005	1976	ITALY	0.20-0.50	0.40-0.8	0.05	…	0.05	…	…	0.05	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.

See footnotes on page 18.

CHEMICAL COMPOSITION LIMITS[1, 2]

REGISTERED COMPOSITION—Continued

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

Registered International Designation																						OTHERS[13]		Al
No. [17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
8006	1978	USA	0.40	1.2-2.0	0.30	0.30-1.0	0.10	…	…	0.10	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8007	1978	USA	0.40	1.2-2.0	0.10	0.30-1.0	0.10	…	…	0.8-1.8	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8008	1979	SPAIN	0.6	0.9-1.6	0.20	0.50-1.0	…	…	…	0.10	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8010	1988	USA	0.40	0.35-0.7	0.10-0.30	0.10-0.8	0.10-0.50	0.20	…	0.40	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8011	1970	USA	0.50-0.9	0.6-1.0	0.10	0.20	0.05	0.05	…	0.10	0.08	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8011A	1979	GERMANY	0.40-0.8	0.50-1.0	0.10	0.10	0.10	0.10	…	0.10	0.05	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8111	1979	USA	0.30-1.1	0.40-1.0	0.10	0.10	0.05	0.05	…	0.10	0.08	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8211	1990	NETHERLANDS	0.40-0.8	0.50-1.0	0.10	0.05-0.20	0.10	0.15	…	0.10	0.05	…	…	…	…	…	…	…	…	…	…	0.06	0.15	Rem.
8112[8]	1954	USA	1.0	1.0	0.40	0.6	0.7	0.20	…	1.0	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8014	1983	USA	0.30	1.2-1.6	0.20	0.20-0.6	0.10	…	…	0.10	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8015	1988	USA	0.30	0.8-1.4	0.10	0.10-0.40	0.10	…	…	0.10	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8016	1989	NORWAY	0.20	0.7-1.1	0.10	0.10-0.30	0.10	…	…	0.10	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8017	1983	USA	0.10	0.55-0.8	0.10-0.20	…	0.01-0.05	…	…	0.05	…	…	0.04	…	…	0.003	…	…	…	…	…	0.03	0.10	Rem.
8018	1989	UK	0.50-0.9	0.6-1.0	0.30-0.6	0.30	…	…	…	…	0.006-0.06	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8019	1990	USA	0.20	7.3-9.3	…	0.05	…	…	…	0.05	0.05	…	…	…	…	…	…	…	…	…	3.5-4.5 Ce, 0.05-0.50 O	0.05	0.15	Rem.
8021	1992	JAPAN	0.15	1.2-1.7	0.05	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8021A	1992	UK	0.20	1.2-1.7	0.05	0.03	0.02	…	…	0.05	0.05	…	…	…	…	…	…	…	…	…	…	0.02	0.15	Rem.
8021B	1996	EAA	0.40	1.1-1.7	0.05	0.03	0.01	0.03	…	0.05	0.05	…	…	…	…	…	…	…	…	…	…	0.03	0.10	Rem.
8022	1991	USA	1.2-1.4	6.2-6.8	…	0.10	…	0.10	…	0.25	0.10	…	…	…	…	…	…	…	0.40-0.8	…	0.05-0.20 O	0.05	0.15	Rem.
8023	1997	BRAZIL	0.20	1.3-1.6	0.10-0.40	0.30-0.6	0.005	0.02	…	…	0.05-0.10	…	0.01-0.02	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8024	1999	UK	0.10	0.12	…	…	…	…	…	…	…	…	…	…	…	3.4-4.2	…	…	…	0.08-0.25	…	0.05	0.15	Rem.
8025	2000	SKAN ALUMINIUM	0.05-0.15	0.06-0.25	0.20	0.03-0.10	0.05	0.18	…	0.50	0.005-0.02	…	…	…	…	…	…	…	…	0.02-0.20	…	0.05	0.15	Rem.
8026	2007	GERMANY	0.6	0.6-1.2	0.30	0.40-1.0	0.20-0.6	0.20	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8030	1975	USA	0.10	0.30-0.8	0.15-0.30	…	0.05	…	…	0.05	…	…	0.001-0.04	…	…	…	…	…	…	…	…	0.03	0.10	Rem.
8130	1976	USA	0.15	0.40-1.0	0.05-0.15	…	…	…	…	0.10	…	…	…	…	…	…	…	…	…	…	1.0 Si+Fe	0.03	0.10	Rem.
8040	1962	USA	…	…	0.20	0.05	…	…	…	0.20	…	…	…	…	…	…	…	…	…	0.10-0.30	1.0 Si+Fe	0.05	0.15	Rem.
8050	1988	EAA	0.15-0.30	1.1-1.2	0.05	0.45-0.55	0.05	0.05	…	0.10	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8150	1998	AUSTRALIA	0.30	0.9-1.3	…	0.20-0.7	…	…	…	…	0.05	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8076	1972	USA	0.10	0.6-0.9	0.04	…	0.08-0.22	…	…	0.05	…	…	0.04	…	…	…	…	…	…	…	…	0.03	0.10	Rem.
8076A	2005	GERMANY	0.10	0.40-0.8	0.04	0.02	0.06-0.25	0.02	…	0.05	0.02	…	…	…	…	…	…	…	…	…	…	0.03	0.10	Rem.

See footnotes on page 18.

CHEMICAL COMPOSITION LIMITS[1, 2]

REGISTERED COMPOSITION—Continued

Only composition limits which are identical to those listed herein for a registered designation are applicable to that designation.

Registered International Designation																						OTHERS[13]		Al
No. [17]	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
8176	1976	USA	0.03-0.15	0.40-1.0	…	…	…	…	…	0.10	…	…	…	…	0.03	…	…	…	…	…	…	0.05	0.15	Rem.
8077	1975	USA	0.10	0.10-0.40	0.05	…	0.10-0.30	…	…	0.05	…	…	0.05	…	…	…	…	…	…	0.02-0.08	…	0.03	0.10	Rem.
8177	1981	USA	0.10	0.25-0.45	0.04	…	0.04-0.12	…	…	0.05	…	…	0.04	…	…	…	…	…	…	…	...	0.03	0.10	Rem.
8079	1969	USA	0.05-0.30	0.7-1.3	0.05	…	…	…	…	0.10	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
8090	1984	EAA	0.20	0.30	1.0-1.6	0.10	0.6-1.3	0.10	…	0.25	0.10	…	…	…	…	2.2-2.7	…	…	…	0.04-0.16	…	0.05	0.15	Rem.
8091	1985	UK	0.30	0.50	1.6-2.2	0.10	0.50-1.2	0.10	…	0.25	0.10	…	…	…	…	2.4-2.8	…	…	…	0.08-0.16	…	0.05	0.15	Rem.
8093	1990	FRANCE	0.10	0.10	1.0-1.6	0.10	0.9-1.6	0.10	…	0.25	0.10	…	…	…	…	1.9-2.6	…	…	…	0.04-0.14	…	0.05	0.15	Rem.

See footnotes on page 18.

FOOTNOTES

1. Composition in weight percent maximum unless shown as a range or a minimum. Standard limits for alloying elements and impurities are expressed to the following places:

   Less than 0.001 percent 0.000X
   0.001 but less than 0.01 percent 0.00X
   0.01 but less than 0.10 percent
   Unalloyed aluminum made by a refining process 0.0XX
   Alloys and unalloyed aluminum not made by a refining process 0.0X
   0.10 through 0.55 percent 0.XX
   (It is customary to express limits of 0.30 percent through 0.55 percent as 0.X0 or 0.X5).
   Over 0.55 percent ....0.X, X.X, etc.
   (except that combined Si +Fe limits for 1xxx designations must be expressed as 0.XX or 1.XX).

2. Except for "Aluminum" and "Others," analysis is required for elements for which specific limits are shown. For purposes of determining conformance to these limits, an observed value or calculated value obtained from analysis is rounded off to the nearest unit in the last right hand place of digits used in expressing the specified limit, in accordance with the following:

   When the digit next beyond the last place to be retained is less than 5, retain unchanged the digit in the last place retained.

   When the digit next beyond the last place to be retained is greater than 5, increase by 1 the digit in the last place retained.

   When the digit next beyond the last place to be retained is 5, and there are no digits beyond this 5, or only zeros, increase by 1 the digit in the last place retained if it is odd, leave the digit unchanged if is even. Increase by 1 the digit in the last place retained if there are non-zero digits beyond this 5.

3. The sum of those "Others" metallic elements 0.010 or more each, expressed to the second decimal before determining the sum.

4. The aluminum content for unalloyed aluminum not made by a refining process is the difference between 100.00 percent and the sum of all other analyzed metallic elements together with silicon present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum. For alloys and unalloyed aluminum not made by a refining process, when the specified maximum limit is 0.XX, an observed value or a calculated value greater than 0.005 but less than 0.010% is rounded off and shown as "less than 0.01".

5. The aluminum content for unalloyed aluminum made by a refining process is the difference between 100.00 percent and the sum of all other metallic elements together with silicon present in amounts of 0.0010 percent or more each, expressed to the third decimal before determining the sum, which is rounded to the second decimal before subtracting. For unalloyed aluminum made by a refining process, when the specified maximum limit is 0.0XX, an observed value or a calculated value greater than 0.0005 but less than 0.0010% is rounded off and shown as "less than 0.001".

6. 0.0003 max Be for welding electrode, welding rod and filler wire.

7. A Zr+Ti limit of 0.20 percent maximum may be used with this alloy designation for extruded and forged products only, but only when the supplier or producer and the purchaser have mutually so agreed. Agreement may be indicated, for example, by reference to a standard, by letter, by order note, or other means which allow the Zr+Ti limit.

8. This designation is considered the original alloy. See Recommendation footnote 5.

9. 45-65% of Mg.

10. A Zr +Ti limit of 0.25 percent maximum may be used with this alloy designation for extruded and forged products only, but only when the supplier or producer and the purchaser have mutually so agreed. Agreement may be indicated, for example, by reference to a standard, by letter, by order note, or other means which allow the Zr +Ti limit.

11. Formerly designated EC.

12. Inactive alloys can be reactivated with their previously assigned designation and registered chemical composition limits. An inactive experimental alloy can only be reactivated with the removal of the experimental alloy status.

13. "Others" includes listed elements for which no specific limit is shown as well as unlisted metallic elements. The producer may analyze samples for trace elements not specified in the registration or specification. However, such analysis is not required and may not cover all metallic "other" elements. Should any analysis by the producer or the purchaser establish that an "others" element exceeds the limit of "Each" or that the aggregate of several "others" elements exceeds the limit of Total, the material shall be considered non-conforming.

14. Alloy 5056A redesignated 5019.

15. Cladding is a main use.

16. 0.0005 max Be for welding electrode, welding rod and filler wire.

17. Various organizations include a prefix to these registered designations that do not change the registered composition and should be considered equivalent to those listed in this document. Examples of such equivalent designations are the AW-xxxx used in European EN standards and the A9xxxx designations used in the Unified Numbering System.

18. Designation listed for informational purposes only. Alloy 6064 is considered the original alloy for this alloy family.

19. This alloy designation was previously deactivated but has been reassigned to a new composition which is listed in the “Chemical Composition Limits” table. The designation remains in the “Previously Assigned but Presently Inactive Alloy Designation” list for historical purposes only.

20. Prior to 2009, the nominal density of alloys having a combination of elements may not have been calculated according to the current Aluminum and Aluminum Alloy Density Calculation Procedure appearing on Pages 2-13 and 2-14 of Aluminum Standards and Data. However, the nominal density of alloys published prior to 2009 shall not be revised.

21. Not a modification of original alloy 2016. The designation remains in the Previously Assigned but Presently Inactive Alloy Designation list for historical purposes.

\+ Designation added since previous issue.
* "X" removed from designation since previous issue.

CALCULATED NOMINAL DENSITIES FOR ACTIVE WROUGHT ALUMINUM AND WROUGHT ALUMINUM ALLOYS

Density is dependent upon composition and nominal density is determined by computation rather than by a weight method. The values shown below have been computed in accordance with the Aluminum and Aluminum Alloy Density Calculation Procedure appearing on pages 2-13 and 2-14 of Aluminum Standards and Data.[20] These calculated densities are nominal values and should not be specified as engineering requirements but may be used in calculating nominal values for weight per unit length, weight per unit area, covering area, etc.

Limiting the expression of nominal density to the number of decimal places indicated is based on the fact that composition variations are discernible from one cast to another for most alloys. The expression of nominal density to more decimal places than allowed by the following implies higher precision than is justified and should not be used.

1. Alloys listed below which have a minimum aluminum content of 99.35% or greater have nominal density values which are rounded in the US customary system (lbs/in^3) to the nearest multiple of 0.0005 and in the metric system [(kg/m^3) x 10^3] to the nearest multiple of 0.005.

2. Alloys listed below which have a minimum aluminum content of less than 99.35% have nominal density values which are rounded in the US customary system (lbs/in^3) to the nearest multiple of 0.001 and in the metric system [(kg/m^3) x 10^3] to the nearest multiple of 0.01.

The US customary (lbs/in^3) unit values are derived from metric values and subsequently rounded and are not to be back-converted to metric values.

	Density	
Designation	lbs/in.^{3}	(kg/m^3) x 10^3
1050	0.0975	2.705
1050A	0.0975	2.705
1060	0.0975	2.705
1065	0.0975	2.700
1070	0.0975	2.700
1070A	0.0975	2.700
1080	0.0975	2.700
1080A	0.0975	2.700
1085	0.0975	2.700
1090	0.0975	2.700
1098	0.0975	2.700
1100	0.098	2.71
1100A	0.098	2.71
1200	0.098	2.70
1200A	0.098	2.71
1300	0.098	2.71
1110	0.098	2.70
1120	0.098	2.71
1230	0.098	2.70
1230A	0.098	2.70
1235	0.0975	2.705
1435	0.0980	2.710
1145	0.0975	2.700
1345	0.0975	2.705
1445	0.0975	2.700
1150	0.0975	2.705
1350	0.0975	2.705
1350A	0.0975	2.700
1450	0.0975	2.705
1370	0.0975	2.700
1275	0.0975	2.705
1185	0.0975	2.700
1285	0.0975	2.700
1385	0.0975	2.700
1188	0.0975	2.700
1190	0.0975	2.700
1290	0.0975	2.700
1193	0.0975	2.700
1198	0.0975	2.700
1199	0.0975	2.700
2001	0.102	2.82
2002	0.099	2.73
2004	0.102	2.82
2005	0.102	2.83
2006	0.099	2.74
2007	0.102	2.82
2007A	0.102	2.81
2007B	0.102	2.81
2008	0.098	2.72
2009	0.099	2.75
2010	0.098	2.72
2011	0.102	2.83
2011A	0.102	2.82
2111	0.102	2.83
2111A	0.102	2.83
2111B	0.102	2.83
2012	0.102	2.82
2013	0.099	2.73
2014	0.101	2.80
2014A	0.101	2.80
2214	0.101	2.80
2015	0.102	2.83

CALCULATED NOMINAL DENSITIES FOR ACTIVE WROUGHT ALUMINUM AND WROUGHT ALUMINUM ALLOYS (continued)

	Designation	Density lbs/in.^{3}	Density (kg/m^3) x 10^3
	2016	0.101	2.79
	2017	0.101	2.79
	2017A	0.101	2.79
	2117	0.099	2.75
	2018	0.102	2.82
	2218	0.101	2.81
	2618	0.100	2.76
	2618A	0.100	2.77
	2219	0.103	2.84
	2319	0.103	2.84
	2419	0.102	2.84
	2519	0.102	2.82
	2021	0.103	2.84
	2022	0.101	2.80
+	2122	0.101	2.80
	2023	0.100	2.77
	2024	0.100	2.78
	2024A	0.100	2.77
	2124	0.100	2.78
+	2124A	0.100	2.78
	2224	0.100	2.77
	2224A	0.100	2.78
	2324	0.100	2.77
	2424	0.100	2.77
	2524	0.100	2.78
	2624	0.100	2.77
	2724	0.100	2.78
	2824	0.100	2.77
	2025	0.101	2.81
	2026	0.100	2.77
	2027	0.101	2.79
	2028	0.102	2.83
	2028A	0.101	2.80
	2028B	0.102	2.81
	2028C	0.102	2.82
	2029	0.100	2.77
	2030	0.102	2.81
	2031	0.100	2.77
	2032	0.100	2.76
+	2033	0.100	2.77
	2034	0.101	2.79
	2036	0.100	2.75
	2037	0.099	2.74
	2038	0.099	2.73
	2039	0.101	2.81
	2139	0.102	2.81
	2040	0.102	2.81
	2041	0.103	2.84
+	2042	0.101	2.80
+	2043	0.095	2.63
	2044	0.102	2.81
	2045	0.102	2.82
	2050	0.098	2.70
	2055	0.097	2.70
	2056	0.100	2.78
	2060	0.098	2.72
	2065	0.097	2.70
	2070	0.097	2.68
+	2071	0.097	2.69
+	2073	0.096	2.66
+	2074	0.097	2.70
+	2075	0.098	2.71
	2076	0.095	2.64
+	2081	0.098	2.71
+	2085	0.095	2.63
	2090	0.093	2.59
	2091	0.093	2.58
	2094	0.098	2.72
	2095	0.098	2.70
	2195	0.098	2.71
	2295	0.097	2.70
+	2395	0.097	2.69
	2196	0.095	2.63
	2296	0.095	2.63
	2097	0.096	2.65
	2197	0.095	2.64
	2297	0.096	2.65
	2397	0.096	2.65
	2098	0.097	2.70
	2198	0.097	2.69
	2099	0.095	2.63
	2199	0.095	2.64
+	3001	0.098	2.73
	3002	0.098	2.70
	3102	0.098	2.71
	3003	0.099	2.73
	3103	0.099	2.73
	3103A	0.098	2.72
	3103B	0.098	2.73
	3203	0.098	2.73
	3403	0.099	2.73
	3004	0.098	2.72
	3004A	0.098	2.71
	3104	0.098	2.72
	3204	0.098	2.71
	3304	0.098	2.72
	3005	0.098	2.73
	3005A	0.099	2.73
	3105	0.098	2.72
	3105A	0.098	2.71
	3105B	0.098	2.72

CALCULATED NOMINAL DENSITIES FOR ACTIVE WROUGHT ALUMINUM AND WROUGHT ALUMINUM ALLOYS (continued)

	Designation	Density lbs/in.^{3}	Density (kg/m^3) x 10^3
	3007	0.098	2.72
	3107	0.098	2.72
	3207	0.098	2.71
	3207A	0.098	2.72
	3307	0.098	2.72
	3009	0.099	2.73
	3010	0.098	2.72
	3110	0.098	2.72
	3011	0.099	2.73
	3012	0.098	2.72
	3012A	0.098	2.72
	3013	0.099	2.74
	3014	0.099	2.75
	3015	0.098	2.72
	3016	0.098	2.72
	3017	0.099	2.73
	3019	0.099	2.73
	3020	0.099	2.73
	3021	0.098	2.72
	3025	0.098	2.72
	3026	0.098	2.72
	3030	0.098	2.72
	3130	0.098	2.71
	3065	0.098	2.73
	4004	0.096	2.65
	4104	0.096	2.65
	4006	0.098	2.71
	4007	0.099	2.74
	4008	0.096	2.67
	4009	0.097	2.70
	4010	0.096	2.67
	4013	0.098	2.71
	4014	0.097	2.70
	4015	0.098	2.71
	4015A	0.098	2.71
	4115	0.098	2.72
	4016	0.099	2.73
	4017	0.098	2.72
	4018	0.096	2.67
	4019	0.099	2.74
	4020	0.098	2.71
	4021	0.097	2.69
+	4025	0.098	2.72
	4026	0.099	2.73
	4032	0.097	2.68
	4043	0.097	2.69

	Designation	Density lbs/in.^{3}	Density (kg/m^3) x 10^3
	4043A	0.097	2.69
	4143	0.097	2.69
	4343	0.097	2.68
	4643	0.097	2.69
	4943	0.097	2.68
	4044	0.097	2.67
	4045	0.096	2.67
	4145	0.099	2.74
	4145A	0.099	2.74
	4046	0.096	2.66
	4047	0.096	2.66
	4047A	0.096	2.66
	4147	0.096	2.66
+	4060	0.097	2.69
	5005	0.098	2.70
	5005A	0.097	2.69
	5205	0.097	2.70
	5305	0.097	2.69
	5505	0.097	2.69
	5605	0.097	2.69
	5006	0.098	2.71
	5106	0.098	2.71
	5010	0.098	2.71
	5110	0.097	2.69
	5110A	0.098	2.70
	5210	0.097	2.69
	5310	0.097	2.69
	5016	0.097	2.70
	5017	0.097	2.69
	5018	0.096	2.67
	5018A	0.097	2.67
+	5018B	0.097	2.68
	5019	0.096	2.65
	5019A	0.096	2.65
	5119	0.096	2.65
	5119A	0.096	2.65
	5021	0.097	2.68
	5022	0.096	2.66
	5023	0.095	2.64
	5024	0.096	2.65
	5026	0.097	2.69
	5027	0.096	2.65
	5028	0.097	2.67
	5040	0.098	2.72
	5140	0.098	2.71
	5041	0.097	2.67
	5042	0.096	2.67
	5043	0.098	2.72
	5049	0.097	2.70
	5149	0.097	2.69
	5249	0.097	2.70
	5349	0.097	2.70

CALCULATED NOMINAL DENSITIES FOR ACTIVE WROUGHT ALUMINUM AND WROUGHT ALUMINUM ALLOYS (continued)

Designation	Density lbs/in.^{3}	Density (kg/m^3) x 10^3
5449	0.097	2.70
5449A	0.098	2.70
5050	0.097	2.69
5050A	0.097	2.69
5050C	0.097	2.70
5150	0.097	2.68
5051	0.097	2.69
5051A	0.097	2.69
5151	0.097	2.68
5251	0.097	2.69
5251A	0.097	2.69
5351	0.097	2.68
5451	0.097	2.68
5052	0.097	2.68
5252	0.096	2.67
5352	0.097	2.67
5154	0.096	2.66
5154A	0.096	2.67
5154B	0.096	2.67
5154C	0.096	2.66
5254	0.096	2.66
5354	0.097	2.69
5454	0.097	2.69
5554	0.097	2.69
5654	0.096	2.66
5654A	0.096	2.66
5754	0.097	2.67
5854	0.097	2.67
5954	0.096	2.66
5056	0.095	2.64
5356	0.096	2.64
5356A	0.096	2.64
5456	0.096	2.66
5456A	0.096	2.66
5456B	0.096	2.66
5556	0.096	2.66
5556A	0.096	2.65
5556B	0.096	2.65
5556C	0.096	2.66
5257	0.097	2.70
5457	0.097	2.69
5557	0.097	2.70
5657	0.097	2.69
5058	0.097	2.67
5059	0.096	2.66
5070	0.097	2.68
5180	0.097	2.70
5180A	0.097	2.70
5082	0.096	2.65
5182	0.096	2.65
5083	0.096	2.66
5183	0.096	2.66
5183A	0.096	2.66
5283	0.096	2.65
5283A	0.096	2.65
5283B	0.096	2.66
5383	0.096	2.66
5483	0.096	2.66

Designation	Density lbs/in.^{3}	Density (kg/m^3) x 10^3
5086	0.096	2.66
5186	0.096	2.66
5087	0.096	2.66
5187	0.096	2.66
5088	0.096	2.65
6101	0.097	2.70
6101A	0.097	2.69
6101B	0.097	2.70
6201	0.097	2.69
6201A	0.097	2.69
6401	0.097	2.69
6501	0.098	2.70
6002	0.097	2.70
6003	0.097	2.70
6103	0.098	2.70
6005	0.097	2.70
6005A	0.098	2.70
6005B	0.097	2.70
6005C	0.098	2.70
6105	0.097	2.70
6205	0.098	2.71
6305	0.097	2.70
6006	0.098	2.70
6106	0.098	2.70
6206	0.098	2.71
6306	0.097	2.70
6008	0.098	2.70
6009	0.098	2.71
6010	0.098	2.71
6110	0.098	2.71
6110A	0.098	2.71
6011	0.099	2.73
6111	0.098	2.71
6012	0.099	2.74
6012A	0.099	2.74
6013	0.098	2.71
6113	0.098	2.71
6014	0.098	2.70
6015	0.097	2.69
6016	0.098	2.70
6016A	0.098	2.70
6116	0.097	2.70
6018	0.099	2.74
6019	0.098	2.71
6020	0.099	2.73
6021	0.098	2.72
6022	0.097	2.69
6023	0.099	2.73
6024	0.098	2.72
6025	0.097	2.70
6026	0.099	2.74

CALCULATED NOMINAL DENSITIES FOR ACTIVE WROUGHT ALUMINUM AND WROUGHT ALUMINUM ALLOYS (continued)

	Designation	Density lbs/in.^{3}	Density (kg/m^3) x 10^3
	6027	0.097	2.70
	6028	0.099	2.74
	6031	0.098	2.70
	6032	0.097	2.70
	6033	0.099	2.73
	6040	0.099	2.73
	6041	0.099	2.73
	6042	0.098	2.72
	6043	0.098	2.72
+	6050	0.099	2.74
	6151	0.098	2.71
	6351	0.098	2.71
	6351A	0.098	2.71
	6451	0.098	2.70
	6951	0.098	2.70
	6053	0.097	2.69
	6055	0.098	2.72
	6056	0.098	2.72
	6156	0.098	2.72
	6060	0.097	2.70
	6160	0.097	2.70
	6260	0.098	2.70
	6360	0.098	2.70
	6460	0.097	2.70
	6460B	0.097	2.70
	6560	0.098	2.70
	6660	0.098	2.70
	6061	0.098	2.70
	6061A	0.098	2.70
+	6061B	0.097	2.70
	6261	0.098	2.70
	6361	0.097	2.70
	6162	0.097	2.70
	6262	0.098	2.72
	6262A	0.098	2.72
	6063	0.097	2.70
	6063A	0.097	2.70
	6463	0.097	2.69
	6463A	0.097	2.69
	6763	0.097	2.69
	6963	0.097	2.70
	6064	0.098	2.72
	6064A	0.098	2.72
	6065	0.098	2.72
	6066	0.098	2.72
	6068	0.099	2.73
	6069	0.098	2.70
	6070	0.098	2.71
	6081	0.097	2.70
	6181	0.097	2.69
	6181A	0.098	2.70
	6082	0.098	2.70
	6082A	0.098	2.70
	6182	0.098	2.71
+	6086	0.098	2.71
	6091	0.097	2.70
	6092	0.098	2.70
+	6099	0.098	2.71
	7003	0.101	2.80
	7004	0.100	2.77
	7204	0.100	2.78
	7005	0.100	2.77
	7108	0.100	2.78
	7108A	0.101	2.78
	7009	0.101	2.80
	7010	0.102	2.82
	7012	0.101	2.81
	7014	0.101	2.79
	7015	0.100	2.77
	7016	0.100	2.78
	7116	0.101	2.78
	7017	0.100	2.76
	7018	0.101	2.79
	7019	0.100	2.76
	7019A	0.100	2.75
	7020	0.100	2.78
	7021	0.101	2.78
	7022	0.100	2.77
	7122	0.100	2.76
	7023	0.100	2.78
	7024	0.100	2.77
	7025	0.100	2.77
	7026	0.100	2.78
	7028	0.100	2.77
	7029	0.100	2.77
	7129	0.100	2.78
	7229	0.100	2.77
	7030	0.101	2.79
	7031	0.099	2.74
	7032	0.102	2.82
	7033	0.101	2.79
	7034	0.105	2.90
	7035	0.099	2.75
	7035A	0.099	2.75
	7036	0.104	2.88
	7136	0.104	2.88
	7037	0.103	2.85
	7039	0.099	2.74

CALCULATED NOMINAL DENSITIES FOR ACTIVE WROUGHT ALUMINUM AND WROUGHT ALUMINUM ALLOYS (continued)

	Designation	Density lbs/in.^{3}	Density (kg/m^3) x 10^3
	7040	0.102	2.82
	7140	0.102	2.83
	7041	0.101	2.80
	7042	0.102	2.84
	7046	0.102	2.82
	7046A	0.102	2.81
	7047	0.102	2.82
	7049	0.103	2.84
	7049A	0.103	2.84
	7149	0.103	2.84
	7249	0.103	2.84
	7349	0.103	2.85
	7449	0.103	2.85
	7050	0.102	2.83
	7050A	0.102	2.82
	7150	0.102	2.83
	7055	0.103	2.86
	7155	0.104	2.87
	7255	0.103	2.86
	7056	0.104	2.87
	7060	0.103	2.85
+	7160	0.103	2.85
	7064	0.103	2.85
	7065	0.103	2.86
	7068	0.103	2.85
	7168	0.103	2.86
	7072	0.098	2.72
	7075	0.101	2.81
	7175	0.101	2.80
	7475	0.101	2.81
	7076	0.102	2.84
	7178	0.102	2.83
	7278	0.102	2.83
	7278A	0.102	2.82
	7081	0.102	2.83
	7181	0.102	2.84
	7085	0.103	2.85
	7185	0.103	2.85
	7090	0.103	2.85
	7093	0.103	2.86
	7095	0.104	2.89
+	7097	0.102	2.84
	7099	0.103	2.85
	7199	0.103	2.85
	8005	0.098	2.71
	8006	0.099	2.74
	8007	0.100	2.76
	8008	0.099	2.74

Designation	Density lbs/in.^{3}	Density (kg/m^3) x 10^3
8010	0.098	2.72
8011	0.098	2.71
8011A	0.098	2.71
8111	0.098	2.71
8211	0.098	2.72
8112	0.098	2.72
8014	0.099	2.73
8015	0.098	2.72
8016	0.098	2.72
8017	0.098	2.71
8018	0.098	2.72
8019	0.106	2.92
8021	0.098	2.73
8021A	0.098	2.72
8021B	0.098	2.72
8022	0.102	2.83
8023	0.099	2.74
8024	0.088	2.43
8025	0.098	2.71
8026	0.099	2.73
8030	0.098	2.71
8130	0.098	2.71
8040	0.098	2.71
8050	0.099	2.73
8150	0.098	2.73
8076	0.098	2.71
8076A	0.098	2.71
8176	0.098	2.71
8077	0.098	2.70
8177	0.098	2.70
8079	0.098	2.72
8090	0.092	2.54
8091	0.092	2.54
8093	0.092	2.55

PREVIOUSLY ASSIGNED BUT PRESENTLY INACTIVE ALLOY DESIGNATIONS[19]

DESIGNATION	DATE RECLASSIFIED
1030	1988-05-23
1035	2005-04-13
1040	2005-04-13
1045	2005-04-13
1130	1966-09-09
1330	1964-12-18
1135	1997-02-03
1335	1966-09-09
1245	1966-09-09
1250	1988-05-23
1055	1988-05-23
1160 (Superseded by 1060)	1958-04-22
1260	2005-04-13
1360	1965-12-09
1165	1966-07-12
1170	1997-02-03
1270	1966-07-12
1075	1988-05-23
1175	1997-02-03
1180	1997-02-03
1187 (Superseded by 1188)	1958-09-10
1095	1988-05-23
1197 (Superseded by 1199)	1958-09-10
1099	1965-12-09
2003	1997-11-28
X2316[21]	1965-03-31
X2119	1966-03-07
2020	1974-11-01
2225	1966-07-12
2048	2005-04-13
2053	1983-11-09
2080	2005-06-02
X2096	2000-12-08
3303	1997-02-03
3205	1965-11-05
3006	2005-04-13
3008	1996-03-15
3018	1998-01-16
4001	1965-11-05
4101	1965-11-05
4002	1981-05-29
X4003	1975-01-27
X4005	1977-06-01
4011	2005-06-02
4012	1965-11-05

DESIGNATION	DATE RECLASSIFIED
4543	1997-02-03
4245 (Redesignated 4048)	1968-08-19
4048	2005-04-13
X5002	1963-06-03
5004	1967-04-26
5105	1960-04-28
5405	1966-07-12
5007	1968-05-13
5008	1968-05-13
5009	1968-05-13
5011	1967-04-26
X5012	1970-06-30
5013	1996-10-02
5014	1997-11-28
X5015	1968-08-19
X5020	1977-08-04
X5220	1962-01-11
5025	2005-06-02
5034	1973-08-09
5039	1975-11-24
5250	2005-04-13
5050B	1996-03-15
5152	1963-06-03
X5452	1971-06-17
5552	1997-02-03
5652	2005-04-13
5053	1968-08-19
X5153	1967-04-26
5854[19]	1996-10-02
X5055	1956-10-19
5155	1971-07-14
5056A[14]	1992-02-21
5357	2005-04-13
5757	1963-05-14
5857	1963-06-10
5957	1963-06-03
X5080	1963-10-22
5280	1996-10-02
X5084	1965-04-27
X5184	1965-04-27
X5085	1977-08-04
X5090	1977-07-18
5091	2000-04-26
6001	1955-07-08
6301	2005-04-13
6004	2005-04-13

See footnotes on page 18.

PREVIOUSLY ASSIGNED BUT PRESENTLY INACTIVE ALLOY DESIGNATIONS[19]

DESIGNATION	DATE RECLASSIFIED
6007	2005-04-13
6017	1997-02-03
X6030	2001-01-25
6051	1963-12-12
X6251	1965-03-31
6253	2002-05-22
6460A	2011-01-03
X6161	1963-06-03
6062	1964-09-04
X6163	1964-12-18
6263	1955-07-12
6363	1964-12-18
6563	1967-04-26
6663	1967-04-26
6863	1996-10-02
X6064[18]	1965-03-31
X6067	1974-11-01
6071	1966-07-12
6090	1992-06-01
7001	1997-02-03
7002	1966-07-12
7104	1988-05-23
X7006	1963-09-10
X7106	1980-04-16
X7007	1972-02-16
7008	2005-04-13
7109	1996-03-15
7011	1999-06-17
7013	1997-02-03
7027	1996-06-26
X7038	1967-04-26
7139	1966-09-09
7146	1997-02-03
7250	2014-10-16
7051	1996-10-02
7070	1988-05-23
X7272	1965-03-31
7472	1997-02-03
X7275	1963-06-03
7277[8]	2000-11-06
7079	1989-03-22
7179	1989-06-06
X7279	1963-06-03
X7080	1971-01-04
7091	1997-02-03
8001	1997-02-03
X8002	1964-12-18
X8003	1964-12-18
8004	1996-10-02
8009	2000-06-19
8212	1967-04-26
8013	1971-11-01
8020	2005-04-13
8276	1996-10-02
8280[8]	2005-04-13
X8380	1964-12-18
X8480	1964-12-18
8081	1997-02-03
X8090A	1989-01-13
X8092	1991-10-24
X8192	1991-10-24

See footnotes on page 18.

REGISTERED CHEMICAL COMPOSITION LIMITS OF INACTIVE ORIGINAL ALLOYS[1,2]

Registered International Designation																					OTHERS[13]		Al
No. [17]	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
1030	USA	0.35	0.6	0.10	0.05	0.05	…	…	0.10	0.03	…	…	…	…	…	…	…	0.05	…	…	0.03	…	99.30 [4]
1035	USA	0.35	0.6	0.10	0.05	0.05	…	…	0.10	0.03	…	…	…	…	…	…	…	0.05	…	…	0.03	…	99.35 [4]
1040	USA	0.30	0.50	0.10	0.05	0.05	…	…	0.10	0.03	…	…	…	…	…	…	…	0.05	…	…	0.03	…	99.40 [4]
1045	USA	0.30	0.45	0.10	0.05	0.05	…	…	0.05	0.03	…	…	…	…	…	…	…	0.05	…	…	0.03	…	99.45 [4]
1055	USA	0.25	0.40	0.05	0.05	0.05	…	…	0.05	0.03	…	…	…	…	…	…	…	0.05	…	…	0.03	…	99.55[4]
1075	USA	0.20	0.20	0.04	0.03	0.03	…	…	0.04	0.03	…	…	…	…	…	…	…	0.05	…	…	0.03	…	99.75 [4]
1095	USA	0.030	0.040	0.010	0.010	0.010	…	…	0.010	0.005	…	…	…	…	…	…	…	…	…	…	0.005	…	99.95[5]
1099	USA	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	99.99 [5]
2003	EAA	0.30	0.30	4.0-5.0	0.30-0.8	0.02	…	…	0.10	0.15	…	…	…	…	…	…	…	0.05-0.20	0.10-0.25	0.05-0.20 Cd	0.05	0.15	Rem.
2020	USA	0.40	0.40	4.0-5.0	0.30-0.8	0.03	…	…	0.25	0.10	…	…	…	…	0.9-1.7	…	…	…	…	0.10-0.35 Cd	0.05	0.15	Rem.
2048	USA	0.15	0.20	2.8-3.8	0.20-0.6	1.2-1.8	…	…	0.25	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
2053	SWITZERLAND	0.30	0.50	1.2-1.8	0.20	0.20-0.50	…	…	0.10	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
2080	USA	0.10	0.20	3.3-4.1	0.25	1.5-2.2	…	…	0.10	…	…	…	…	…	…	…	…	…	0.08-0.25	0.005 Be, 0.05-0.50 O	0.05	0.15	Rem.
X2096	USA	0.12	0.15	2.3-3.0	0.25	0.25-0.8	…	…	0.25	0.10	0.25-0.6	…	…	…	1.3-1.9	…	…	…	0.04-0.18	…	0.05	0.15	Rem.
3006	USA	0.50	0.7	0.10-0.30	0.50-0.8	0.30-0.6	0.20	…	0.15-0.40	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
3008	GERMANY	0.40	0.7	0.10	1.2-1.8	0.01	0.05	0.05	0.05	0.10	…	…	…	…	…	…	…	…	0.10-0.50	…	0.05	0.15	Rem.
3018	FRANCE	0.30	0.15-0.25	0.10-0.30	1.1-1.4	0.8-1.4	0.10	...	0.25	0.10	…	…	…	…	…	0.01	…	…	…	…	0.05	0.15	Rem.
4001	USA	1.5-2.5	0.8	0.20	0.10	0.05	…	…	0.10	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4002	USA	3.5-4.5	0.35	0.05-0.15	0.03	0.05-0.15	…	…	0.15	0.02	…	…	…	…	…	…	…	…	…	0.8-1.4 Cd	0.05	0.15	Rem.
X4003	USA	6.8-8.2	0.8	0.25	0.10	2.0-3.0	…	…	0.20	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
X4005	USA	9.5-11.0	0.8	0.25	0.10	0.20-1.0	…	…	0.20	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
4011	USA	6.5-7.5	0.20	0.20	0.10	0.45-0.7	…	…	0.10	0.04-0.20	…	…	…	…	…	…	…	…	…	0.04-0.07 Be	0.05	0.15	Rem.
4012	USA	11.0-13.0	0.8	1.0-2.0	0.5-0.9	0.45-1.0	…	…	1.0	…	…	…	…	…	…	…	…	…	…	…	…	…	Rem.
4048	USA	9.3-10.7	0.8	3.3-4.7	0.07	0.07	0.07	…	9.3-10.7	…	…	…	…	…	…	…	…	…	…	[6]	0.05	0.15	Rem.
X5002	USA	0.10	0.15	0.10-0.20	…	0.9-1.5	…	…	…	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5004	USA	0.40	0.7	0.40	0.30	0.7-1.4	0.10	…	1.0	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5007	USA	0.006	0.006	0.006	0.001	0.40-0.6	0.001	0.001	0.003	0.002	…	…	…	…	…	…	…	…	…	…	0.002	…	99.35
5008	USA	0.006	0.006	0.006	0.001	0.9-1.1	0.001	0.001	0.003	0.002	…	…	…	…	…	…	…	…	…	…	0.002	…	98.85
5009	USA	0.006	0.006	0.006	0.001	1.8-2.2	0.001	0.001	0.003	0.002	…	…	…	…	…	…	…	…	…	…	0.002	…	97.75
5011	USA	0.6	0.7	0.20	0.40-0.8	0.6-1.0	0.10	…	0.10	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
X5012	USA	0.08	0.10	0.10	0.05	1.6-2.1	…	…	0.03	0.03	…	…	…	…	…	…	…	…	…	…	0.03	0.10	Rem.
5013	FRANCE	0.20	0.25	0.03	0.30-0.50	3.2-3.8	0.03	0.03	0.10	0.10	…	…	…	…	…	0.003	…	…	0.05	…	0.05	0.15	Rem.
5014	EAA	0.40	0.40	0.20	0.20-0.9	4.0-5.5	0.20	…	0.7-1.5	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
X5015	USA	…	…	0.03-0.10	0.03-0.15	0.50-1.0	…	…	…	0.02	…	…	…	…	…	…	…	…	…	0.03 Si+Fe	0.01	0.02	Rem.
X5020	USA	0.30	0.7	1.3-1.9	0.10-0.50	2.4-3.2	0.20	…	0.20	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
5025	USA	0.25	0.25	0.10	0.20	4.5-6.0	0.20	…	0.25	0.05-0.20	…	…	…	…	…	…	…	…	0.10-0.25	0.0008 Be, 0.05-0.55 Sc	0.05	0.15	Rem.
5034	USA	0.40	0.40-0.9	0.40	0.20-0.50	0.6-1.1	0.10	…	0.40	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
++ 5039	USA	0.10	0.40	0.03	0.30-0.50	3.3-4.3	0.10-0.20	…	2.4-3.2	0.10	…	…	…	…	…	…	…	…	…	0.0008 Be	0.05	0.10	Rem.
5053	USA	…	…	0.03-0.10	0.03-0.10	3.1-3.9	…	…	…	0.02	…	…	…	…	…	…	…	…	…	0.03 Si+Fe	0.01	0.02	Rem.

See footnotes on page 18.

REGISTERED CHEMICAL COMPOSITION LIMITS OF INACTIVE ORIGINAL ALLOYS[1,2]

Registered International Designation																					OTHERS[13]		Al
No. [17]	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
X5055	USA	0.30	0.7	0.25	0.30-0.8	4.0-5.0	0.25	…	0.25	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
X5080	USA	…	…	0.10	0.20-0.7	3.5-4.5	0.05-0.20	…	1.7-2.8	0.20	…	…	…	…	…	…	…	…	…	0.35 Si + Fe	0.05	0.15	Rem.
X5084	USA	0.40	0.40	…	0.9	5.0 (Nom.)	0.10 (Nom.)	…	2.0 (Nom.)	…	…	…	…	…	…	…	…	…	…	…	…	…	Rem.
X5085	USA	0.30	0.40	0.15	0.20	5.8-6.8	0.20	…	0.20	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
X5090	USA	0.50	0.50	0.25	0.35	6.0-8.0	0.05-0.30	…	0.20	0.02	…	0.001-0.05	…	…	…	…	…	…	…	0.001-0.02 Be	0.05	0.15	Rem.
5091	USA	0.20	0.30	…	…	3.7-4.2	…	…	…	…	…	…	…	…	1.2-1.4	…	…	…	…	1.0-1.3 C, 0.20-0.7 O	0.05	0.15	Rem.
6001	USA	0.35-0.7	0.6	0.10	0.03	0.35-0.7	0.03	…	0.10	…	…	…	…	…	…	…	…	…	…	…	0.03	0.10	Rem.
6004	USA	0.30-0.6	0.10-0.30	0.10	0.20-0.6	0.40-0.7	…	…	0.05	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6007	USA	0.9-1.4	0.7	0.20	0.05-0.25	0.6-0.9	0.05-0.25	…	0.25	0.15	…	…	…	…	…	…	…	…	0.05-0.20	…	0.05	0.15	Rem.
6017	USA	0.55-0.7	0.15-0.30	0.05-0.20	0.10	0.45-0.6	0.10	…	0.05	0.05	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
X6030	USA	0.40-0.8	0.7	0.15-0.40	0.15	0.8-1.2	0.04-0.35	…	0.25	0.15	…	…	…	…	…	…	0.05-0.50	…	…	0.05-0.50 In	0.05	0.15	Rem.
6051	USA	0.6-1.2	1.0	0.15	0.20	0.45-0.8	…	…	0.25	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6062	USA	0.40-0.8	0.7	0.15-0.40	0.15	0.8-1.2	0.04-0.14	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
X6067	USA	0.9-1.8	0.7	0.9-2.0	0.40-1.2	0.7-1.5	0.20	…	0.25	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6071	USA	1.1-1.9	0.50	0.15-0.40	0.40-1.0	0.8-1.4	0.10	…	0.25	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
6090	USA	0.40-0.8	0.7	0.30-0.9	0.15	0.8-1.2	0.15	…	0.25	0.15	…	…	…	…	…	…	…	…	…	0.05-0.7 O	0.05	0.15	Rem.
7001	USA	0.35	0.40	1.6-2.6	0.20	2.6-3.4	0.18-0.35	…	6.8-8.0	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7002	USA	0.20	0.40	0.50-1.0	0.05-0.30	2.0-3.0	0.10-0.30	…	3.0-4.0	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
X7006	USA	…	…	0.10	0.50	1.7-2.8	0.30	…	3.7-4.8	0.15	…	…	…	…	…	…	…	…	…	0.35 Si+Fe	0.05	0.15	Rem.
X7007	USA	…	…	0.25	0.40	1.4-2.2	0.05-0.25	…	6.0-7.0	0.01-0.06	…	…	…	…	…	…	…	…	0.05-0.25	0.40 Si+Fe	0.05	0.15	Rem.
7008	USA	0.10	0.10	0.05	0.05	0.7-1.4	0.12-0.25	…	4.5-5.5	0.05	…	…	…	…	…	…	…	…	…	…	0.05	0.10	Rem.
7011	USA	0.15	0.20	0.05	0.10-0.30	1.0-1.6	0.05-0.20	…	4.0-5.5	0.05	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7013	USA	0.6	0.7	0.10	1.0-1.5	…	…	…	1.5-2.0	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7027	SWITZERLAND	0.25	0.40	0.10-0.30	0.10-0.40	0.7-1.1	…	…	3.5-4.5	0.10	…	…	…	…	…	…	…	…	0.05-0.30	…	0.05	0.15	Rem.
X7038	USA	0.20	0.35	0.10	0.10-0.35	3.0-4.0	0.05-0.25	…	4.0-5.0	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7051	FRANCE	0.35	0.45	0.15	0.10-0.45	1.7-2.5	0.05-0.25	…	3.0-4.0	0.15	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7070	USA	0.15	0.25	0.05	…	…	…	…	1.3-1.8	…	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7277	USA	0.50	0.7	0.8-1.7	…	1.7-2.3	0.18-0.35	…	3.7-4.3	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7079	USA	030	0.40	0.40-0.8	0.10-0.30	2.9-3.7	0.10-0.25	…	3.8-4.8	0.10	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
X7080	USA	0.30	0.40	0.50-1.5	0.10-0.7	1.5-3.0	0.12	…	5.0-7.0	0.20	…	…	…	…	…	…	…	…	…	…	0.05	0.15	Rem.
7091	USA	0.12	0.15	1.1-1.8	…	2.0-3.0	…	…	5.8-7.1	…	…	…	…	…	…	…	…	…	…	0.20-0.6 Co, 0.20-0.50 O	0.05	0.15	Rem.
8001	USA	0.17	0.45-0.7	0.15	…	…	…	0.9-1.3	0.05	…	…	0.001	…	…	0.008	…	…	…	…	0.003 Cd, 0.001 Co	0.05	0.15	Rem.
X8002	USA	0.25	1.2-1.6	0.05	…	…	…	1.2-1.6	…	…	…	0.001	…	…	0.008	…	…	…	…	0.003 Cd, 0.001 Co	0.05	0.15	Rem.
X8003	USA	0.02	1.2-1.6	…	…	…	…	1.2-1.6	…	…	…	0.001	…	…	0.008	…	…	…	…	0.003 Cd, 0.001 Co	…	0.03	Rem.
8004	FRANCE	0.15	0.15	0.03	0.02	0.02	…	…	0.03	0.30-0.7	…	…	…	…	…	…	…	…	…	…	0.02	0.15	Rem.
8009	USA	1.7-1.9	8.4-8.9	…	0.10	…	0.10	…	0.25	0.10	…	…	…	…	…	…	…	1.1-1.5	…	0.30 O	0.05	0.15	Rem.

See footnotes on page 18.

REGISTERED CHEMICAL COMPOSITION LIMITS OF INACTIVE ORIGINAL ALLOYS[1,2]

Registered International Designation																					OTHERS[13]		Al
No. [17]	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total[3]	Minimum
8013	USA	...	...	...	...	...	0.20-0.50	...	...	0.10	...	...	...	...	...	...	...	...	...	0.25 Si+Fe	0.03	0.10	Rem.
8020	USA	0.10	0.10	0.005	0.005	…	…	…	0.005	…	…	…	0.10-0.50	…	…	…	0.10-0.25	0.05	…	…	0.03	0.10	Rem.
8280	USA	1.0-2.0	0.7	0.7-1.3	0.10	…	…	0.20-0.7	0.05	0.10	…	…	…	…	…	…	5.5-7.0	…	…	…	0.05	0.15	Rem.
8081	USA	0.7	0.7	0.7-1.3	0.10	…	…	…	0.05	0.10	…	…	…	…	…	…	18.0-22.0	…	…	…	0.05	0.15	Rem.
X8092	USA	0.10	0.15	0.50-0.8	0.05	0.9-1.4	0.05	…	0.10	0.15	…	…	…	…	2.1-2.7	…	…	…	0.08-0.15	...	0.05	0.15	Rem.

See footnotes on page 18.

CROSS REFERENCE OF INTERNATIONAL DESIGNATIONS

DECLARATION OF ACCORD (DOA) TO ISO*

DOA DESIGNATION	FORMER ISO DESIGNATION	DOA DESIGNATION	FORMER ISO DESIGNATION	DOA DESIGNATION	FORMER ISO DESIGNATION
1050A	Al99.5	3105	AlMn0.5Mg0.5	6101	E-AlMgSi
1350	E-Al99.5	4043	AlSi5	6101A	E-AlMgSi(A)
1060	Al99.6	4043A	AlSi5(A)	6005	AlSiMg
1070A	Al99.7	4047	AlSi12	6005A	AlSiMg(A)
1370	E-Al99.7	4047A	AlSi12(A)	6351	AlSi1Mg0.5Mn
1080A	Al99.8(A)	5005	AlMg1(B)	6060	AlMgSi
1100	Al99.0Cu	5019	AlMg5	6061	AlMg1SiCu
1200	Al99.0	5050	AlMg1.5(C)	6262	AlMg1SiPb
2011	AlCu6BiPb	5251	AlMg2	6063	AlMg0.7Si
2014	AlCu4SiMg	5052	AlMg2.5	6063A	AlMg0.7Si(A)
2014A	AlCu4SiMg(A)	5154	AlMg3.5	6181	AlSi1Mg0.8
2017	AlCu4MgSi	5154A	AlMg3.5(A)	6082	AlSi1MgMn
2017A	AlCu4MgSi(A)	5454	AlMg3Mn	7005	AlZn4.5Mg1.5Mn
2117	AlCu2.5Mg	5554	AlMg3Mn(A)	7010	AlZn6MgCu
2219	AlCu6Mn	5754	AlMg3	7020	AlZn4.5Mg1
2024	AlCu4Mg1	5056	AlMg5Cr	7049A	AlZn8MgCu
2030	AlCu4PbMg	5356	AlMg5Cr(A)	7050	AlZn6CuMgZr
3003	AlMn1Cu	5456	AlMg5Mn1	7075	AlZn5.5MgCu
3103	AlMn1	5083	AlMg4.5Mn0.7	7475	AlZn5.5MgCu(A)
3004	AlMn1Mg1	5183	AlMg4.5Mn0.7(A)	7178	AlZn7MgCu
3005	AlMn1Mg0.5	5086	AlMg4		

*Source: ISO 209-1.

NOTE: This table is included for informational purposes only. ISO 209-1 has been withdrawn and replaced by ISO 209 which references the Teal Sheets as the normative reference and the source for international alloy designations.

The Aluminum Association
1400 Crystal Drive, Suite 430
Arlington, VA 22202
U.S.A.

RECOMMENDATION

INTERNATIONAL DESIGNATION SYSTEM FOR WROUGHT ALUMINUM AND WROUGHT ALUMINUM ALLOYS

15 December 1970
Revised June 2014

This Recommendation is based on the numerical designation system for wrought aluminum and wrought aluminum alloys which was adopted in the U.S.A. in 1954, and became its national standard in 1957. This Recommendation was officially adopted by the International Signatories of the Declaration of Accord on December 15, 1970.

Designations, registered in accordance with this Recommendation, may be used by any country. For use, see Appendixes A, B, and C.

A numerical designation assigned in conformance with this Recommendation should only be used to indicate an aluminum or an aluminum alloy having chemical composition limits identical to those registered with the Signatories to the Declaration of Accord on an International Alloy Designation System for Wrought Aluminum and Wrought Aluminum Alloys.

1. Scope

This recommendation describes a four-digit numerical system for designating wrought aluminum and wrought aluminum alloys.

2. Alloy Groups [1, 2, 3, 6]

The first of the four digits in the designation indicates the alloy group as follows:

Aluminum, 99.00 percent and greater....................1xxx
Aluminum alloys grouped by major alloying elements
- Copper....................2xxx
- Manganese....................3xxx
- Silicon....................4xxx
- Magnesium....................5xxx
- Magnesium and Silicon....................6xxx
- Zinc....................7xxx
- Other elements....................8xxx

Unused series....................9xxx

3. 1xxx Group

The designation assigned shall be in the 1xxx group whenever the minimum aluminum content is specified as 99.00 percent and greater. In the 1xxx group, the last two of the four digits in the designation indicate the minimum aluminum percentage[4]. These digits are the same as the two digits to the right of the decimal point in minimum aluminum percentage when it is expressed to the nearest 0.01 percent. The second digit in the alloy designation indicates alloy modifications in impurity limits or alloying elements. If the second digit in the designation is zero, it indicates unalloyed aluminum having natural impurity limits; integers 1 through 9, which are assigned consecutively as needed, indicate special control of one or more individual impurities or alloying elements.

4. 2xxx-8xxx Groups

The alloy designation in the 2xxx through 8xxx groups is determined by the alloying element (Mg_2Si for 6xxx alloys) present in the greatest mean percentage. If the greatest mean percentage is common to more than one alloying element, choice of group shall be in order of group sequence Cu, Mn, Si, Mg, Mg_2Si, Zn or Others. In the 2xxx through 8xxx alloy groups the last two of the four digits in the designation have no special significance but serve only to identify the different aluminum alloys in the group. The second digit in the alloy designation indicates the original alloy[5] and alloy modifications; integers 1 through 9, which are assigned consecutively, indicate alloy modifications.

5. Modifications

A modification of the original alloy [5] is limited to any one or a combination of the following:

(a) Change of not more than the following amounts in the arithmetic mean of the limits for an individual alloying element or combination of elements expressed as an alloying element or both:

Arithmetic Mean of Limits for Alloying Elements in Original Alloy	Maximum Change
Up through 1.0 percent	0.15
Over 1.0 through 2.0 percent	0.20
Over 2.0 through 3.0 percent	0.25
Over 3.0 through 4.0 percent	0.30
Over 4.0 through 5.0 percent	0.35
Over 5.0 through 6.0 percent	0.40
Over 6.0 percent	0.50

To determine compliance when maximum and minimum limits are specified for a combination of two or more elements in one alloy composition, the arithmetic mean of such combination is compared to the sum of the mean values of the same individual elements, or any combination thereof, in another alloy composition.

(b) Addition or deletion of not more than one alloying element with limits having an arithmetic mean of not more than 0.30 percent, or addition or deletion of not more than one combination of elements expressed as an alloying element with limits having a combined arithmetic mean of not more than 0.40 percent.

(c) Substitution of one alloying element for another element serving the same purpose.

(d) Change in limits for impurities expressed singly or as a combination.

(e) Change in limits for grain refining elements.

(f) Maximum iron or silicon limits of 0.12 percent and 0.10 percent, or less, respectively, reflecting high purity base metal.

An alloy shall not be registered as a modification if it meets the requirements for a variation.

6. Variations

Variations of wrought aluminum and wrought aluminum alloys registered in accordance with this Recommendation are identified by a serial letter after the numerical designation. The serial letters are assigned in alphabetical sequence starting with A for the first variation registered, but omitting I, O, and Q.

A variation has composition limits which are similar but not identical to a modification or an original alloy, with differences such as:

(a) Change of not more than the following amounts in the arithmetic mean of the limits for an individual alloying element or combination of elements expressed as an alloying element or both:

Arithmetic Mean of Limits for Alloying Elements in Original Alloy or Modification	Maximum Change
Up through 1.0 percent	0.15
Over 1.0 through 2.0 percent	0.20
Over 2.0 through 3.0 percent	0.25
Over 3.0 through 4.0 percent	0.30
Over 4.0 through 5.0 percent	0.35
Over 5.0 through 6.0 percent	0.40
Over 6.0 percent	0.50

To determine compliance when maximum and minimum limits are specified for a combination of two or more elements in one alloy composition, the arithmetic mean of such combination is compared to the sum of the mean values of the same individual elements, or any combination thereof, in another alloy composition.

(b) Substitution of one alloying element for another element serving the same purpose.

(c) Change in limits of impurities expressed singly or as a combination except for low iron. Iron maximum of 0.12 percent or less, reflecting high purity base metal, should be considered an alloy modification. See 5(f).

(d) Change in limits on grain refining elements.

(e) Inclusion of a minimum limit for iron or silicon or both, without a change in the maximum limit.

An alloy shall not be registered as a new alloy or alloy modification if it meets the requirements for a variation.

See footnotes on page 32

RECOMMENDATION - FOOTNOTES

1. For codification purposes an alloying element is any element which is intentionally added for any purpose other than grain refinement and for which minimum and maximum limits are specified.

2. Standard limits for alloying elements and impurities are expressed to the following places:

   Less than 0.001 percent .... …… 0.000X
   0.001 but less than 0.01 percent .... …….. 0.00X
   0.01 but less than 0.10 percent
   Unalloyed aluminum made by a refining process .... …….. 0.0XX
   Alloys and unalloyed aluminum not made by a refining process ...... ………. 0.0X
   0.10 through 0.55 percent .... ………. 0.XX
   (It is customary to express limits of 0.30 percent through 0.55 percent as 0.X0 or 0.X5).
   Over 0.55 percent .... 0.X, X.X, etc.
   (except that combined Si +Fe limits for 1xxx designations must be expressed as 0.XX or 1.XX).

3. Standard limits for alloying elements and impurities are expressed in the following sequence: Silicon; Iron; Copper; Manganese; Magnesium; Chromium; Nickel; Zinc; Titanium (See Note 1); Other (See Note 2) Elements, Each; Other Elements, Total; Aluminum (See Note 3).

   Note 1—Additional specified elements having limits are inserted in alphabetical order by their chemical symbols between Titanium and Other Elements, Each, or are specified in footnotes.

   Note 2—"Others" includes listed elements for which no specific limit is shown as well as unlisted metallic elements. The producer may analyze samples for trace elements not specified in the registration or specification; however, such analysis is not required and may not cover all metallic "Others" elements. Should any analysis by the producer or the purchaser establish that an "Others" element exceeds the limit of "Each" or that the aggregate of several "Others" elements exceeds the limit of "Total", the material shall be considered non-conforming.

   Note 3—Aluminum is specified as minimum for unalloyed aluminum, and as a remainder for aluminum alloys.

4. The aluminum content for unalloyed aluminum made by a refining process is the difference between 100.00 percent and the sum of all other metallic elements together with silicon present in amounts of 0.0010 percent or more each, expressed to the third decimal before determining the sum, which is rounded to the second decimal before subtracting; for unalloyed aluminum not made by a refining process it is the difference between 100.00 percent and the sum of all other analyzed metallic elements together with silicon present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum. For unalloyed aluminum made by a refining process, when the specified maximum limit is 0.0XX, an observed value or a calculated value greater than 0.0005 but less than 0.0010 percent is rounded off and shown as "less than 0.001". For alloys and unalloyed aluminum not made by a refining process, when the specified maximum limit is 0.XX, an observed value or a calculated value greater than 0.005 but less than 0.010 percent is rounded off and shown as "less than 0.01".

5. The term "original" alloy as used in the Registration Record is defined based on the following guidelines:

   (a) Only one alloy in any alloy family (having the same first, third and fourth digits) is considered the "original" alloy, and it is always used as the basis for registration of a modification.

   (b) All active and inactive alloys whose second digit is "0" are considered the "original" alloys for each specific alloy family.

   (c) For those alloy families with no second digit "0" registered, the alloy with the lowest second digit is considered the "original" alloy whether the alloy is active or inactive and a note (8)* is added following the designation. No registration shall be granted for a designation with a lower second digit for these alloy families.

   (d) No designation changes are made to any and all of the currently registered original alloys whether active or inactive.

6. Individual element limits (i.e. maximum limits or a range) are required for elements having a combined maximum limit in excess of 0.10%. Individual element limits are not required for elements having a combined maximum limit of 0.10% or less.

* See footnote 8 on page 18.

APPENDIX A

USE AND ASSIGNMENT OF DESIGNATIONS

USE OF DESIGNATIONS

A.1 Alloy designations used in accordance with this Recommendation shall have chemical composition limits identical to the registered limits of that designation.

A.2 Designations that could be mistaken for a designation described in the Recommendation (shown on page 28) shall not be used for unregistered wrought aluminum or wrought aluminum alloys.

A.3 Wrought aluminum or wrought aluminum alloys having chemical composition limits that differ from registered designations should be submitted for the assignment of a designation.

ASSIGNMENT OF DESIGNATIONS

A.4 Designations for a new alloy registration shall be assigned in the following order of precedence:

A.4.1 Any proposed alloy having chemical composition limits that are identical to a registered designation shall use the registered designation.

A.4.2 A proposed alloy can qualify to be a variation of a modification or of an original alloy. If the chemical composition limits of an alloy meet the requirements for a variation, a suffix letter shall be added to the modification or original alloy designation.

A.4.3 A proposed alloy can qualify to be a modification of an original alloy. The designation for an alloy modification shall be assigned if the chemical composition limits meet the requirements for an alloy modification unless the limits also meet the requirements for a variation. When the limits meet the requirements for a variation, the variation designation described in A.4.2 will take precedence.

A.4.3.1 In cases where all designations in an alloy family have been assigned (i.e. s0xx, s1xx, ….., s9xx), new modifications shall be assigned consecutively using designations from a previously unused alloy family. The sequence of alloys sNyy, starting at s1yy, shall be considered an extension of the s0xx family. A footnote shall be used to associate the sequence of alloy modifications sNyy to their original alloy, s0xx. The designation s0yy shall not be assigned.

For example, when future modifications are assigned to the 5054 family, the sequence would be “51xx, 52xx, …, 59xx”, where the last two digits are from an unused alloy family. Alloys 51xx, 52xx, …, 59xx would be assigned a footnote describing these alloys as modifications of 5054.

A.4.4. A new original designation shall be assigned only for an alloy having different chemical composition limits which do not meet the requirements to qualify as a variation or a modification of any registered alloy.

APPENDIX B

DEACTIVATION OF REGISTERED ALLOYS

B.1 All countries using designations in accordance with this Recommendation should review, at least once in every five years, the alloys registered by them to see if these alloys are still commercially active. If not, alloys should be proposed for deactivation. Any inactive alloy can still be reactivated when such need arises.

APPENDIX C

GENERAL GUIDELINES FOR DETERMINING COMPLIANCE WITH "SALE OF ALLOY" AND "COMMERCIAL QUANTITY" FOR PURPOSES OF REGISTERING WROUGHT ALUMINUM AND WROUGHT ALUMINUM ALLOYS
(See Declaration of Accord, Item 1)

C.1 Sale of Alloy

Sale of an alloy shall have been made to external users/customers (i.e., internal use and/or transfer of an alloy within a company does not meet the stated criteria).

C.2 Commercial Quantity

C.2.1 The alloy has undergone bona fide mill production and is NOT a "laboratory" scale volume.

C.2.2 The alloy is cast and fabricated in standard production facilities and is NOT a one-time production.

C.2.3 There is an expected and ongoing commercial demand and/or need for the alloy.

C.2.4 The alloy must be purchased and sold in a standard business context which indicates that the alloy is actually "sold" and not "given away" for uses such as promotional evaluations.

DECLARATION OF ACCORD ON AN INTERNATIONAL ALLOY DESIGNATION SYSTEM FOR WROUGHT ALUMINUM AND WROUGHT ALUMINUM ALLOYS

It is agreed by the parties hereto that the following rules shall apply in assigning alloy designations in accordance with the Recommendation dated December 15, 1970 and last revised June 2014 for an International Designation System for Wrought Aluminum and Wrought Aluminum Alloys:

1. To be eligible for registration, an aluminum or aluminum alloy shall be offered for sale currently and shall have been supplied in the previous twelve months, in both cases in commercial quantities. The complete composition limits shall be registered and the former national or international designation if any, shall be shown in the registration request.

2. All requests for international registration shall be submitted to The Aluminum Association by a signatory of the Declaration of Accord. The signatory, in carrying out this function, will endeavor to restrict registrations to those required for international, regional or national standards or standards of equivalent importance in the commercial field. In view of its historic usage of these designations, more latitude is ceded to The Aluminum Association in this regard.

3. It shall be the duty of each signatory to inform all other signatories of composition limits proposed during the registration process. The alloy designation shall be assigned by The Aluminum Association when negotiations on composition limits are complete among all signatories to the Declaration of Accord.

4. No designation or chemical composition limits shall become final until at least 60 days after announcement to all signatories. During this 60-day period, all questions and objections regarding the designation or chemical composition limits shall be submitted; or an extension of the period shall be requested. Technical objections shall be substantially resolved prior to final registration.

5. After the 60-day period or any extension thereof, The Aluminum Association shall confirm the registered designation and the composition limits to all signatories.

6. No changes in the chemical composition limits are allowed after the registration is final.

7. This Declaration of Accord may be executed in several counterparts and all so executed shall constitute one agreement.

Organization

Representative

Address

Date

Signature

DECLARATION D'ACCORD SUR UN SYSTEME DE DESIGNATION INTERNATIONALE POUR L'ALUMINIUM CORROYE ET SES ALLIAGES

Il est convenu entre les participants que les règles suivantes seront appliquées dans la désignation des alliages, en concordance avec la recommandation du 15 décembre 1970, dernièrement révisée en juin 2014, pour un système de désignation internationale pour l'aluminium et ses alliages corroyés:

1. Pour être admis à l'enregistrement, un aluminium - ou alliage d'aluminium - doit être offert à la vente et avoir été fourni au cours des douze derniers mois en quantités commerciales dans les deux cas. Les limites de composition chimique ainsi que la désignation internationale ou nationale précédente, s'il en existe une, doivent être indiquées dans la demande d'enregistrement.

2. Toute demande d'enregistrement international doit être soumise à l'Aluminum Association par un signataire de la Déclaration d'Accord. Le-dit signataire, dans l'exercice de cette fonction, s'appliquera à limiter les enregistrements à ceux requis pour les normes internationales, nationales ou régionales,ou autres normes d'importance équivalente dans le secteur commercial. Compte tenu de l'utilisation historique de ces désignations, l'Aluminum Association dispose d'une plus grande latitude à cet égard.

3. Il appartiendra à chaque signataire d'informer toutes les organisations des pays participants de toutes correspondances pendant le processus d'enregistrement. Les attributions de numéros d'alliage seront effectuées par l'Aluminum Association dès l'achèvement des négociations sur les limites de composition par tous les signataires de la Déclaration d'Accord.

4. Aucune désignation ou limites de composition chimique ne deviendra definitive avant moins 60 jours à compter de la date d'annonce donnée aux organisations participantes. Durant ces 60 jours, toutes questions et objections concernant cette désignation ou limites de composition chimique devront être soumises; ou une extension de la période devra etre demandée à l'Aluminum Association. Toutes objections techniques devront être résolues de facon substantielle avant l'enregistrement final.

5. Après la période de 60 jours, ou de l'extension de période demandée, l'Aluminum Association devra confirmer la désignation enregistrée et les limites de composition chimique à chaque organisation participante.

6. Aucun changement dans les limites de composition chimique est autorisé après l'enregistrement final.

7. Cette Déclaration d'Accord pourra être reproduite en plusieurs exemplaires tout en constituant un seul agrément.

Organisation

Représentant

Adresse

Date

Signature

NOTES

OTHER ALUMINUM ASSOCIATION REGISTRATION RECORDS AND REFERENCES

- **INTERNATIONAL DESIGNATIONS AND CHEMICAL COMPOSITION LIMITS FOR UNALLOYED ALUMINUM** (Gold Sheets).

- **DESIGNATIONS AND CHEMICAL COMPOSITION LIMITS FOR ALUMINUM ALLOYS IN THE FORM OF CASTINGS AND INGOT** (Pink Sheets).

- **INTERNATIONAL DESIGNATIONS AND CHEMICAL COMPOSITION LIMITS FOR ALUMINUM HARDENERS** (Gray Sheets).

- **COMPONENTS OF CLAD ALUMINUM ALLOY PRODUCTS** (Lt. Green Sheets).

- **TEMPERS FOR ALUMINUM AND ALUMINUM ALLOY PRODUCTS** (Yellow Sheets).

- **TEMPERS FOR ALUMINUM AND ALUMINUM ALLOY PRODUCTS—METRIC EDITION** (Tan Sheets).

- **ALUMINUM STANDARDS AND DATA**
  A reference book containing data on chemical compositions, mechanical and physical properties, tolerances and other information on aluminum mill products in general use, in US customary units.

- **ALUMINUM STANDARDS AND DATA METRIC SI**
  A reference book containing data on chemical compositions, mechanical and physical properties, tolerances and other information on aluminum mill products in general use, in metric units.

An Aluminum Association Publication can be ordered by calling: (480) 779-6259.

On-line ordering of The Aluminum Association publications is available through our website: www.aluminum.org

ADDENDUM TO TEAL SHEETS

International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys

May 16, 2024

Alloy Designations and Chemical Composition Limits Registered Since Publication of 2018 Edition of the Teal Sheets

Registered International Designation																					Additional Elements	OTHERS		Al
No.	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total	Minimum
2079	2024-01-17	UK	0.12	0.15	3.0-3.8	0.10-0.35	0.05-0.35	...	...	0.8-1.2	0.10	...	...	...	...	0.8-1.0	...	...	...	0.05-0.15	...	0.05	0.15	Rem.
6084	2023-10-25	USA	0.40.1.0	0.7	0.15-0.50	0.20	0.7-1.2	0.04-0.20	...	0.30	0.15	...	...	0.20-0.8	...	...	0.10	...	...	...	...	0.05	0.15	Rem.
2050A	2023-01-26	USA	0.08	0.10	3.2-3.9	0.20-0.50	0.20-0.6	0.05	0.05	0.25	0.10	0.20-0.7	...	...	0.05	0.7-1.0	...	...	0.05	0.06-0.14	...	0.05	0.15	Rem.
6094	2023-02-10	USA	0.7-1.2	0.40	0.40-0.8	0.05-0.50	0.7-1.2	0.05-0.50	...	0.10	0.10	...	...	...	...	...	...	...	...	...	...	0.05	0.15	Rem.
2007C	2022-12-05	USA	0.8	0.8	3.3-4.6	0.20-1.0	0.40-1.8	0.10	0.20	0.8	0.20	...	...	0.10-1.0	...	...	0.10	...	...	...	...	0.05	0.15	Rem.
8031	2022-08-31	Korea	...	0.30-0.6	0.30-0.50	...	...	...	...	...	0.01-0.03	...	0.001-0.01	...	...	...	...	...	...	...	...	0.05	0.15	Rem.
8376	2022-08-08	Russia	0.12	0.40-0.8	0.04	0.01	0.02	0.01	...	0.05	...	...	0.02	...	0.03	...	...	...	...	...	V+Ti 0.02	0.03	0.10	Rem.
6026A	2022-08-23	USA	0.6-1.4	0.7	0.20-0.50	0.20-1.0	0.6-1.2	0.30	...	0.30	0.20	...	...	0.50-1.5	...	...	0.10	...	...	...	...	0.05	0.15	Rem.
8027	2021-03-05	USA	...	...	...	...	3.6-4.4	...	...	...	...	...	...	...	...	...	...	...	...	...	Cerium 7.2-8.8	0.10	0.50	Rem.
6282	2021-04-16	USA	0.9-1.2	0.30	0.30	0.30 - 0.8	0.8 - 1.2	0.15 - 0.40	...	0.25	0.02	...	...	...	...	...	...	...	...	...	...	0.05	0.15	Rem.
6083	2020-09-21	Russia	0.9-1.2	0.20	0.05	0.20 - 0.40	0.8 - 1.1	0.10 - 0.30	...	0.10	0.06 - 0.10	...	...	...	...	...	...	...	...	...	In 0.001 - 0.01	0.02	0.10	Rem.
4062	2021-03-12	Netherlands	23.0-26.0	0.20-0.7	1.7-2.3	0.30	1.2-1.9	0.10	0.20-0.7	0.20	0.20	...	...	...	...	...	...	...	...	0.10-0.30	...	0.10	0.30	Rem.
6035	2020-09-08	USA	0.7 - 1.4	0.50	0.6 - 1.0	0.40 - 1.0	0.6 - 1.0	0.25	...	0.20	0.20	...	...	...	...	...	...	...	...	0.07 - 0.20	...	0.05	0.15	Rem.
6039	2020-05-21	USA	0.5 - 0.9	0.40	0.05- 0.35	0.3 - 0.6	0.5- 0.9	0.15 - 0.25	...	0.25	0.02	...	...	...	...	...	...	...	...	...	...	0.05	0.15	Rem.
3033	2020-04-24	Russia	0.20	0.08 - 0.30	0.10	0.70 - 1.30	0.20 - 0.70	...	0.001 - 0.10	0.10	0.02 - 0.06	...	0.005	...	...	...	...	...	...	0.03 - 0.15	Ce 0.001 - 0.10 Ni+Ce≤0.15	0.05	0.15	Rem.
5181	2020-03-20	Russia	0.06 - 0.16	0.12 - 0.22	0.10	0.40 - 0.8	4.3 - 5.3	0.08 - 0.18	...	0.25	0.15	...	...	...	...	...	...	...	0.10	0.08 - 0.18	Sc 0.01 - 0.09 Ca 0.10	0.05	0.15	Rem.
2077	2019-12-13	Italy	0.40-1.0	0.7	4.0-5.0	0.6-1.2	0.6-1.2	0.20	0.20	0.25	0.15	0.15	...	0.20-0.9	...	0.15	...	...	...	0.15	...	0.05	0.15	Rem.
7048	2019-12-13	USA	0.20	0.40	0.10-0.6	0.30	1.1-1.7	0.20	...	7.1-8.2	0.06	...	...	...	...	...	...	...	...	0.10-0.25	...	0.05	0.15	Rem.
6034	2019-06-20	USA	0.20-0.7	0.15-0.25	0.30	0.20-0.50	0.20-0.7	0.15-0.40	...	0.10	0.02	...	...	...	...	...	...	...	...	...	...	0.05	0.15	Rem.
2046	2019-01-29	USA	0.08	0.10	3.2 - 3.9	0.20 - 0.50	0.20 - 0.6	...	...	0.40 - 0.8	0.10	0.15	...	...	...	0.7 - 1.1	...	...	...	0.06 - 0.14	...	0.05	0.15	Rem.
2064	2019-01-10	USA	0.10	0.10	3.0 - 4.0	0.10 - 0.50	0.20 - 0.50	...	...	0.40 - 1.0	0.10	0.25 - 0.7	...	...	...	0.7 - 1.1	...	...	...	0.05 - 0.15	...	0.05	0.15	Rem.
6029	2019-03-28	USA	0.50 - 0.9	0.10 -0.30	0.6 - 1.7	0.10 - 0.20	0.7 - 1.1	0.05 - 0.15	...	0.25	0.15	...	...	...	...	...	...	...	...	...	...	0.05	0.15	Rem.
5081	2019-04-29	Russia	0.06 -0.16	0.12 -0.18	0.10	0.40 -0.8	4.9 -5.3	0.08 -0.18	...	0.25	0.15	...	...	...	...	...	...	...	0.10	0.06 -0.18	Sc 0.05 -0.14 Ca 0.10 Be 0.03	0.05	0.15	Rem.

ADDENDUM TO TEAL SHEETS

International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys

May 16, 2024

Registered International Designation	Product	Date Deactivated
4007	Cobalt and Oxygen	09/19/2018
7064	Cobalt and Oxygen	09/19/2018
7090	Cobalt and Oxygen	09/19/2018

ADDENDUM TO TEAL SHEETS

International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys

May 16, 2023

Alloy Designations and Chemical Composition Limits Registered Since Publication of 2018 Edition of the Teal Sheets

Registered International Designation																					Additional Elements	OTHERS		Al
No.	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total	Minimum
2007C	2022-12-05	USA	0.8	0.8	3.3-4.6	0.20-1.0	0.40-1.8	0.10	0.20	0.8	0.20	...	...	0.10-1.0	...	...	0.10	...	...	...		0.05	0.15	Rem.
8031	2022-08-31	Korea	...	0.30-0.6	0.30-0.50	...	...	...	...	...	0.01-0.03	...	0.001-0.01	...	...	...	...	...	...	...	...	0.05	0.15	Rem.
8376	2022-08-08	Russia	0.12	0.40-0.8	0.04	0.01	0.02	0.01	...	0.05	...	...	0.02	...	0.03	...	...	...	...	...	V+Ti 0.02	0.03	0.10	Rem.
6026A	2022-08-23	USA	0.6-1.4	0.7	0.20-0.50	0.20-1.0	0.6-1.2	0.30	...	0.30	0.20	...	...	0.50-1.5	...	...	0.10	...	...	...	...	0.05	0.15	Rem.
8027	2021-03-05	USA	...	...	...	...	3.6-4.4	...	...	...	...	...	...	...	...	...	...	...	...	...	Cerium 7.2-8.8	0.10	0.50	Rem.
6282	2021-04-16	USA	0.9-1.2	0.30	0.30	0.30 - 0.8	0.8 - 1.2	0.15 - 0.40	...	0.25	0.02	...	...	...	...	...	...	...	...	...	...	0.05	0.15	Rem.
6083	2020-09-21	Russia	0.9-1.2	0.20	0.05	0.20 - 0.40	0.8 - 1.1	0.10 - 0.30	...	0.10	0.06 - 0.10	...	...	...	...	...	...	...	...	...	In 0.001 - 0.01	0.02	0.10	Rem.
4062	2021-03-12	Netherlands	23.0-26.0	0.20-0.7	1.7-2.3	0.30	1.2-1.9	0.10	0.20-0.7	0.20	0.20	...	...	...	...	...	...	...	...	0.10-0.30	...	0.10	0.30	Rem.
6035	2020-09-08	USA	0.7 - 1.4	0.50	0.6 - 1.0	0.40 - 1.0	0.6 - 1.0	0.25	...	0.20	0.20	...	...	...	...	...	...	...	...	0.07 - 0.20	...	0.05	0.15	Rem.
6039	2020-05-21	USA	0.5 - 0.9	0.40	0.05- 0.35	0.3 - 0.6	0.5- 0.9	0.15 - 0.25	...	0.25	0.02	...	...	...	...	...	...	...	...	...	...	0.05	0.15	Rem.
3033	2020-04-24	Russia	0.20	0.08 - 0.30	0.10	0.70 - 1.30	0.20 - 0.70	...	0.001 - 0.10	0.10	0.02 - 0.06	...	0.005	...	...	...	...	...	...	0.03 - 0.15	Ce 0.001 - 0.10 Ni+Ce≤0.15	0.05	0.15	Rem.
5181	2020-03-20	Russia	0.06 - 0.16	0.12 - 0.22	0.10	0.40 - 0.8	4.3 - 5.3	0.08 - 0.18	...	0.25	0.15	...	...	...	...	...	...	...	0.10	0.08 - 0.18	Sc 0.01 - 0.09 Ca 0.10	0.05	0.15	Rem.
2077	2019-12-13	Italy	0.40-1.0	0.7	4.0-5.0	0.6-1.2	0.6-1.2	0.20	0.20	0.25	0.15	0.15	...	0.20-0.9	...	0.15	...	...	...	0.15	...	0.05	0.15	Rem.
7048	2019-12-13	USA	0.20	0.40	0.10-0.6	0.30	1.1-1.7	0.20	...	7.1-8.2	0.06	...	...	...	...	...	...	...	...	0.10-0.25	...	0.05	0.15	Rem.
6034	2019-06-20	USA	0.20-0.7	0.15-0.25	0.30	0.20-0.50	0.20-0.7	0.15-0.40	...	0.10	0.02	...	...	...	...	...	...	...	...	...	...	0.05	0.15	Rem.
2046	2019-01-29	USA	0.08	0.10	3.2 - 3.9	0.20 - 0.50	0.20 - 0.6	...	...	0.40 - 0.8	0.10	0.15	...	...	...	0.7 - 1.1	...	...	...	0.06 - 0.14	...	0.05	0.15	Rem.
2064	2019-01-10	USA	0.10	0.10	3.0 - 4.0	0.10 - 0.50	0.20 - 0.50	...	...	0.40 - 1.0	0.10	0.25 - 0.7	...	...	...	0.7 - 1.1	...	...	...	0.05 - 0.15	...	0.05	0.15	Rem.
6029	2019-03-28	USA	0.50 - 0.9	0.10 -0.30	0.6 - 1.7	0.10 - 0.20	0.7 - 1.1	0.05 - 0.15	...	0.25	0.15	...	...	...	...	...	...	...	...	...	...	0.05	0.15	Rem.
5081	2019-04-29	Russia	0.06 -0.16	0.12 -0.18	0.10	0.40 -0.8	4.9 -5.3	0.08 -0.18	...	0.25	0.15	...	...	...	...	...	...	...	0.10	0.06 -0.18	Sc 0.05 -0.14 Ca 0.10 Be 0.03	0.05	0.15	Rem.

ADDENDUM TO TEAL SHEETS

International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys

May 16, 2023

Registered International Designation	Product	Date Deactivated
4007	Cobalt and Oxygen	09/19/2018
7064	Cobalt and Oxygen	09/19/2018
7090	Cobalt and Oxygen	09/19/2018

ADDENDUM TO TEAL SHEETS

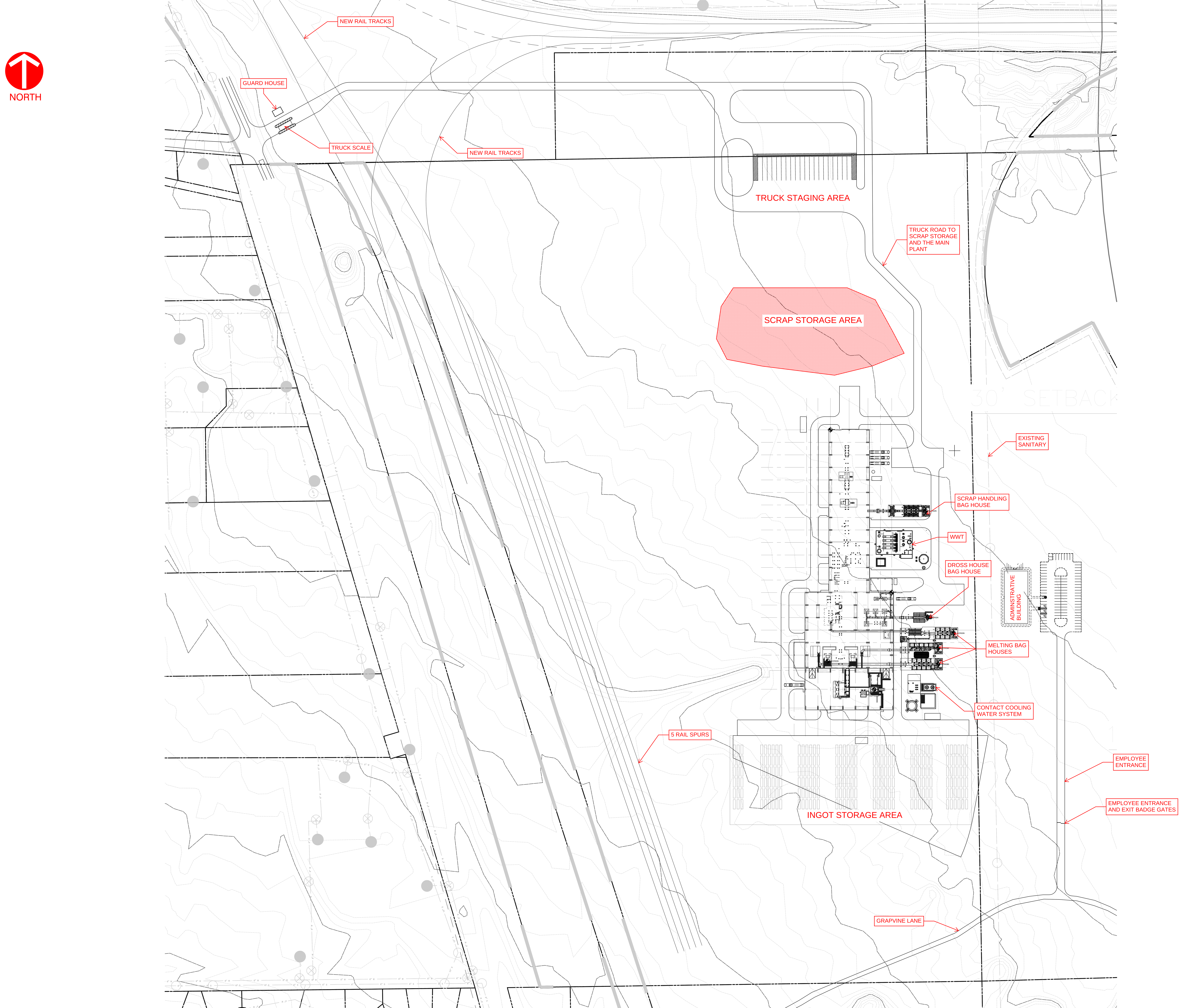
International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys

December 8, 2022

Alloy Designations and Chemical Composition Limits Registered Since Publication of 2018 Edition of the Teal Sheets

Registered International Designation																					Additional Elements	OTHERS		Al
No.	Date	By	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	B	Bi	Ga	Li	Pb	Sn	V	Zr		Each	Total	Minimum
8031	2022-08-31	Korea	...	0.30-0.6	0.30-0.50	...	...	...	...	...	0.01-0.03	...	0.001-0.01	...	...	...	...	...	...	...	...	0.05	0.15	Rem.
8376	2022-08-08	Russia	0.12	0.40-0.8	0.04	0.01	0.02	0.01	...	0.05	...	...	0.02	...	0.03	...	...	...	...	...	V+Ti 0.02	0.03	0.10	Rem.
6026A	2022-08-23	USA	0.6-1.4	0.7	0.20-0.50	0.20-1.0	0.6-1.2	0.30	...	0.30	0.20	...	...	0.50-1.5	...	...	0.10	...	...	...	...	0.05	0.15	Rem.
8027	2021-03-05	USA	...	...	...	...	3.6-4.4	...	...	...	...	...	...	...	...	...	...	...	...	...	Cerium 7.2-8.8	0.10	0.50	Rem.
6282	2021-04-16	USA	0.9-1.2	0.30	0.30	0.30 - 0.8	0.8 - 1.2	0.15 - 0.40	...	0.25	0.02	...	...	...	...	...	...	...	...	...	...	0.05	0.15	Rem.
6083	2020-09-21	Russia	0.9-1.2	0.20	0.05	0.20 - 0.40	0.8 - 1.1	0.10 - 0.30	...	0.10	0.06 - 0.10	...	...	...	...	...	...	...	...	...	In 0.001 - 0.01	0.02	0.10	Rem.
4062	2021-03-12	Netherlands	23.0-26.0	0.20-0.7	1.7-2.3	0.30	1.2-1.9	0.10	0.20-0.7	0.20	0.20	...	...	...	...	...	...	...	...	0.10-0.30	...	0.10	0.30	Rem.
6035	2020-09-08	USA	0.7 - 1.4	0.50	0.6 - 1.0	0.40 - 1.0	0.6 - 1.0	0.25	...	0.20	0.20	...	...	...	...	...	...	...	...	0.07 - 0.20	...	0.05	0.15	Rem.
6039	2020-05-21	USA	0.5 - 0.9	0.40	0.05- 0.35	0.3 - 0.6	0.5- 0.9	0.15 - 0.25	...	0.25	0.02	...	...	...	...	...	...	...	...	...	...	0.05	0.15	Rem.
3033	2020-04-24	Russia	0.20	0.08 - 0.30	0.10	0.70 - 1.30	0.20 - 0.70	...	0.001 - 0.10	0.10	0.02 - 0.06	...	0.005	...	...	...	...	...	...	0.03 - 0.15	Ce 0.001 - 0.10 Ni+Ce≤0.15	0.05	0.15	Rem.
5181	2020-03-20	Russia	0.06 - 0.16	0.12 - 0.22	0.10	0.40 - 0.8	4.3 - 5.3	0.08 - 0.18	...	0.25	0.15	...	...	...	...	...	...	...	0.10	0.08 - 0.18	Sc 0.01 - 0.09 Ca 0.10	0.05	0.15	Rem.
2077	2019-12-13	Italy	0.40-1.0	0.7	4.0-5.0	0.6-1.2	0.6-1.2	0.20	0.20	0.25	0.15	0.15	...	0.20-0.9	...	0.15	...	...	...	0.15	...	0.05	0.15	Rem.
7048	2019-12-13	USA	0.20	0.40	0.10-0.6	0.30	1.1-1.7	0.20	...	7.1-8.2	0.06	...	...	...	...	...	...	...	...	0.10-0.25	...	0.05	0.15	Rem.
6034	2019-06-20	USA	0.20-0.7	0.15-0.25	0.30	0.20-0.50	0.20-0.7	0.15-0.40	...	0.10	0.02	...	...	...	...	...	...	...	...	...	...	0.05	0.15	Rem.
2046	2019-01-29	USA	0.08	0.10	3.2 - 3.9	0.20 - 0.50	0.20 - 0.6	...	...	0.40 - 0.8	0.10	0.15	...	...	...	0.7 - 1.1	...	...	...	0.06 - 0.14	...	0.05	0.15	Rem.
2064	2019-01-10	USA	0.10	0.10	3.0 - 4.0	0.10 - 0.50	0.20 - 0.50	...	...	0.40 - 1.0	0.10	0.25 - 0.7	...	...	...	0.7 - 1.1	...	...	...	0.05 - 0.15	...	0.05	0.15	Rem.
6029	2019-03-28	USA	0.50 - 0.9	0.10 -0.30	0.6 - 1.7	0.10 - 0.20	0.7 - 1.1	0.05 - 0.15	...	0.25	0.15	...	...	...	...	...	...	...	...	...	...	0.05	0.15	Rem.
5081	2019-04-29	Russia	0.06 -0.16	0.12 -0.18	0.10	0.40 -0.8	4.9 -5.3	0.08 -0.18	...	0.25	0.15	...	...	...	...	...	...	...	0.10	0.06 -0.18	Sc 0.05 -0.14 Ca 0.10 Be 0.03	0.05	0.15	Rem.

Registered International Designation	Product	Date Deactivated
4007	Cobalt and Oxygen	09/19/2018
7064	Cobalt and Oxygen	09/19/2018
7090	Cobalt and Oxygen	09/19/2018


NORTH
NEW RAIL TRACKS
GUARD HOUSE
TRUCK SCALE
NEW RAIL TRACKS
TRUCK STAGING AREA
TRUCK ROAD TO SCRAP STORAGE AND THE MAIN PLANT
SCRAP STORAGE AREA
EXISTING SANITARY
SCRAP HANDLING BAG HOUSE
WWT
DROSS HOUSE BAG HOUSE
ADMINSTRATIVE BUILDING
MELTING BAG HOUSES
CONTACT COOLING WATER SYSTEM
5 RAIL SPURS
INGOT STORAGE AREA
EMPLOYEE ENTRANCE
EMPLOYEE ENTRANCE AND EXIT BADGE GATES
GRAPVINE LANE

APPENDIX C. SAFETY DATA SHEETS (SDS)

- SDS are not directly relied upon for any potential emission calculations carried out in this application. If ADEQ would like to request specific SDS for any raw materials used in the secondary aluminum manufacturing processes (i.e, solid salt flux used in furnaces), Aluminum Dynamics can provide these documents as a supplement to the initial application to be contained within this Appendix C

APPENDIX D. ACRONYMS AND DEFINITIONS

-#-
40 CFR = Title 40 of the Code of Federal Regulations
-A-
A.A.C. = Arizona Administrative Code
ACGIH = American Conference of Governmental and Industrial Hygienists
ADEQ = Arizona Department of Environmental Quality
ADI = Aluminum Dynamics, Inc.
AP-42 = Compilation of air pollutant emission factors published by the EPA
-B-
BACT = Best Available Control Technology
-C-
CAA = Clean Air Act
CAM = Compliance Assurance Monitoring
CCS = Control and collection system
CFR = Code of Federal Regulations
CH_4 = Methane
CI = Combustion Ignition
CO = Carbon Monoxide
CO_2 = Carbon Dioxide
CO_2e = CO_2 equivalents (GHGs x GWP)
-D-
D/F = Dioxins & Furans
-E-
ECS = Eddy current separator
EF= Emission factor
EMS = Electromagnetic stirrer
EPA = U.S. Environmental Protection Agency
-G-
G&P = Gillespie & Powers, Inc.
GHG = Greenhouse Gas
GWP = Global Warming Potential
-H-
HAP = Hazardous Air Pollutant
HC = Hydrocarbons
HCl = Hydrogen Chloride
hp = Horse power
HVAC = Heating, Ventilation and Air Conditioning
-I-
ICE = Internal Combustion Engines
-L-
lbs = pounds
lb/ft = pounds per foot
-M-
MACT = Maximum Achievable Control Technology
MMBtu = Million Btu

mNSR = Minor New Source Review
-N-
N_2O = Nitrous Oxide
NAAQS = National Ambient Air Quality Standards
NA-NSR = Non-attainment New Source Review
NESHAP = National Emission Standard for Hazardous Air Pollutants (located at 40 CFR Part 61)
NG = Natural Gas
NO_x = Nitrogen Oxides (sum of NO and NO_2)
NOSCR = Notification of Compliance Status Report
NSPS = New Source Performance Standard (located at 40 CFR Part 60)
NSR = New Source Review (preconstruction authorization permit program – required by all sources)
-O-
OMMP = Operation, Maintenance and Monitoring Plan
-P-
Pb = Lead
PM = Particulate Matter
PM_{10} = Particulate matter < 10 microns
$PM_{2.5}$ = Particulate matter < 2.5 microns
PSD = Prevention of Significant Deterioration
PTE = Potential to Emit
-R-
RACT = Reasonably Available Control Technology
RCRA = Resource Conservation and Recovery Act
RFI = Rotary flux injector
RICE = Reciprocating Internal Combustion Engine
RMP = Risk Management Plan
RSI = Remelt Secondary Ingots
-S-
SDI = Steel Dynamics, Inc.
SI ICE = Spark Ignition Internal Combustion Engine
SIC = Standard Industrial Classification
SMACT = National Emission Standards for Hazardous Air Pollutants for Secondary Aluminum Production, 40 CFR 63 Subpart RRR
SO_2 = Sulfur dioxide
-T-
TDS = Total Dissolved Solids
THC = Total Hydrocarbon
tpy = tons per year
-U-
UBC = Used Beverage Containers
UPL = Upper Prediction Limit
-V-
VDC = Vertical Direct Chill
VMT = Vehicle Miles Traveled
VOC = Volatile Organic Compounds

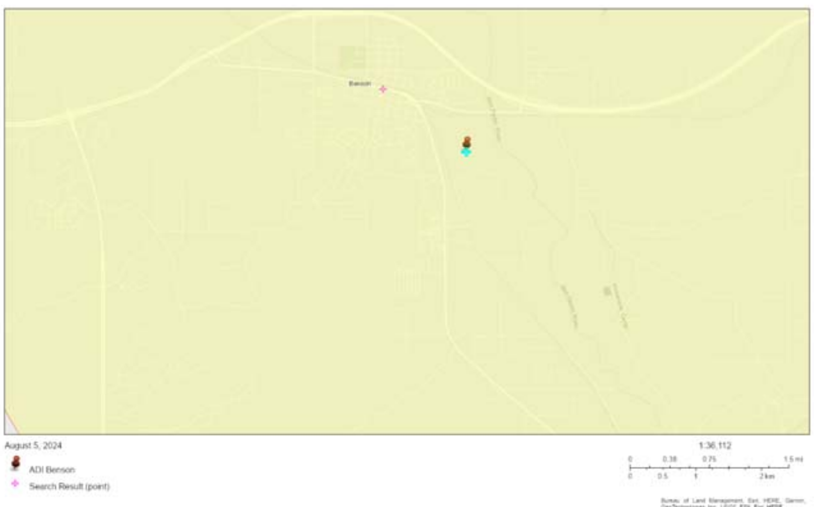
APPENDIX E. EJSCREEN 2.1 REPORT

EJScreen Community Report

This report provides environmental and socioeconomic information for user-defined areas, and combines that data into environmental justice and supplemental indexes.

Benson, AZ

5 miles Ring Centered at 31.959525,-110.282564
Population: 7,503
Area in square miles: 78.53



COMMUNITY INFORMATION

Low income: 39 percent

People of color: 26 percent

Less than high school education: 9 percent

Limited English households: 2 percent

Unemployment: 7 percent

Persons with disabilities: 24 percent

Male: 50 percent

Female: 50 percent

80 years
Average life expectancy

$30,723
Per capita income

Number of households: 3,243

Owner occupied: 71 percent

BREAKDOWN BY RACE

White: 74%

Black: 0%

American Indian: 0%

Asian: 1%

Hawaiian/Pacific Islander: 0%

Other race: 1%

Two or more races: 4%

Hispanic: 19%

BREAKDOWN BY AGE

From Ages 1 to 4	5%
From Ages 1 to 18	18%
From Ages 18 and up	82%
From Ages 65 and up	31%

LIMITED ENGLISH SPEAKING BREAKDOWN

Speak Spanish	99%
Speak Other Indo-European Languages	1%
Speak Asian-Pacific Island Languages	0%
Speak Other Languages	0%

Notes: Numbers may not sum to totals due to rounding. Hispanic population can be of any race.
Source: U.S. Census Bureau, American Community Survey (ACS) 2018-2022. Life expectancy data comes from the Centers for Disease Control.

LANGUAGES SPOKEN AT HOME

LANGUAGE	PERCENT
English	91%
Spanish	8%
Total Non-English	9%

Report for 5 miles Ring Centered at 31.959525,-110.282564

Report produced August 5, 2024 using EJScreen Version 2.3

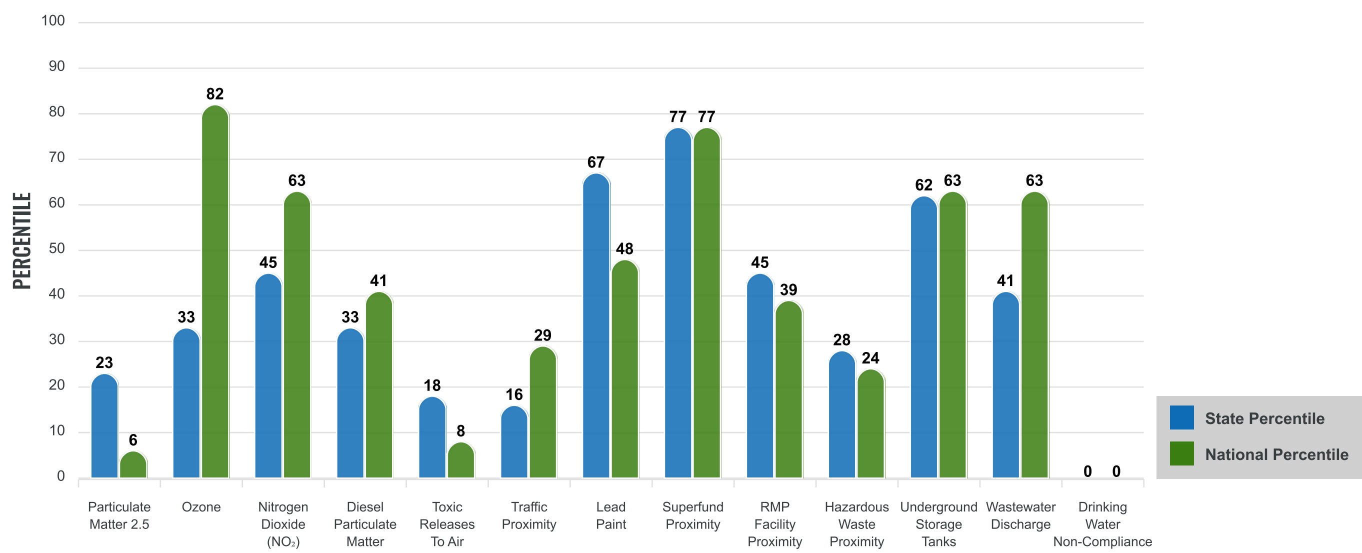
Environmental Justice & Supplemental Indexes

The environmental justice and supplemental indexes are a combination of environmental and socioeconomic information. There are thirteen EJ indexes and supplemental indexes in EJScreen reflecting the 13 environmental indicators. The indexes for a selected area are compared to those for all other locations in the state or nation. For more information and calculation details on the EJ and supplemental indexes, please visit the EJScreen website.

EJ INDEXES

The EJ indexes help users screen for potential EJ concerns. To do this, the EJ index combines data on low income and people of color populations with a single environmental indicator.

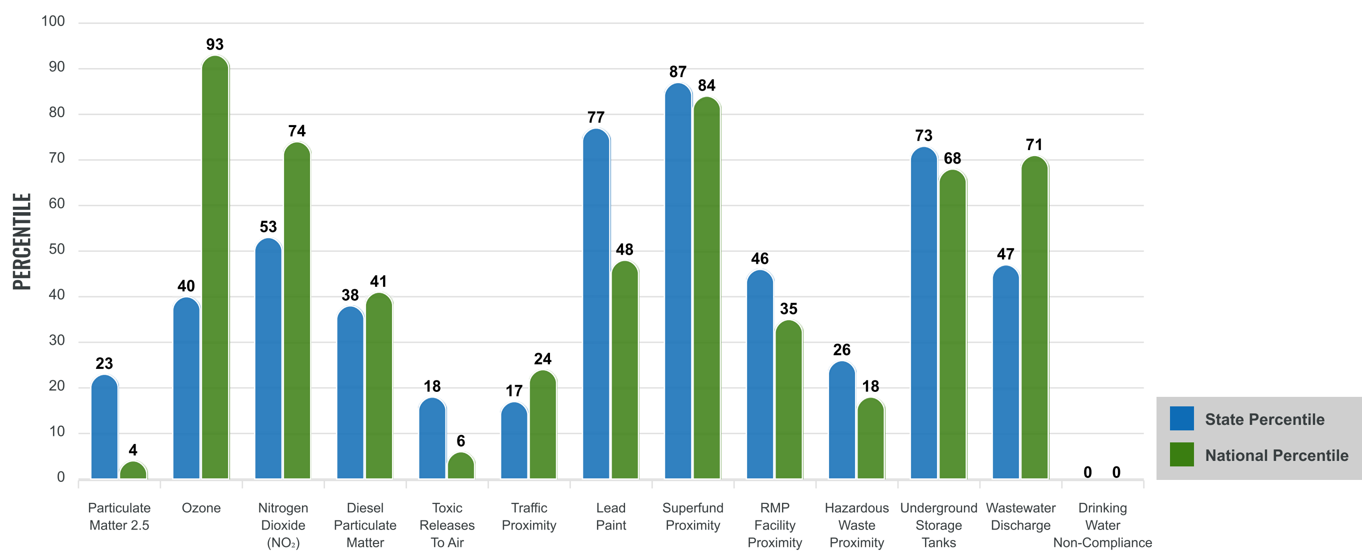
EJ INDEXES FOR THE SELECTED LOCATION



SUPPLEMENTAL INDEXES

The supplemental indexes offer a different perspective on community-level vulnerability. They combine data on percent low income, percent persons with disabilities, percent less than high school education, percent limited English speaking, and percent low life expectancy with a single environmental indicator.

SUPPLEMENTAL INDEXES FOR THE SELECTED LOCATION



Report for 5 miles Ring Centered at 31.959525,-110.282564

Report produced August 5, 2024 using EJScreen Version 2.3

EJScreen Environmental and Socioeconomic Indicators Data

SELECTED VARIABLES	VALUE	STATE AVERAGE	PERCENTILE IN STATE	USA AVERAGE	PERCENTILE IN USA
ENVIRONMENTAL BURDEN INDICATORS					
Particulate Matter 2.5 ($\mu g/m^3$)	5.48	7.4	14	8.45	2
Ozone (ppb)	51.7	53.2	27	41	91
Nitrogen Dioxide (NO_2) (ppbv)	7.9	9.3	24	7.8	53
Diesel Particulate Matter ($\mu g/m^3$)	0.0898	0.209	22	0.191	24
Toxic Releases to Air (toxicity-weighted concentration)	1.3	2,800	11	4,600	5
Traffic Proximity (daily traffic count/distance to road)	100,000	1,900,000	11	1,700,000	17
Lead Paint (% Pre-1960 Housing)	0.11	0.088	78	0.3	36
Superfund Proximity (site count/km distance)	0.59	0.41	92	0.39	85
RMP Facility Proximity (facility count/km distance)	0.085	0.54	35	0.57	30
Hazardous Waste Proximity (facility count/km distance)	0.085	1.5	23	3.5	17
Underground Storage Tanks (count/km^2)	1.6	1.6	67	3.6	59
Wastewater Discharge (toxicity-weighted concentration/m distance)	79	32000	31	700000	53
Drinking Water Non-Compliance (points)	0.15	1.8	61	2.2	74
SOCIOECONOMIC INDICATORS					
Demographic Index USA	1.33	N/A	N/A	1.34	57
Supplemental Demographic Index USA	2	N/A	N/A	1.64	74
Demographic Index State	1.39	1.53	52	N/A	N/A
Supplemental Demographic Index State	1.75	1.43	71	N/A	N/A
People of Color	26%	44%	31	40%	44
Low Income	39%	31%	67	30%	69
Unemployment Rate	6%	6%	67	6%	68
Limited English Speaking Households	2%	4%	61	5%	64
Less Than High School Education	9%	12%	55	11%	53
Under Age 5	5%	5%	53	5%	52
Over Age 64	31%	21%	80	18%	89

*Diesel particulate matter index is from the EPA's Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

Sites reporting to EPA within defined area:

Superfund 1
Hazardous Waste, Treatment, Storage, and Disposal Facilities 0
Water Dischargers 3
Air Pollution 0
Brownfields 0
Toxic Release Inventory 1

Other community features within defined area:

Schools 8
Hospitals 1
Places of Worship 12

Other environmental data:

Air Non-attainment .... No
Impaired Waters .... Yes

Selected location contains American Indian Reservation Lands* .... No
Selected location contains a "Justice40 (CEJST)" disadvantaged community .... Yes
Selected location contains an EPA IRA disadvantaged community .... Yes

Report for 5 miles Ring Centered at 31.959525,-110.282564

Report produced August 5, 2024 using EJScreen Version 2.3

EJScreen Environmental and Socioeconomic Indicators Data

HEALTH INDICATORS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Low Life Expectancy	20%	19%	55	20%	56
Heart Disease	10.2	5.9	93	5.8	98
Asthma	11.2	10.5	79	10.3	77
Cancer	9.6	6.7	86	6.4	96
Persons with Disabilities	24.5%	14.2%	91	13.7%	94

CLIMATE INDICATORS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Flood Risk	8%	6%	76	12%	57
Wildfire Risk	98%	48%	71	14%	94

CRITICAL SERVICE GAPS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Broadband Internet	13%	12%	66	13%	60
Lack of Health Insurance	9%	11%	50	9%	63
Housing Burden	No	N/A	N/A	N/A	N/A
Transportation Access Burden	Yes	N/A	N/A	N/A	N/A
Food Desert	Yes	N/A	N/A	N/A	N/A

Report for 5 miles Ring Centered at 31.959525,-110.282564

Report produced August 5, 2024 using EJScreen Version 2.3