

RULE 1407

Control of Emissions of Arsenic, Cadmium and Nickel From Non-Ferrous Metal Melting Operations

(a) Purpose

The purpose of this rule is to reduce emissions of arsenic, cadmium, and nickel from non-ferrous metal melting operations.

(b) Applicability

This rule applies to all persons who own or operate non-ferrous metal melting operation(s), including but not limited to, smelters (primary and secondary), foundries, die-casters, coating processes (galvanizing and tinning) and other miscellaneous processes such as dip soldering, brazing and aluminum powder production.

For the purpose of this rule, the following definitions shall apply:

- (1) ALUMINUM AND ALUMINUM-BASED ALLOY is any metal that is at least 80 percent aluminum by weight.
- (2) CLEAN ALUMINUM SCRAP is scrap that is composed solely of aluminum or aluminum alloys (including anodized aluminum) and that is free of paints, oils, greases, coatings, rubber, or plastics.
- (3) COPPER OR COPPER BASED ALLOY is any metal that is more than 50 percent copper by weight, including, but not limited to, brass and bronze.
- (4) DISTRICT is the South Coast Air Quality Management District.
- (5) DUST FORMING MATERIAL is any material containing more than 15 percent by weight of particulate matter less than 0.84 millimeter (mm) equivalent diameter as determined by ASTM C136-84a "Standards for Sieve Analysis of Fine and Coarse Aggregates" using a Number 20 U.S. Bureau of Standards sieve with 0.84-mm square openings or an alternate method deemed acceptable by the Executive Officer or his designee.

- (6) EMISSION COLLECTION SYSTEM is any equipment installed for the purpose of directing, taking in, confining, and conveying an air contaminant, and which conforms to design and operation specifications given in the most current edition of Industrial Ventilation, Guidelines and Recommended Practices, published by the American Conference of Government and Industrial Hygienists (20th Edition or thereafter) at the time a complete permit application is on file with the District.
- (7) EMISSION POINT is any location where molten metal is or can be exposed to air, including, but not limited to, furnaces, crucibles, refining kettles, ladles, tap holes, pouring spouts, and slag channels. A mold or die in which metal is cooling is not considered an emission point.
- (8) ENCLOSED STORAGE AREA is any space used to contain materials that has a wall or partition on at least three sides or three-quarters of its circumference and that screens the materials stored therein to prevent emissions of the material to the air.
- (9) FACILITY is any real or personal property which is located on one or more contiguous or adjacent parcels of property in actual contact or separated solely by a public roadway or other public right-of-way and is owned or operated by the same person or person(s), corporation, government agency, public district, public officer, association, joint venture, partnership, or any combination of such entities.
- (10) FUGITIVE EMISSIONS are emissions from sources that enter the atmosphere without passing through a stack or vent designed to direct or control their flow or that escape from a properly designed and operated emission collection systems. Fugitive emissions broadly include emissions from process or open sources. Process sources include, but are not limited to, emissions from storage and handling of materials such as baghouse dust. Open sources include, but are not limited to, emissions from entrainment of solid particulates by the forces of wind or machinery acting on exposed sources such as dust settled from charging and tapping of metallurgical furnaces.
- (11) FUGITIVE EMISSIONS CONTROL is any equipment, activity, or process that is utilized to reduce fugitive emissions.
- (12) GOOD OPERATING PRACTICES are any specific activities necessary to maintain the collection and control efficiencies as designed and permitted for. These activities include, but are not limited to, verifying operating specifications such as production throughput, temperature control, cleaning cycles, air flow and velocity, and inspecting equipment, such as filter cartridges or bags in a baghouse, pressure gauges, duct work, blowers and components of the control equipment, through a general maintenance and inspection program.
- (13) HARD LEAD is any alloy containing at least 90 percent lead and more than 0.001 percent arsenic by weight or 0.001 percent cadmium by weight.

- (14) **MOLTEN METAL** is metal or metal alloy in a liquid state, in which a cohesive mass of metal will flow under atmospheric pressure and take the shape of a container in which it is placed.
- (15) **METAL MELTING FURNACE** is any apparatus in which metal in a container is brought to a liquid state including, but not limited to, reverberatory, cupola, induction, direct arc furnaces, sweat furnaces, and refining kettles, regardless of the heating mechanism. **METAL MELTING FURNACE** does not include any apparatus in which the metal is heated but does not reach a molten state, such as a sintering furnace or an annealing furnace.
- (16) **NEW SAND** is any sand not exposed to the casting process.
- (17) **NON-FERROUS METAL** is any metal that contains aluminium, arsenic, cadmium, copper, lead, zinc or their alloys.
- (18) **PARTICULATE MATTER OR PM** is any material, except uncombined water, which exists in a finely divided form at standard conditions of temperature and pressure (293° K and 760 mm mercury).
- (19) **FINE PARTICULATE MATTER** or PM₁₀ is any material, except uncombined water, which exists in a finely divided form, less than 10 microns in size, at standard conditions of temperature and pressure (293° K and 760 mm mercury).
- (20) **PARTICULATE MATTER CONTROL SYSTEM** is any device or series of devices designed and operated in a manner intended to remove or reduce fine particulate matter (<10 um) from an air or gas stream.
- (21) **PERSON** is any firm, business establishment, association, partnership, corporation or individual, whether acting as principal, agent, employee or other capacity, including any governmental entity or charitable organization as defined in Health and Safety Code Section 39047.
- (22) **PROCESS EMISSION CONTROL** is any equipment installed and operated to control emissions of toxic metals from any emission point.
- (23) **PURE LEAD** is any alloy that is at least 90 percent lead and contains no more than 0.001 percent cadmium by weight and no more than 0.001 percent arsenic by weight.
- (24) **RINGLEMANN CHART** is the Ringlemann Chart published in the United States review of Mine Information Circular No. 1C8333, (May 1967), as specified in Health and Safety Code Section 41701 (b).

- (25) RERUN SCRAP is any material that includes sprues, gates, risers, foundry returns, and similar material intended for remelting that has been generated at the facility as a consequence of casting or forming process but has not been coated or surfaced with any material containing cadmium, arsenic, or nickel.
- (26) SCRAP is any metal or metal-containing material that has been discarded or removed from the use for which it was produced or manufactured and which is intended for reprocessing. This does not include rerun scrap.
- (27) SOLDER is any metal in which the sum of the lead and tin content is greater than 50 percent by weight and which is used to join two metals or join a metal to any other material.
- (28) TYPE METAL is any lead-based alloy used for Linotype machines.

(d) Requirements

Any person who owns or operates a non-ferrous metal melting facility shall be in compliance with all the requirements specified in subdivisions (d) and (e), no later than July 6, 1996.

- (1) All emission points shall be vented to an emission collection system designed and operated in accordance with the manufacturer specifications, which was submitted in the permit application to the District, and the conditions specified in the issued permit.
- (2) The gas stream from any emission collection system shall be ducted to a control device which shall reduce the particulate emissions by 99 percent or more by weight.
- (3) The temperature of the gas stream entering any particulate matter control device that is part of the emission collection system shall not exceed 360 degrees Fahrenheit, unless it can be demonstrated and is approved in writing by the District, that a control efficiency of 99 percent or more for arsenic and cadmium will be achieved at a higher temperature.
- (4) The control efficiency of the particulate control device shall be determined by a source test conducted in accordance with SCAQMD Method 5.2 - Determination of Particulate Matter Emissions From Stationary Sources Using Heated Probe and Filter. An alternate test method to Method 5.2 may be used if it is approved by the Executive Officer or his designee and the Executive Officer or his designee of the California Air Resources Board. The control efficiency shall be calculated using the following equation:

$$\frac{C_{in} - C_{out}}{C_{in}} \times 100 = \% \text{ emission reduction}$$

- Where:
- C_{in} = mass of particulate matter at the inlet to the control device
 - C_{out} = mass of particulate matter at the outlet of the control device
 - Mass = sum of filter catch, probe catch, impinger catch, and solvent extract

The Executive Officer or his designee may require additional source testing periodically to verify continued compliance or when the process is changed.

- (5) Good operating practices shall be used by the facility, and demonstrated through a maintenance program and the use of measuring devices, or other procedures approved by the District, to maintain air movement and emission collection efficiency by the system consistent with the design criteria for the system.

(A) Maintenance Program

The maintenance program shall specify at a minimum the following:

- (i) Maximum allowable variation from designed values of operating parameters, such as air velocity in the hood and ducts and pressure drop across the control device.
- (ii) Areas to be visually inspected, such as the clean side of the baghouse and ducts operating under positive pressure, and the required frequency of such inspections.
- (iii) Methods of documenting compliance with these requirements, such as a log of such inspections and records of observations and measurements.

(B) Measuring Devices

- (i) Flow Meter
Flow meter(s) shall be installed in the collection system to indicate the air velocity in the duct leading to or from the control device.
- (ii) Pressure Gauge
A magnehelic or a light sensitive gauge shall be installed to indicate the pressure drop. This gauge should have a high and low setting for the pressure drop and should trigger an alarm system when the high or low set points are exceeded or the cleaning cycle when the high set point is reached.

- (iii) Broken Bag Detector
A broken bag detector with an alarm system shall be installed in the dry filter control device to sound an alarm, if there are broken or damaged filter media or leaks in the baghouse.
- (iv) Temperature Gauge
A thermocouple and a temperature controller to monitor the temperature to the inlet of the control device shall be installed.

(e) Fugitive Emission Control

- (1) No activity associated with non-ferrous metal melting at a facility, including furnace operation, casting, emission control system operation, and the storage, handling, or transfer of any materials (except new sand), shall discharge into the air any air contaminant, other than uncombined water vapor, for a period aggregating more than three minutes in any one hour which is:
 - (A) Half as dark or darker in shade as that designated as Number 1 on the Ringlemann Chart, as published by the United States Bureau of Mines, or
 - (B) Of such opacity so as to obscure an observer's view to a degree equal to or greater than smoke as described in subparagraph (e)(1)(A) or 10 percent opacity.
- (2) Dust-forming material including, but not limited to, dross, ash, or feed material, shall be stored in an enclosed storage area or stored in a manner which meets the requirements of paragraph (e)(1).
- (3) Material collected by a particulate matter control system shall be discharged into closed containers or an enclosed system that is completely sealed to prevent any dust emissions.
- (4) Surfaces that are subjected to vehicular or foot traffic shall be vacuumed, wet mopped, or otherwise maintained in accordance with a District approved housekeeping plan, which shall be submitted as part of the compliance plan.

(f) Compliance Schedule

- (1) All facilities subject to this rule, including those seeking an exemption pursuant to paragraph (i)(1) and/or (i)(2), shall submit a compliance plan no later than January 6, 1995, to show how they will comply with all the applicable provisions of the rule or to demonstrate proof of exemption.

The compliance plan shall, at a minimum, contain the following information:

- (A) how the exemptions (i)(1) and/or (i)(2) may apply;
- (B) how the control measure or proposed alternate control measure, (h), will meet the requirements of (d)(1) through (d)(4);
- (C) how the maintenance program measures for the control device will ensure continuous compliance; and,
- (D) how the housekeeping measures will minimize fugitive emissions.

Those seeking exemptions pursuant to (i)(3) through (i)(6), may submit in writing a letter, instead of a compliance plan, to the District, providing proof of exemption.

- (2) Facilities required to install or modify control equipment pursuant to this rule shall submit permit to construct application(s) by no later than July 6, 1995, and shall comply with the rule no later than July 6, 1996.

(g) Recordkeeping

- (1) Facilities subject to subdivision (d) shall maintain on site for a period of two years, and make available to the District upon request, a record of the results of any source testing required by the District to demonstrate that the particulate matter control device(s) are operating as required by paragraph (d)(2).
- (2) Facilities seeking an exemption under paragraphs (i)(1) and/or (i)(2) or (i)(3) shall maintain for two years records of the amount and type of metal processed in those furnaces including results of analyses as required to support exemption under paragraph (i)(2). These records shall be made available to the District upon request.

(h) Alternative Emission Control

The District may approve an alternative emission control measure proposed by a facility if the facility operator can demonstrate to the satisfaction of the Executive Officer or his designee that the alternative control measure is enforceable, achieves equivalent or greater reductions in emissions and risk, and achieves the reduction within the same time period as required by this rule. The Executive Officer or his designee shall revoke this approval if the facility operator fails to adequately implement the alternative approach or the alternative approach does not reduce emissions as required.

(i) Exemptions

(1) Small Quantity Exemptions.

A facility shall be exempt from subdivisions (d) and (e), if they meet either one of the following conditions:

- (A) The facility melts a total of no more than one ton per year of all non-ferrous metals, or
- (B) For facilities melting solely metals listed in Table I, [not including any metal or alloy that meets the purity exemption of paragraph (i)(2)], the eligibility for exemption shall be determined using the following formula:

$$A/A_0 + B/B_0 + C/C_0 + \dots <= 1$$

Where A, B, C, ..., are quantities of Table I metals melted and A₀, B₀, C₀, ..., are the exemption limits listed in Table I.

- (i) For each metal listed in Table I, divide the quantity melted by the specific exemption limit listed.
- (ii) Sum the resulting fractions for all the metals.
- (iii) If the sum does not exceed 1.0, the facility qualifies for exemption under paragraph (i)(1).

Table I
Exemption Limits For Metal Melted

<u>Metal</u>	<u>Exemption Limit</u> (tons per year)
Pure Lead	400
Hard Lead	200
Aluminum Scrap	125
Aluminum Ingot containing more than 0.004 percent cadmium or 0.002 percent arsenic by weight	125
Solder	100
Zinc Scrap	30
Copper or copper-based alloys (except scrap) containing more than 0.004 percent cadmium or 0.002 percent arsenic by weight	30
Type Metal	25

(2) Metal or Alloy Purity Exemption

Facilities or furnaces which do not melt scrap except clean aluminum scrap or rerun scrap and which melt a metal or alloy (other than metals listed in Table I) which is shown by laboratory analysis to have less than 0.004 percent of cadmium and less than 0.002 percent of arsenic by weight are exempt from subdivisions (d) and (e).

(3) Clean Aluminum Scrap

Furnaces used exclusively to process clean aluminum scrap or a mixture of clean aluminum scrap and aluminum ingot to produce extrusion billet are exempt from paragraphs (d)(1) through (d)(5).

(4) Aluminium Scrap Furnaces

The combustion chamber in a reverberatory furnace is exempt from the requirements of paragraphs (d)(1) through (d)(5) if the furnace meets the following conditions:

- (A) The furnace is used solely to melt aluminum and aluminum based alloys; and,
- (B) The furnace is constructed with a charging well or similar device in which feed is added to molten metal in a separate chamber.

(5) Aluminum Pouring Exemption

Ladles, launders or other equipment used to convey aluminum from a melting or holding furnace to casting equipment is exempt from the requirements of paragraphs (d)(1) through (d)(5).

(6) Rule 1420 - Emissions of Lead

Facilities that emit lead and who have demonstrated 99 percent or greater control efficiency for particulate matter or 98 percent or greater for lead pursuant to the requirement of Rule 1420 paragraph (e)(2), shall be exempt from the requirement of paragraph (d)(2) provided:

- (A) The source test method used meets the requirement of paragraph (d)(4) for particulate matter or SCAQMD Method 12.1 for lead; and,
- (B) The inlet temperature to the control device meets the requirement of paragraph (d)(3).

(7) Control Devices for Fugitive Emissions

Devices used solely to control fugitive emissions are exempt from the requirements of (d)(1) through (d)(5).

(j) Applicable Material Testing Methods

One of the following methods as identified in paragraphs (j)(1) through (j)(7) or an alternate method deemed acceptable by the Executive Officer or his designee shall be used. Sampling for these methods shall comply with ASTM E 88-58 (1986), "Standard Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition."

- (1) To determine the composition of alloys defined in paragraph (c) (1) and to determine the cadmium content of aluminum alloys to evaluate eligibility for exemption under paragraph (i) (2), one of the following methods shall be used:
 - (A) ASTM E 227-67 (1982), "Standard Method for Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Point-to-Plane Technique."
 - (B) ASTM E 607-90, "Standard Method for Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Point-to-Plane Technique, Nitrogen Atmosphere;" or
 - (C) ASTM E 1251-88, "Standard Method for Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Argon Atmosphere, Point-to-Plane Unipolar Self-Initiating Capacitor Discharge."
- (2) To determine alloy composition as defined in paragraphs (c)(13) and (c)(23), ASTM E 117-64 (1985) "Standard Method for Spectrographic Analysis of Pig Lead by the Point-to-Plane Technique" shall be used.
- (3) To determine alloy composition as defined in paragraph (c)(26), ASTM E 46-87 "Test Method for Chemical Analysis of Lead and Tin-Base Solder" shall be used.
- (4) To determine cadmium concentration in zinc and zinc alloys to evaluate eligibility for exemption under paragraph (i)(2), ASTM E 536-84 (1988), "Standard Test Method for Chemical Analysis of Zinc and Zinc Alloys" shall be used.
- (5) To determine cadmium concentration in copper and copper based alloys to evaluate eligibility for exemption under paragraph (i)(2), ASTM E 53-86a "Standard Test Method for Chemical Analysis of Copper" shall be used.

- (6) To determine arsenic concentration in copper or copper based alloys to evaluate eligibility for exemption under paragraph (i)(2), ASTM E 62-89, "Standard Test Method for Chemical Analysis of Copper and Copper Alloys" shall be used.
- (7) To determine arsenic content in aluminum or zinc (or any other alloy in which determination of arsenic by spectrochemical methods is compromised by interference) to evaluate eligibility for exemption under paragraph (i)(2), US-EPA Method 7061 (Revision 1, December, 1987), "Arsenic (Atomic Absorption, Gaseous Hydride)," U.S. EPA Test Methods for Evaluating Solid Waste Physical and Chemical Methods, First Update (3rd Edition), January, 1988; EPA/530/SW-846.3-1; PB 89-14876 shall be used. For aluminum alloys, sample digestion shall employ the hydroxide digestion technique listed in Attachment A.

[SIP: Not SIP]

ATTACHMENT A

Digestion of Metal Aluminum Sample for Determining Arsenic

1. Introduction:

Metal aluminum cannot react with nitric acid or concentrated sulfuric acid. It can dissolve in dilute sulfuric acid or hydrochloric acid. Active hydrogen, generated during the acid digestion process, will reduce arsenic to AsH_3 , which will escape from solution, resulting in a low or negative arsenic value. The proposed method sets up a protocol to dissolve metal alumina without loss of arsenic.
2. Reagent:

3M NaOH, 10% HgSO_4 Solution, 30% H_2O_2
1:1 H_2SO_4 , Concentrated HNO_3 , Tiling Copper.
3. Procedure:
 - 3.1. Dissolve
 - 3.1.1 Dissolve using NaOH (Method 1).

Weigh 0.5 g of metal aluminum sample to a 125 ml Erlenmeyer flask, add 15 ml of 3M NaOH solution, allow to react and dissolve about 20 minutes. Again add 10 ml of 3M NaOH, continue reaction until no gas bubbles are present and the sample is dissolved completely.
 - 3.1.2 Dissolve using HgSO_4 (Method 2).

Weigh 0.5 g of metal aluminum sample to a 125 ml Erlenmeyer flask, add 10 ml of 10% HgSO_4 solution and 5 ml of 30% H_2O_2 . After 20 minutes, add appropriate amount of HgSO_4 . Allow reaction to continue until no gas bubbles are present. Add metal copper strips (large surface area) into the sample solution. After 10 minutes, withdraw the copper strips and add new copper strips. Repeat until the surface of copper strips in sample solution do not change to a silver color. Withdraw all copper strips from sample solution.
 - 3.2 Digestion

Add 3 ml of concentrated HNO_3 , 5 ml of 1:1 H_2SO_4 into the sample solution obtained from 3.1.1 or 3.1.2. Heat slowly and evaporate the sample solution until SO_3 fumes are present for 5 minutes. Cool and dilute the sample to 50.0 ml. Determine Arsenic by Atomic Absorption method.