United States Environmental Protection Agency

Implementation of the 2008 Lead National Ambient Air Quality Standards

Guide to Developing Reasonably Available Control Measures (RACM) for Controlling Lead Emissions

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Implementation of the 2008 Lead National Ambient Air Quality Standards Guide to Developing Reasonably Available Control Measures (RACM) for Controlling Lead Emissions

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List of Acronyms

BDT	Best Demonstrated Technology
BOPF	Basic Oxygen Process Furnace
BOPH	Basic Oxygen Process Heater
CAA	Clean Air Act
CFR	Code of Federal Regulations
EAF	Electric Arc Furnace
EIF	Electric Induction Furnace
EPA	Environmental Protection Agency
FR	Federal Register
GACT	Generally Available Control Technology
HAP	Hazardous Air Pollutant
HEPA	High Efficiency Particulate Air
MACT	Maximum Available Control Technology
NAAQS	National Ambient Air Quality Standard
NAICS	North American Industry Classification System
NEI	National Emissions Inventory
NESHAP	National Emission Standards for Hazardous Air Pollutants
NSPS	New Source Performance Standard
PM	Particulate Matter
RACM	Reasonably Available Control Measure
RACT	Reasonably Available Control Technology
SCAQMD	South Coast Air Quality Management District
SIP	State Implementation Plan
TPY	Tons Per Year
WESPs	Wet Electrostatic Precipitators

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1.0. INTRODUCTION.

1.1. Purpose – Supporting the Implementation of the 2008 Lead NAAQS by Analyzing Relevant Control Measures for RACM Development.

In order to support the implementation of the 2008 Lead National Ambient Air Quality Standards (NAAQS), this document contains an analysis of air control measures for the purpose of determining what controls may constitute reasonably available control measures (RACM), including reasonably available control technologies (RACT), for controlling lead emissions pursuant to Section 172(c)(1) of the Clean Air Act (CAA). This document was prepared pursuant to EPA Contract EP-D-07-001, Work Assignment # 4-10, by EC/R Incorporated.

This document identifies control measures used to control lead emissions from sources in the Secondary Lead Smelting, Lead Acid Battery Manufacturing, Iron and Steel Mills, and Iron and Steel Foundries source categories. For each identified control measure, this document contains a RACM criteria assessment to determine how likely each control measure is to constitute RACM. In addition, for the Primary Lead Smelting, Secondary Aluminum Production, Secondary Copper Smelting, Mining, and Petroleum Refineries source categories, data relevant to a RACM determination was collected from EPA's CoST database and is presented here for a RACM criteria assessment.

A prior EPA document identifies potential RACM for controlling lead emissions.[1] This document, "Implementation of the 2008 Lead National Ambient Air Quality Standards (NAAQS): Guide to Developing Reasonably Available Control Measures (RACM) for Controlling Lead Emissions," is intended to replace such prior document, and any other EPA-issued document, with respect to identifying RACM for controlling lead emissions.

1.2. The 2008 Lead NAAQS and RACM Requirements.

On November 12, 2008, EPA published the final rule on the Lead NAAQS. Based on its review, EPA made revisions to the primary and secondary Lead NAAQS to provide requisite protection of the public health and welfare. EPA revised the primary standard to provide increased protection for children and other at-risk populations against an array of adverse health effects. Such health effects most notably include neurological effects in children, including neurocognitive and neurobehavioral effects. EPA revised the level from 1.5 to 0.15 micrograms per cubic meter ($\mu g/m^3$). EPA revised the secondary standard to be identical in all respects to the revised primary standard.[2]

The CAA requires that states submit for each nonattainment area a state implementation plan (SIP) that contains RACM, including RACT. Specifically, section 172(c)(1) of the CAA requires that nonattainment SIPs "provide for the implementation of all *reasonably available control measures* as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of *reasonably available control technology*) and shall provide for the attainment of the NAAQS [emphasis added]."[3]

The first step in addressing RACM for the 2008 Lead NAAQS is to identify potential measures for controlling lead emissions from lead sources in nonattainment areas. In addition, if states are aware of

[1] "Lead Guideline Document," EPA-452/R-93-009, April 1993.
[2] National Ambient Air Quality Standards for Lead; Final Rule, 73 FR 66964, 67036 (Published November 12, 2008).
[3] Id. at 67036.

information or receive substantive public comments that demonstrate through appropriate documentation that additional control measures may be reasonably available in a specific area, the measures should be added to the list of available measures for consideration in that particular area.[4]

While EPA does not presume that control measures are reasonably available in all areas, a reasoned justification for rejection of any available control measure should be prepared. If it can be shown that such control measures, if applied to individual sources or to a source category, are unreasonable because emissions from the affected sources are insignificant (i.e., would not have any effect on attainment), then the control measures may be excluded from further consideration as they would not be representative of RACM for the affected area. The resulting control measures should then be evaluated for reasonableness, considering their technological feasibility and the cost of control in the area for which the SIP applies.[5]

[4] Id.
[5] Id.

2.0. EPA CRITERIA AND PROCEDURES FOR RACM DEVELOPMENT.

This section provides EPA criteria and procedures for the development of RACM, which will be used in subsequent sections to assess how likely each control measure is a RACM.

2.1. EPA Criteria for Determining whether a Control Measure is a RACM.

EPA provides that in determining whether a control measure is a RACM, the following factors should be considered:

1. The economic feasibility of the control measure,
2. The capital costs, annualized cost, and cost effectiveness of the control measure; and
3. The extent of adoption of the control measure by state regulations.[6]

2.1.1. The Economic Feasibility of the Control Measure.

The economic feasibility of a control measure refers to the cost of reducing emissions and the difference between the cost of the control measure at the particular source in question and the costs of control measures that have been implemented at similar sources. Economic feasibility is largely determined by evidence that other sources in a particular source category have applied the control measure in question, although EPA does encourage the development of innovative measures not previously employed that may be technically and economically feasible. Absent other indications, EPA, as a general matter, expects that it is reasonable for similar sources to bear the costs for similar control measures.[7]

2.1.2. The Capital Costs, Annualized Costs, and Cost Effectiveness of the Control Measure.

Substantial weight should be given to cost effectiveness in evaluating whether a control measure is a RACM. The cost effectiveness of a technology is its annualized cost (e.g, $/year) divided by the emissions reduced (e.g., tons/year) which yields a cost per amount of emission reduction (e.g., $/ton).[8]

In considering what level of control is reasonable, EPA has not adopted a specific dollar per ton cost threshold. However, a control measure is likely to be a RACM if it has a cost per ton similar to other measures previously employed for that pollutant, or similar to that of other measures needed to achieve expeditious attainment in the area within the CAA's timeframes. A higher cost per ton value may be reasonable in areas with more serious air quality problems than in areas with less serious problems because it is expected that the residents in the areas with more serious air quality problems could realize greater public health benefits from attaining the standard as expeditiously as practicable. A higher cost per ton value also may be reasonable in areas where essential reductions are difficult to achieve (e.g., because many sources are already controlled).[9]

In addition, EPA believes that in determining appropriate emission control levels, the state should consider the collective public health benefits that can be realized in the area due to projected

[6] Id. at 67035-67037.
[7] Id. at 67036.
[8] Id.
[9] Id.

improvements in air quality.[10] One such collective public health benefit might be improved air quality in areas with large demographic populations that are the subject of environmental justice concerns, as more expensive control measures might be more reasonable for sources in a nonattainment area with large demographic populations that are the subject of environmental justice concerns. Considering environmental justice concerns in this way is consistent with EPA Plan EJ 2014, which represents a strategy aimed at protecting health in communities that are over-burdened by pollution.[11]

2.1.3. The Adoption of Control Measures by States.

The fact that a control measure has been adopted or is in the process of being adopted by states is an indicator that the measure may be a RACM.[12] This document will specifically focus on the state regulations and permit requirements that pertain to source categories with corresponding sources in such states.

Similarly, the fact that EPA has identified a control measure as a generally available control technology (GACT), best demonstrated technology (BDT), or a maximum available control technology (MACT) might also suggest that the control measure is reasonably available. EPA identifies control measures as GACT when promulgating National Emission Standards for Hazardous Air Pollutants (NESHAP) for area sources in a source category. In determining what constitutes GACT for a particular area source category, EPA evaluates the control technologies and management practices that are generally available for the area sources in a source category that reduce hazardous air pollutants (HAP). EPA may consider costs in determining what constitutes GACT for the area source category.[13] The fact that EPA has considered a control measure GACT after considering costs would generally suggest that such a control measure is likely a RACM.

EPA identifies control measures as BDT when promulgating New Source Performance Standards (NSPS). BDT refers to the best system of continuous emissions reduction that has been demonstrated to work in a given industry, considering economic costs and other factors, such as energy use.[14] The fact that EPA has considered a control measure BDT after considering costs would generally suggest that such a control measure is a RACM.

EPA identifies control measures as MACT when promulgating NESHAP standards for major sources in a source category. For major sources, MACT standards must reflect the maximum degree of emissions reductions of HAP achievable after considering cost, energy requirements, and non-air quality health and environmental impacts. The MACT ''floor'' is the minimum control level allowed for MACT standards promulgated under CAA section 112(d)(3) and may not be based on cost considerations. For new sources, the MACT floor cannot be less stringent than the emissions control that is achieved in practice by the best controlled similar source. The MACT floors for existing sources can be less stringent than floors for new sources, but they cannot be less stringent than the average emissions limitation achieved by the best performing 12 percent of existing sources in the category or subcategory (or the best performing five sources for categories or subcategories with fewer than 30 sources).[15] In

[10] Id.
[11] EPA Plan EJ 2014, EPA Office of Environmental Justice (Published September 2011).
[12] National Ambient Air Quality Standards for Lead; Final Rule, 73 FR 66964, 67036 (Published November 12, 2008).
[13] See, for example, NESHAP for Area Source: Acrylic and Modacrylic Fibers Production, Carbon Black Production, Chemical Manufacturing, Flexible Polyurethane Foam Production and Fabrication, Lead Acid battery Manufacturing, and Wood Preserving; Final Rule, 72 FR 38864, 38880 (Published July 16, 2007).
[14] NSPS for Portland Cement Manufacturing, 75 CFR 54970, 54974-54975 (Published September 9, 2010).
[15] See, for example, Proposed NESHAP for Iron and Steel Foundries, 67 CFR 78274, 78276 (Published December 23, 2002).

some circumstances, such as when a large amount of time has passed since a control measure was identified as MACT, the fact that a control technology was identified as MACT might suggest that such a control measure is a RACM.

2.2. Using Particulate Matter Cost-Effectiveness Information as a Surrogate for Lead Cost-Effectiveness Information.

As indicated in Section 2.1, cost-effectiveness information is an important factor to consider when determining whether a control measure is a RACM. However, cost-effectiveness information for controlling lead is often limited. Consequently, EPA often uses the cost-effectiveness information for controlling particulate matter (PM) for a control measure as a surrogate for the cost-effectiveness of controlling lead for the measure. That is, EPA will use evidence that suggests that a control measure is cost effective for controlling PM emissions to support the contention that the control measure is also cost effective for controlling lead emissions.

For example, for the development of RACM/RACT for the 2008 Lead NAAQS, EPA guidance indicates that states should rely on the RACM guidance issued for PM. Regulations and guidance that address the implementation of pre-existing NAAQS for lead are mainly provided in the following documents: (1) ‘‘state Implementation Plans; General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990,’’57 FR 13549, April 16, 1992, (2) ‘‘state Implementation Plans for Lead Nonattainment Areas; Addendum to the General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990,’’58 FR 67748, December 22, 1993, and (3) regulations listed at 40 CFR 51.117.[16]

In accordance with such EPA guidance, when lead cost-effectiveness information is limited for a control measure, this document contains cost-effectiveness data for controlling PM for control measures to glean whether the control measure might also be cost effective for controlling lead. However, it is important to note that the cost-effectiveness for a control measure at a specific facility depends on many factors such as the type, size and amount of emissions; the layout of the facility; control technology specifications and several other factors. Consequently, it will not always be the case that a control measure that is cost effective to control PM at one facility will be cost effective to control lead at the same facility, at another facility within the same source category, or at another facility from a different source category.

[16] National Ambient Air Quality Standards for Lead; Final Rule, 73 FR 66964, 67030 (Published November 12, 2008).

3.0. OVERVIEW OF RACM DEVELOPMENT FOR THE IMPLEMENTATION OF THE 2008 LEAD NAAQS.

This section provides an overview of RACM development for the 2008 Lead NAAQS. Section 3.1 explains why this document assesses control measures for RACM development within the context of source categories. Section 3.2 explains why this document focuses on certain source categories - Secondary Lead Smelting, Lead Acid Battery Manufacturing, Iron and Steel Foundries, and Iron and Steel Mills – for RACM development. Section 3.3 provides a strategy for RACM development for sources in source categories not focused on in this document.

3.1. Overview of RACM Development.

This document presents control measures within specific source categories because applying the RACM criteria discussed in Section 2.1[17] is most conveniently analyzed and clearly presented within the context of source categories. For example, economic feasibility of a control measure is largely determined by the extent of adoption by sources is the same source category. Moreover, the cost-effectiveness of a control measure is often more similar (although variable) across a certain source category. In addition, state and federal regulations are generally written for specific source categories and, therefore, the extent to which a control measure is adopted by state/federal regulations is most easily analyzed within the context of source categories.

3.2. Selecting the Source Categories for which RACM Development is Focused on in this Document.

This document focuses on four source categories for which RACM development for the 2008 Lead NAAQS is likely to be most relevant. Some source categories do not emit lead in great enough quantities to cause lead NAAQS exceedances. Other source categories do not have corresponding sources in nonattainment areas with respect to lead and, therefore, no sources will be subject to the RACM requirement. Section 3.2.1 identifies sources categories with corresponding sources in nonattainment areas with respect to lead, and for such source categories, Section 3.2.2 provides an assessment of how relevant RACM development would likely be for each source category. Sections 4 through 7 present control measures relevant to each of the four selected source categories and assess he likelihood that each such control measure would constitute a RACM.

3.2.1. <u>Identification of Lead-Emitting Sources in Nonattainment Areas with respect to the 2008 Lead NAAQS.</u>

The task of identifying the lead-emitting sources in nonattainment areas with respect to the 2008 Lead NAAQS is a two-step process. First, the nonattainment areas with respect to the 2008 Lead NAAQS must be identified. Then, the lead-emitting sources within such nonattainment areas can be identified.

In order to identify the areas of nonattainment with respect to the 2008 Lead NAAQS, EPA's Area Designations for 2008 Lead Standards Website was reviewed.[18] Specifically, the counties and specific

[17](1) The economic feasibility of the control measure, as indicated by extent of adoption; (2) the capital costs, annualized cost, and the cost effectiveness of the control measure; and (3) the extent of adoption of the control measure by state regulations.

[18]EPA's Area Designations for 2008 Lead Standards Website (Accessed December, 2011).

cities/townships that were in nonattainment were identified in the designation support documents for each specific state as of December 1, 2011.[19] Table 3-1 provides a summary of the nonattainment areas with respect to the 2008 Lead NAAQS. Overall, there were 21 nonattainment areas within 22 counties.

Once the nonattainment areas were identified, the corresponding designation support documents were reviewed and the lead-emitting sources (emitting ≥ 0.10 TPY of lead) in each nonattainment area were identified. In order to determine the corresponding source category for each source, the corresponding North American Industry Classification System (NAICS) code and NAICS description for each source were identified using EPA's National Emission Inventory Database.[20] Table 3-2 provides a summary of the most significant lead-emitting sources in areas of nonattainment with the 2008 Lead NAAQS, with corresponding NAICS codes and descriptions. Table 3-2 also provides the values for emitted TPY of lead for each facility as provided by each state in its respective designation support document, except when indicated otherwise.

EPA's purpose in identifying the lead-emitting sources in nonattainment areas in Table 3-2 is to help determine the source categories for which information related to RACM development will be most useful and relevant. In preparing this draft document, EPA assumed that the source categories with the most and largest lead-emitting sources in nonattainment areas would be the source categories for which information on RACM development would be most useful and relevant. Therefore, this draft document was prepared to provide more in-depth RACM development information in Sections 4 through 8 for such source categories. However, EPA emphasizes that the list of sources identified in Table 3-2 is not an exhaustive list of all the lead-emitting sources in nonattainment areas. In addition, even though EPA focused its search on sources emitting more than 0.10 TPY of lead, EPA recognizes that sources emitting less than 0.10 TPY are might be required to install RACM pursuant to CAA §172(c)(1) and might be significant contributors to NAAQS exceedances.

[19] Puerto Rico Support Document, Pennsylvania Support Document I, Pennsylvania Support Document II, Pennsylvania Support Document III, Alabama Support Document , Tennessee Support Document , Florida Support Document , Illinois Support Document I, Illinois Support Document II, Indiana Support Document , Michigan Support Document , Minnesota Support Document , Ohio Support Document I, Ohio Support Document II, Ohio Support Document III , Texas Support Document , Iowa Support Document , Kansas Support Document , Missouri Support Document I , Missouri Support Document II , California Support Document I. (All documents represent the most recent state designation documents for the 2008 Lead NAAQS as of December, 2011).

[20] EPA's National Emission Inventory Database (Accessed December, 2011).

Table 3-1. Nonattainment Areas with respect to the 2008 Lead NAAQS.

State	Area Name	County Name
Alabama	Troy	Pike (partial)
California	Los Angeles County within the South Coast Air Basin, excluding San Clemente and Santa Catalina Islands (Southern Los Angeles County)	Los Angeles (partial)
Florida	Tampa	Hillsborough (partial)
Illinois	Granite City	Madison (partial)
	Chicago	Cook (partial)
Indiana	Muncie	Delaware (partial)
Iowa	Pottawattamie County	Pottawattamie (partial)
Kansas	Saline County	Saline (partial)
Michigan	Belding	Ionia (partial)
Minnesota	Eagan	Dakota (partial)
Missouri	Iron County	Iron (partial), Dent (partial), Reynolds (partial)
	Jefferson County	Jefferson (partial)
Ohio	Bellefontaine	Logan (partial)
	Cleveland	Cuyahoga (partial)
	Delta	Fulton (partial)
Pennsylvania	Lower Beaver Valley	Beaver (partial)
	Lyons	Berks (partial)
	North Reading	Berks (partial)
Puerto Rico	Arecibo	Arecibo (partial)
Tennessee	Bristol	Sullivan (partial)
Texas	Frisco	Collin (partial)
Total	21 Nonattainment Areas	22 partial counties (parts of Berks County, PA in 2 areas)

Table 3-2. Lead-emitting Sources (≥ 0.10 TPY) in Nonattainment Areas with the 2008 Lead NAAQS

Region	State	County	Source Name	Emissions (TPY)	NAICS Code and Description	
Secondary Lead Smelting						
2	PR	Arecibo	The Battery Recycling Company	1.22	331492	Secondary Smelting, and Alloying of Nonferrous Metal
3	PA	Berks	East Penn Manfg. Co.	0.20	331492	…
3	PA	Berks	Exide Technologies	1.44[21]	331492	…
4	AL	Pike	Sanders Lead Comp.	4.44	331492	…
4	FL	Hills-borough	EnviroFocus Technologies	1.30	331492	…
5	IN	Delaware	Exide Technologies	0.81	331492	…
6	TX	Collin	Exide Corp.	2.0	331492	…
7	MO	Iron, Dent, Reynolds	Buick Resources Recycling	12.1	331492	…
9	CA	LA	Exide Technologies	2.00	335911	…
9	CA	LA	Quemetco Inc.	0.32	331492	…
Lead Acid Battery Manufacturing						
3	PA	Berks	East Penn Manf.	2.49	335911	Storage Battery Manf.
3	PA	Berks	Yuasa Battery Inc.	0.18[22]	335911	…
4	TN	Sullivan	Exide Technologies	0.78	335912	Primary Battery Manf.
7	KS	Salina	Exide Technologies	2.17	335912	…
Iron and Steel Foundries						
5	IL	Madison	ASF-Keystone, Inc. (Amsted Rail)	0.19[23]	331513	Steel Foundries
7	IA	Potta-wattamie	Griffin Pipe Facility	1.20	331515	Iron Foundries
7	KS	Saline	Metlcast Products	0.14	331515	…
Iron and Steel Mills						
5	IL	Madison	US Steel Corp.	1.33[24]	33111	Iron and Steel Mills
7	OH	Fulton	N. Blue-scope Steel	0.19	33111	…
Other Source Categories[25]						
7	MO	Jefferson	Doe Run	59.00[26, 27]	331419	Primary Smelting and

[21] PA state 2008 inventory (As of December 2011).
[22] Id.
[23] 2008 NEI v1.5 (As of December 2011).
[24] Id.
[25] These are source categories with at least one corresponding source in a nonattainment area, which are not focused on in this document. This document focuses on developing RACM for the following source categories: Secondary Lead Smelting, Lead Acid Battery Manufacturing, Iron and Steel Foundries, Iron and Steel Mills
[26] The Regulatory Impact Analysis of the Proposed Revisions to the National Ambient Air Quality Standards for Lead (Published October 2008). Page 7.
[27] EPA's purpose in identifying the lead-emitting sources in nonattainment areas in Table 3-2 is to help determine the source categories for which information related to RACM development will be most useful and relevant. In preparing this draft document, EPA assumed that the source categories with the most and largest lead-emitting sources in nonattainment areas would be the source categories for which information on RACM development would be most useful and relevant. Therefore,

Region	State	County	Source Name	Emissions (TPY)	NAICS Code and Description	
			Herculaneum			Refining of Nonferrous Metal (except Copper and Aluminum)
5	MN	Dakota	Gopher Resource Corp.	0.36[28]	331314	Secondary Smelting and Alloying of Aluminum
5	IL	Cook	H. Kramer & Company	0.12[29]	331423	Secondary Smelting, Refining, and Alloying of Copper
5	MI	Ionia	Mueller Industries	0.80[30]	331421	Copper Rolling, Drawing, and Extruding
2	PR	Arecibo	PREPA Cambalache Combustion Turbine Plant	0.17	221112	Fossil Fuel Electric Power Generation
7	MO	Iron, Dent, Reynolds	Doe Run Company-Buick Mill	0.10	212231	Lead Ore and Zinc Ore Mining
5	IL	Cook	Fisk Electric Generating Station	0.07[31]	221112	Fossil Fuel Electric Power Generation
9	CA	Los Angeles	BP West Coast Products LLC	0.79	324110	Petroleum Refineries
9	CA	Los Angeles	Tesoro LA Refinery	0.15	324110	Petroleum Refineries

3.2.2. Source Categories with Corresponding Sources in Nonattainment Areas for which RACM Development is Likely to be Most Relevant.

RACM development is only relevant for a source category if corresponding sources from the source category are located in nonattainment areas. For such source categories with a least one corresponding source in a nonattainment area, we used four factors to determine which of these source categories to include in this document for further assessment.

The first factor is the number of sources a corresponding source category has in nonattainment areas. The more sources a corresponding source category has in nonattainment areas, the more likely that the source category would be included in this document.

The second factor is the total annual emissions emitted from all the sources within a source category. Specifically, higher emissions are likely to make control measures more cost effective and, therefore, more appropriate to include in this document.

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this draft document was prepared to provide more in-depth RACM development information in Sections 4 through 8 for such source categories. However, EPA emphasizes that the list of sources identified in Table 3-2 is not an exhaustive list of all the lead-emitting sources in nonattainment areas. In addition, even though EPA focused its search on sources emitting more than 0.10 TPY of lead, EPA recognizes that sources emitting less than 0.10 TPY might be required to install RACM pursuant to CAA §172(c)(1) and might be significant contributors to NAAQS exceedances.

[28] 2008 NEI v1.5 (As of December, 2011).

[29] Id.

[30] Id.

[31] Id.

The third factor is the overall number of sources in a corresponding source category. The more sources in a source category, the more likely that a source will be identified as being in an area classified as nonattainment in the future and, therefore, more appropriate to include in this document.

The fourth factor is other reasons cited in designation support documents, such as if modeling indicates that certain sources within a source category are significantly contributing to nonattainment with the NAAQS. Specifically, control measures are more likely to be necessary for a source if emission reductions are needed to attain the NAAQS.

Table 3.3 contains some of the information we used to decide which source categories to cover in this document, including the overall lead emissions from each source category in TPY and the number of sources in each source category.[32]

[32] The Regulatory Impact Analysis of the Proposed Revisions to the National Ambient Air Quality Standards for Lead (Published October 2008). Page 7. (Unless indicated otherwise). Note that in the referenced RIA, the table lists many more source categories and accounts for all lead emissions from stationary sources except for 7.08 % of the total national annual lead emitted. The table was revised in this document to only list the source categories with corresponding lead-emitting sources in nonattainment areas. In the referenced RIA, the smallest lead-emitting source category listed emitted 5 TPY of lead. In the referenced RIA, the source categories of Petroleum Refineries and Fossil Fuel Electric Power Generation were not listed, and therefore, the lead emissions are assumed to be less than 5 TPY.

Table 3-3. Nationwide Lead Emissions from Stationary Source Categories with Corresponding Sources in Current Nonattainment Areas.

Source Category	Annual Emission (Tons Lead/Year)	Number of Sources in Source Category	Relative % of Total Emissions from Stationary Source Categories
Iron and Steel Foundries	83	600+ [33]	6.05
Primary Lead Smelting	59	1 [34]	4.30
Secondary Lead Smelting	44	15 [35]	3.21
Iron & Steel Mills	17	18 [36]	1.24
Lead Acid Battery Manufacturing	17	60 [37]	1.24
Mining	15	Undetermined	1.09
Secondary Aluminum Production	9	Undetermined	0.66
Secondary Copper Smelting	6	Undetermined	0.44
Petroleum Refineries	< 5	Undetermined	< 0.40
Fossil Fuel Electric Power Generation	< 5	Undetermined	< 0.40
Remainder of Lead Emissions from Sources in Other Source Categories			**88%**[38]

Application of the four factors suggests that the following source categories are the most relevant for including in this document: Secondary Lead Smelting, Lead Acid Battery Manufacturing, Iron and Steel Mills, and Iron and Steel Foundries. The source category of Secondary Lead Smelting has the highest number of corresponding sources in nonattainment areas, as shown in Table 3-2. Moreover, such sources have some of the highest annual emissions of lead, with three sources each emitting four tons of lead per year, also shown in Table 3-2. Overall, there are 15 secondary lead smelting sources in the United States.[39] However, this small number of facilities is responsible for the emission of 44 tons of lead per year, which represents 3.21% of all lead emitted, as shown in Table 3-3. Consequently, control measures for this source category are reviewed in this document.

[33] NESHAP for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0002 (Published December, 2002). Page 2-1 .

[34] Memorandum – Summary of Information Collection Request, Received from Source- Doe Run Resources Corporation, From V. Hanzel, RTI International, To Docket. November 19, 2010.

[35] Memorandum –Draft Development of the RTR Emissions Dataset for the Secondary Lead Source Category, From Mike Burr, ERG, To Chuck French of EPA/OAQPS. April 2011. Page 1.

[36] NESHAP for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0002 (Published December, 2002). Page 2-1.

[37] Memorandum – Lead Acid Battery Manufacturing Area Source Category Additional Information to Support Proposed Rule, From Nancy Jones, EC/R, To U.S. EPA Docket Number EPA-HQ-OAR-2006-0897. February 28, 2007. Page 3.

[38] The largest-emitting source categories that make up this 88% are mobile sources (45.44%), Industrial/Commercial/Institutional Boilers & Process Heaters (3.87%), and Hazardous Waste Incinerators (3.43%). All other source categories have relative % of total lead emissions of less than 2%. Generally, many of the source categories that make up this 88% were not focused on by this document because the emissions per source were too low to likely cause significant contributions to NAAQS exceedances.

[39] Memorandum – Draft Development of the RTR Emissions Dataset for the Secondary Lead Smelting Source Category, From Mike Burr, ERG, To Chuck French of EPA/OAQPS. April 2011. Page 1.

The source category of Lead Acid Battery Manufacturing has the second highest number of corresponding sources in nonattainment areas, as shown in Table 3-2. Moreover, such sources have relatively high levels of annual lead emissions, with two sources each emitting over two tons of lead per year, as shown in Table 3-2. Overall, there are roughly 60 lead acid battery manufacturing sources in the United States.[40] This high number of facilities is responsible for 17 tons of lead per year, which represents 1.24% of all lead emitted, as shown in Table 3-3. Consequently, control measures for this source category are reviewed in this document.

The source category of Iron and Steel Foundries has the third highest number of corresponding sources in nonattainment areas, as shown in Table 3-2. Such sources have relatively moderate levels of annual emissions of lead - only emitting less than two tons of lead per year. However, overall there are over 600 iron and steel foundries sources in the United States.[41] This large number of facilities is responsible for the emission of 83 tons of lead per year, which represents 6.05% of all lead emitted, as shown in Table 3-3. The percent of lead emissions emitted from the sources within the Iron and Steel Foundries source category is higher than the lead emissions emitted from sources within any other one source category with at least one corresponding source in a nonattainment area. Consequently, control measures for this source category are reviewed in this document.

The source category of Iron and Steel Mills only has two sources in nonattainment areas, which have relatively small annual lead emissions, as shown in Table 3-3. However, there are 18 iron and steel mill sources in the United States.[42] This number of facilities is responsible for 17 tons of lead per year, which represents 1.24% of all lead emitted, as shown in Table 3-3. Consequently, control measures for this source category are reviewed in this document.

Other source categories with at least some corresponding sources in nonattainment areas are not included in this document for several reasons, including: (1) lack of a large number of corresponding sources in nonattainment areas, or (2) a small likelihood that a source category's corresponding sources in nonattainment areas will contribute significantly to NAAQS exceedances due to low emissions or otherwise. Such source categories include the following: Primary Lead Smelting, Secondary Aluminum Production, Secondary Copper Smelting, Mining, and Petroleum Refineries.

The source category of Primary Lead Smelting has only one corresponding source in a nonattainment area, as shown in Table 3-2. Such a source currently has a very large level of annual emissions of lead, with the one source emitting over 60 tons of lead per year, as shown in Table 3-2. However, there are no other primary lead smelters currently operating in the United States, even though the emissions from this one source account for 4.3% of the total lead annual emissions.[43] More importantly, this one source is being rebuilt from the ground up with state-of-the art control technology. Consequently, control measures for this source are not reviewed in this document.

The source category of Secondary Aluminum Production has only two corresponding sources in nonattainment areas, as shown in Table 3-2. Moreover, while one source is a fairly large emitter,

[40] Memorandum – Lead Acid Battery Manufacturing Area Source Category Additional Information to Support Proposed Rule, From Nancy Jones, EC/R, To U.S. EPA Docket Number EPA-HQ-OAR-2006-0897. February 28, 2007. Page 3.
[41] NESHAP for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0002 (Published December 2002). Page 2-1.
[42] NESHAP for Integrated Iron and Steel Plants - Background Information for Proposed Standards, Document # EPA-453/R-01-005. (Published January 2001). Page 2-1.
[43] Memorandum – Summary of Information Collection Request, Received from Source- Doe Run Resources Corporation, From V. Hanzel, RTI International, To Docket. November 19, 2010.

emitting over three tons of lead per year, the other source emits less than one ton of lead per year, as shown in Table 3-2. Moreover, while there are a very large number (> 100) of secondary aluminum production facilities,[44] the overall annual emissions of lead from such facilities is very small - only 9 tons of lead per year. This is less than one percent of the total annual lead emitted from all source categories, as shown in Table 3-3. Consequently, control measures for this source category are not reviewed in this document.

The source category related to Secondary Copper Production has only two corresponding sources in nonattainment areas, as shown in Table 3-2. Both facilities emit under one ton of lead per year each, as shown in Table 3-2.[45] Moreover, such facilities account for a less than one percent of the overall annual lead emissions (6 tons, or less than 0.6%). Consequently, control measures for this source category are not reviewed in this document.

The source category of Petroleum Refineries has only two corresponding sources in nonattainment areas, as shown in Table 3-2. Moreover, both facilities emit well under one ton of lead per year each, as shown in Table 3-2. While the total number of facilities in the source category was not determined, the annual emissions from all facilities in the source category are very small, not even registering in Table 3-3. Furthermore, the designation support document for the corresponding nonattainment county indicates that a secondary lead smelter in the county is responsible for the elevated lead concentrations, and not the petroleum refineries listed.[46] Consequently, control measures for this source category are not reviewed in this document.

The source category of Fossil Fuel Electric Power Generation has only one corresponding source in a nonattainment area, as shown in Table 3-2. Moreover, the emissions from this source are less than 0.5 TPY, as shown in Table 3-2. While the number of facilities in the source category was not determined, the annual emissions from all facilities in the source category are very small, not even registering in Table 3-3. Consequently, control measures for this source category are not reviewed in this document.

The source category of Mining has only one corresponding source in a nonattainment area, as shown in Table 3-2. Moreover, the emissions from this source are less than 0.5 TPY. While the number of mining facilities was not determined, the annual emissions from all mining facilities are only about 1 percent, as shown in Table 3-3. Consequently, control measures for this source are not reviewed in this document.

3.3. Strategy for Developing RACM for Source Categories not Focused on in this Document.

Most sources that will be required to implement RACM will be in the source categories focused on by this document – Secondary Lead Smelting, Lead Acid Battery Manufacturing, Iron and Steel Foundries, and Iron and Steel Mills. However, there might be some sources in other source categories that will be required to implement RACM for controlling lead emissions.

For source categories not focused on by this document states can begin to determine what constitutes RACM accordingly. First, states can begin developing RACM by using EPA's CoST database. A review of all stationary source categories was conducted to determine the control measures typically used to

[44] List of Sources Subject to the Secondary Aluminum Production MACT Standard, EPA.
[45] Current Status of Secondary Copper Production Facilities in the United States, Document # EPA-HQ-OAR-2006-0510-0008 (Published March 31, 2006).
[46] California Designation Support Document I. (Most recent state designation document for 2008 Lead NAAQS as of December, 2011).

control lead emissions. Specifically, EPA's CoST database contains the most cost effective control technologies typically used to control PM process emissions and, therefore, likely lead process emissions, including fabric filters (e.g., reverse air, mechanical shaker, pulse jet), scrubbers (e.g., impingement and Venturi) and electrostatic precipitators (e.g., wet and dry). The database contains the most cost effective control technologies typically used to control PM fugitive dust emissions, including paving unpaved roads, chemically stabilizing unpaved roads, and vacuum sweeping paved roads.[47]

In addition, states can glean information from the control measure information for the source categories focused on in this document. States might analyze the three RACM factors for its corresponding source category to see how they compare to the control measures for source categories focused on in this document. As an example, suppose a state is determining how likely a particular control measure is RACM for a hypothetical source category. Suppose that the extent of adoption of the control measure in the hypothetical source category is as widespread as the extent of the adoption of the control measure in the Secondary Lead Smelting source category. Further, suppose that the cost effectiveness of the control measure for sources in the hypothetical source category is similar to the cost effectiveness of the control measure for sources in the Secondary Lead Smelting source category. Also suppose that the control measure has been adopted by state regulations pertaining to the hypothetical source category to a similar extent that the control measure has been adopted by state regulations pertaining to the Secondary Lead Smelting source category. In this situation, the control measure is as likely to be a RACM for the hypothetical source category as it is likely to be RACM for the Secondary Lead Smelting source category.

States can also search other sources of information on how the RACM criteria apply to various possible control measures for controlling lead emissions. With respect to the first two RACM factors – the economic feasibility of the control measures (as indicated by extent of adoption by other sources in source category) and the cost effectiveness of the control measures – information related to such factors can be found in support documents located in the dockets of related MACT standard development. Information related to the third RACM factor - extent of adoption by state regulations-can be obtained through state environmental agencies.

In addition, it is important to note that, while not all sources will be covered by the four source categories focused on by this document, many of the sources in source categories not focused on in this document may have implemented corresponding RACM in order to comply with other federal or state regulations. For instance, the controls required by MACT standards for sources in the Fossil Fuel Electric Power Generation and Petroleum Refinery source categories may be RACM.

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[47] EPA CoST database.

4.0. RACM DEVELOPMENT FOR THE SECONDARY LEAD SMELTING SOURCE CATEGORY.

This section presents control measures to consider for RACM development for the Secondary Lead Smelting source category. Section 4.1 provides an overview of the Secondary Lead Smelting source category. Section 4.2 provides a summary of the operations and lead emission points with respect to secondary lead smelting facilities. Section 4.3 provides a summary of the control measures utilized at secondary lead smelting facilities, and Section 4.4 provides a more detailed application of the RACM criteria to each identified control measure.

4.1. Overview of Source Category.

The Secondary Lead Smelting source category includes any facility at which lead-bearing scrap material, primarily, but not limited to, lead acid batteries, is recycled into elemental lead or lead alloys by smelting.[48] The corresponding NAICS Code for the Secondary Lead Smelting source category is 331492. The NAICS description for facilities with such NAICS code is "establishments primarily engaged in alloying purchased nonferrous metals and/or recovering nonferrous metals from scrap." The NAICS description specifically includes establishments engaged in "lead recovering from scrap and/or alloying purchased metals."[49]

As of March, 2012, there are 15 secondary lead smelting facilities in the United States. No new secondary lead smelters have been built in the last 20 years. However, one facility is currently in the process of expanding its operations.[50] Another facility is currently under construction in South Carolina.[51]

4.2. Facility Operations and Lead Emission Points.

The secondary lead smelting process consists of pre-processing lead-bearing materials, melting lead metal and reducing lead compounds of lead metal in the smelting furnace, and refining and alloying lead to customer specifications. There are three types of emissions from secondary lead smelting facilities: process emissions, process fugitive emissions, and fugitive dust emissions. Each type of emissions has its own corresponding control measures.[52]

Process emissions include exhaust gases from feed dryers and from blast, reverberatory, rotary, and electric-melting furnaces. While such emissions include some organic compounds, process emissions are mostly metal, primarily lead compounds. Such emissions are released from a stack directly into the atmosphere. The control measures used to control such process emissions are fabric filters, wet electrostatic precipitators (WESPs), and cartridge controls.[53]

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[48] Memorandum – Draft Summary of the Technology Review for the Secondary Lead Smelting Source Category, From Mike Burr, ERG, to Chuck French, EPA/OAQPS. April 2011. Page 2.
[49] North American Industry Classification System Website (Accessed December, 2011).
[50] Memorandum – Draft Summary of the Technology Review for the Secondary Lead Smelting Source Category, From Mike Burr, ERG, to Chuck French, EPA/OAQPS. April 2011. Page 2.
[51] Correspondence with Nathan Topham of EPA/RTP (December, 2011).
[52] Id at 2.
[53] Id.

Process fugitive emissions are released from various sources throughout the smelting process, including smelting furnace charging and tapping points, refining kettles, agglomerating furnace product taps, and kiln transition equipment. Process fugitive emissions are comprised primarily of metal emissions, such as lead.[54] The control measures used to control such emissions include partial and total enclosures, which may or may not be maintained under negative pressure.

Fugitive dust emissions are another type of emissions from secondary lead smelting facilities. Such emissions are not associated with a specific process or process fugitive vent or stack. Fugitive dust emissions are comprised of metal emissions, such as lead, and result from the entrainment of emissions in ambient air due to material handling activities, vehicle traffic, wind, and other activities.[55] The control measures used to control such emissions include paving unpaved roads, vacuuming paved roads, and chemical stabilization of paved roads.

4.3. Identification and Summary of Possible RACM Candidates.

Table 4-2 provides a summary of control measures for which the RACM criteria are applied and the relative likelihood that each control measure is a RACM. Specifically, each control measure is assigned a rating of 1 through 3; where the higher the number, the more likely that the control measure is a RACM. Table 4-1 provides an explanation of these assigned values.

Table 4-1. General Meanings of Assigned RACM Ratings.

RACM Rating	General Meaning of RACM Rating
1	There is limited support for identifying the control measure as a RACM.
2	There is some support for identifying the control measure as a RACM; more than for a control measure with a RACM Rating of "1."
3	There is substantial support for identifying the control measure as a RACM.
U (+ or -)	A "U" indicates that the likelihood that the control measure constitutes a RACM is undetermined due to incomplete information. A corresponding "+" indicates that despite incomplete information, an application of RACM criteria would likely suggest that the control measure is a RACM, while a "-" indicates that despite incomplete information, an application of the RACM criteria would likely suggest that the control measure is not a RACM.

[54] Id.
[55] Id.

Table 4-2. Secondary Lead Smelting Source Category - Summary of Known Control Measures and Relative Likelihood that each Control Measure is a RACM.

RACM Rating	Control Measure	Brief Reasoning for RACM Rating
3	Fabric filters controlling uncontrolled lead process emissions from stacks.	1. Adoption by almost all sources. 2. Cost data suggest cost effective. 3. Identified as MACT for almost 14 years. 4. California's South Coast Air Quality Management District (SCAQMD) adopted a rule practically requiring such a control measure; it requires that filter media other than filter bags are to be rated by the manufacturer of achieving 99.97% capture efficiency for 0.3 micron particles.
1.5	Fabric filters with downstream add-on control devices controlling uncontrolled lead process emissions from stacks.	1. Adoption by 1 of 14 sources and plans to adopt by two other sources. 2. Cost data suggest not cost effective. 3. Not required by any known federal regulation.
1	Replacing old fabric filters controlling uncontrolled lead process emissions from stacks with new fabric filters.	1. No known adoption. 2. Cost data suggest not cost effective. 3. Not required by any known federal regulation. 4. California's SCAQMD adopted a rule that might practically require such a control measure; it requires that filter media other than filter bags are to be rated by the manufacturer of achieving 99.97% capture efficiency for 0.3 micron particles.
U +	Other control measures for process emissions from fabric filters: (1) switching bag types, (2) properly installing bags, (3) sealing ducts and dust conveyance devices, (4) replacing and not repairing torn bags.	1. Not enough information to apply RACM criteria. 2. California's SCAQMD adopted a rule that might practically require such a control measure; it requires that filter media other than filter bags are to be rated by the manufacturer of achieving 99.97% capture efficiency for 0.3 micron particles.
3	Enclosure hoods and partial enclosures with wet suppression for process units and storage areas to capture process fugitive emissions.	1. Adoption by all sources, and exceeded by a supermajority of sources. 2. No known cost data. 3. Identified as MACT for almost 14 years. 4. California's SCAQMD adopted a rule that requires total enclosures for many areas and operations.
3	In addition to enclosure hoods, a combination of negative pressure total enclosures and partial enclosures with wet suppressions for process units and storage areas to capture fugitive emissions.	1. Adoption by 11 of 14 sources. 2. No known cost data. 3. Required by 2012 NESHAP for secondary lead smelters. 4. California's SCAQMD adopted a rule that requires total enclosures under negative pressure for many areas/operations.

RACM Rating	Control Measure	Brief Reasoning for RACM Rating
3	In addition to enclosure hoods, negative pressure total enclosures for all process units and storage areas to capture process fugitive emissions.	1. Adoption by 7 of 14 sources. 2. No known cost data. 3. Not required by any known federal regulations. 4. California's SCAQMD adopted a rule that requires total enclosures under negative pressure for many areas/operations, and the 2012 NESHAP for secondary lead smelting requires such controls.
3	Paving unpaved roads and cleaning paved roads for controlling fugitive dust sources.	1. Adoption by all sources. 2. Cost data suggest cost effective. 3. Identified as MACT for almost 14 years. 4. Required by California's SCAQMD rule as this rule requires cleaning surfaces subject to vehicular traffic and paving facility ground subject to traffic.
3	Partial enclosure, wet suppression, and pavement cleaning of operating areas and storage piles; totally enclosing operating areas and storage piles; and vehicle washing at each facility exit to control fugitive dust lead emissions.	1. Adoption by all sources. 2. No known cost data available. 3. Identified as MACT for almost 14 years. 4. Required by rule adopted by California's SCAQMD. Rule requires several such measures including requiring dust-forming material to be stored in enclosure, washing/vacuuming surfaces accumulating lead-containing dust, etc.
U +	Other control measures for controlling fugitive dust emissions: more complete vehicle washing inside buildings, improved roadway cleaning techniques, pavement of entire facility, cleaning of building and roofs, etc.	1. Seven of 14 facilities adopted a combination of such control measures, and, generally, emissions from such facilities were lower. 2. California's SCAQMD rule requires several such control measures. 3. The 2012 NESHAP for secondary lead smelting requires many such control measures.

4.4. Application of RACM Criteria to Possible RACM Candidates.

4.4.1. Fabric Filters (or other Primary Controls) Controlling Uncontrolled Lead Emissions from Stacks.

The common use of fabric filters by secondary lead smelters suggests that fabric filters are the most economically feasible control technologies for regulating process lead emissions from stacks. A 2011 review of information collection request responses from secondary lead smelters revealed that almost all (if not all) secondary lead smelters use fabric filters to control uncontrolled PM (including lead) emissions from stacks. Several types of fabric filters are used by the industry, including shaker, pulse jet, and reverse pulse jet fabric filters.[56]

In addition, the available data suggest that fabric filters are cost effective for regulating process lead emissions. Specifically, cost-effectiveness information for PM was available for selected control technologies in the source category of Lead Processing, as shown in Table 4-3, where cost-effectiveness

[56] Id at 4.

values for fabric filters are on average roughly $400/ton.[57] This information suggests that fabric filters are cost effective for regulating lead as well.

Table 4-3. Cost-Effectiveness Information for Selected Control Technologies for Controlling Particulate Matter for the Lead Processing Source Category.

Control Technology	Cost Effectiveness* ($/ton PM)	Low/High Control Efficiency
Dry Electrostatic Precipitator – Wire Plate Type	400	95/98
Fabric Filter – Reverse-Air Cleaned Type	500	99/99.5
Fabric Filter (Mech. Shaker Type)	450	99/99.5
WESP – Wire Plate Type	800	99/99.5
* Rounded to the nearest $50 and escalated from 1999 to 2011 U.S. dollars.[58]		

The 1997 NESHAP for Secondary Lead Smelting suggests that such fabric filters are reasonably available. Specifically, the 1997 NESHAP applies to process emissions from the following furnace configurations: collated blast and reverberatory furnace; blast furnace; and reverberatory, rotary and electric furnaces. The 1997 NESHAP provides an emissions limit for lead compounds of 2.0 milligrams per dry standard cubic meter (mg/dscm) from each such furnace configuration. Such a standard does not explicitly require a control, such as a fabric filter, but such a control is practically required in order to comply with the emission limit. The fact that such controls were MACT 14 years ago, and have been required by all currently operating sources for at least 11 years, suggests that such controls may be RACM today.[59]

A review of state rules from California and Missouri further suggests that such control measures are reasonably available. These states were chosen for review because they both have secondary lead sources (2 in each state) within their states. Missouri incorporates the federal 1997 NESHAP into state law.[60] California's SCAQMD adopted a rule practically requiring such a control measure adopted a rule that might practically require such a control measure; it requires that filter media other than filter bags are to be rated by the manufacturer of achieving 99.97% capture efficiency for 0.3 micron particles.[61]

4.4.2. Fabric Filters (or other Primary Controls) Controlling Uncontrolled Lead Emissions with Add-on Downstream Control Technologies.

The current use of add-on control technologies, such as WESP and high efficiency particulate air (HEPA) filters, downstream of fabric filters (or other primary controls) to further reduce lead emissions from stacks suggests that such add-on control technologies are less economically feasible but are becoming more economically feasible. Specifically, while only one secondary lead smelting facility uses a WESP as an add-on control to a fabric filter, two other facilities currently have plans to install WESP

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[57] EPA CoST database.
[58] In order to escalate from 1999 dollars to 2011 dollars, used the formula and approach presented in EPA's Control Strategy Tool (CoST) Control Measures Database (CMDB) Documentation, Page 9.
[59] NESHAP for Secondary Lead Smelting, 40 CFR 63, Subpart X (Published June 13, 1997).
[60] 10 CSR 10-6.075 Maximum Achievable Control Technology Regulations; Air Quality Standards, Definitions, Sampling, and Reference Methods and Air Pollution Control Regulations for the Entire State of Missouri. (Published August 16, 1977). Page 91.
[61] California (South Coast Air Quality Management District), Rule 1420.1 - Emission Standards for Lead from Large Lead Acid Battery Recycling Facilities (Adopted November 5, 2010).

units to be used as add-on controls to fabric filters. Several facilities also reported using HEPA filters as add-on controls downstream of their fabric filters.[62]

However, the available data suggest that using add-on control technologies downstream of fabric filters is much less cost effective for controlling lead than the cost effectiveness of the primary control. Specifically, installing an add-on control technology, such as a WESP, downstream of the primary control would double the control technology costs. Moreover, because fabric filters can achieve efficiencies of greater than 99%, the amount of further lead emissions captured is relatively low compared to the amount captured with a fabric filter controlling uncontrolled emissions. In fact, one recent estimate of the cost effectiveness of an add-on WESP at a secondary lead smelting facility in Quemetco, California, revealed that the cost effectiveness of the add-on WESP would be $295,900/ton PM (and $2,279,500/ton of lead)[63]. Thus using a WESP as an add-on control can be over 250 times less cost effective than using a WESP as a primary control. There is no known federal standard currently requiring such a control measure.

There is no known federal standard currently requiring such a control measure. However, California's SCAQMD, which has two sources, adopted a rule that practically requires such a control measure by requiring 99.97% capture efficiency for 0.3 micron particles.[64]

4.4.3. Replacing Old Fabric Filters Controlling Uncontrolled Lead Emissions from Stacks with New Fabric Filters.

A recent comparison of fabric filter outlet lead emissions revealed that the controlling factor determining the effectiveness of the fabric filter was the age of the fabric filter. Generally, older fabric filters have higher outlet lead emissions, while newer fabric filters have lower outlet emissions. The average outlet lead concentration for lead emissions for fabric filters installed in the 1960s is roughly 0.40 mg/dscm, in the 1970s roughly 0.30 mg/dscm, in the 1980s roughly 0.20 mg/dscm, and in the 2000s less than 0.10 mg/dscm. Consequently, one possible control measure would be to replace old fabric filters with new fabric filters, as on average, this could reduce lead emissions by a factor of four or more.[65]

Similarly, a recent comparison of fabric filter outlet lead emissions also revealed that another factor that determines the effectiveness of the fabric filter is the type of fabric filter (e.g., shaker, pulse jet, reverse bag pulse jet). Specifically, shaker fabric filters appear to have higher outlet lead concentrations than those of the pulse jet or reverse bag pulse jet type. However, this finding may be misleading because the majority of the older units appear to be shaker types.[66]

There is no known federal standard currently requiring old fabric filters to be replaced by higher efficiency types. A review of state rules from California and Missouri weakly suggests that such control measures might be within economic reach. Such states were chosen for review because they both have secondary lead sources (2 in each state) within their states. Missouri incorporates the federal 1997 NESHAP into state law, which does not require such a measure.[67] However, California's SCAQMD,

[62] Memorandum – Draft Summary of the Technology Review for the Secondary Lead Smelting Source Category, From Mike Burr, ERG, to Chuck French, EPA/OAQPS. April 2011. Page 4.
[63] Cost estimate provided by Nathan Topham/EPA/OAQPS/SPPD/MIG.
[64] California (South Coast Air Quality Management District), Rule 1420.1 - Emission Standards for Lead from Large Lead Acid Battery Recycling Facilities (Adopted November 5, 2010).
[65] Id at 7.
[66] Id.
[67] Air10 CSR 10-6.075 Maximum Achievable Control Technology Regulations; Air Quality Standards, Definitions,

which has two sources, adopted a rule that might practically require such a control measure; it requires that filter media other than filter bags are to be rated by the manufacturer of achieving 99.97% capture efficiency for 0.3 micron particles.[68]

4.4.4. Other Control Measures for Controlling Process Lead Emissions.

One company in the industry has suggested that Teflon (polytetrafluoroethylene) bags specifically supplied by Gore-Tex© performed better than other bag types, such as polyester. The company also suggested that the most critical factors influencing fabric filter performance are proper installation and maintenance practices. The company mentioned specific practices such as ensuring proper installation of the bags and properly sealing all ducts and dust conveyance devices help increase control efficiency. Additionally, the company claimed that replacing torn bags, rather than repairing them, can significantly improve fabric filter performance. However, while such control measures might be utilized, information is not available for a RACM criteria analysis.[69]

4.4.5. Partial and Total Enclosures to Control Fugitive Process Lead Emissions.

The complete adoption of partial and total enclosures by secondary lead smelters to control fugitive process emissions suggests that partial and total enclosures are economically feasible control measures. Specifically, all secondary lead smelting facilities currently use partial and total enclosures to control process fugitive emissions from the following emission sources: smelting furnace and dryer charging hoppers, chutes, and skip hoists; smelting furnace lead taps, and molds during tapping; smelting furnace slag taps, and molds during tapping; refining kettles; dryer transition pieces; and agglomerating furnace product taps. All secondary lead smelters equip such fugitive emission sources with an enclosure hood or locate such sources in a total enclosure subject to general ventilation that maintains the building at a lower than ambient pressure to ensure in-draft through any doorway opening accordingly. All process fugitive hoods (except for refining kettles and dryer transition pieces) are ventilated to ensure a face velocity of at least 90 meters per minute at all hood openings. Process fugitive hoods for refining kettles are ventilated to maintain a face velocity of at least 75 meters per minute. Process fugitive hoods for dryer transition pieces are ventilated to maintain a face velocity of at least 110 meters per minute. Such ventilation air is conveyed to a controlled device. [70] No cost-effectiveness information was available for such control measures.

The 1997 NESHAP for Secondary Lead Smelting requires such partial and total enclosure control measures for fugitive process lead emissions. The fact that such controls were MACT 14 years ago, and have been required by all currently operating sources for 11 years, suggests such controls are RACM today.[71]

A review of state rules from California and Missouri further suggests that such control measures are reasonable. Such states were chosen for review because they both have secondary lead sources (2 in

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Sampling, and Reference Methods and Air Pollution Control Regulations for the Entire State of Missouri (Published August 16, 1977). Page 91.

[68] California (South Coast Air Quality Management District), Rule 1420.1 - Emission Standards for Lead from Large Lead Acid Battery Recycling Facilities (Adopted November 5, 2010).

[69] Memorandum – Draft Summary of the Technology Review for the Secondary Lead Smelting Source Category, From Mike Burr, ERG, to Chuck French, EPA/OAQPS. April 2011. Page 7.

[70] Id at 11.

[71] NESHAP for Secondary Lead Smelting, 40 CFR 63, Subpart X (Published June 13, 1997).

each state) located within the state. Missouri incorporates the federal 1997 NESHAP into state law.[72] California's SCAQMD adopted a rule that requires total enclosure of several areas (e.g., battery breaking areas; materials storage and handling areas; dryer and dryer areas; smelting furnaces; agglomerating furnaces; and refining and casting areas).

4.4.6. In Addition to Enclosure Hoods, a Combination of Negative Pressure Total Enclosures and Partial Enclosures with Wet Suppression for Process Units and Storage Areas.

The common use of, in addition to enclosure hoods, a combination of negative pressure total enclosures and partial enclosures with wet suppression for process units and storage areas, suggests these additional control measures are economically feasible. Specifically, 12 of the 14 secondary lead smelting facilities use a combination of negative pressure total enclosures and partial enclosures with wet suppression for process units and storage areas in addition to enclosures hoods. Additionally, half of the secondary lead smelting facilities, in addition to enclosure hoods for process fugitive sources, use negative pressure total enclosures for all process units and storage areas.[73] No cost-effectiveness information was available for such control measures.[74]

There is no identified federal standard currently requiring such a control measure. However, California requires negative pressure total enclosures for several areas (e.g., battery breaking areas; materials storage and handling areas; dryer and dryer areas; smelting furnaces; agglomerating furnaces; and refining and casting areas).[75] Also, the 2012 NESHAP for Secondary Lead Smelting requires facilities to locate and control sources of fugitive lead emissions within total enclosures that are maintained under negative pressure and vented to a control device.[76] These emissions sources include the smelting furnaces; smelting furnace charging areas; lead taps; slag taps; molds during tapping; battery breakers, refining kettles; casting areas; dryerts; material handling areas; and areas where dust from fabric filters, sweepings, or used fabric filters are processed.

4.4.7. Paving Unpaved Roads and Cleaning Paved Roads for Controlling Fugitive Dust Lead Emissions.

The common practice of paving plant roadways, including all areas subject to vehicle traffic – and cleaning such pavement twice per day, except when natural precipitation makes cleaning unnecessary or when sand or similar material has been spread on plant roadways to provide traction on ice and snow, suggest that such practice is economically feasible. Specifically, all secondary smelting facilities have adopted such practices.[77]

In addition, available data suggest that such control measures are cost effective for controlling lead emissions. Specifically, cost-effectiveness information was available for the control measures in the source category of Lead Processing for PM in 2010 dollars, as shown in Table 4-3, where cost-

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[72] Air10 CSR 10-6.075 Maximum Achievable Control Technology Regulations; Air Quality Standards, Definitions, Sampling, and Reference Methods and Air Pollution Control Regulations for the Entire State of Missouri (Published August 16, 1977). Page 91.
[73] Memorandum – Draft Summary of the Technology Review for the Secondary Lead Smelting Source Category, From Mike Burr, ERG, to Chuck French, EPA/OAQPS. April 2011. Page 11.
[74] Id. at 11.
[75] California (South Coast Air Quality Management District), Rule 1420.1 - Emission Standards for Lead from Large Lead Acid Battery Recycling Facilities (Adopted November 5, 2010).
[76] NESHAP for Secondary Lead Smelting (Published January, 2012).
[77] Memorandum – Draft Summary of the Technology Review for the Secondary Lead Smelting Source Category, From Mike Burr, ERG, to Chuck French, EPA/OAQPS. April 2011. Page 11.

effectiveness values for such measures were on average roughly $500/ton.[78] Since lead is commonly associated with PM, this information suggests that such control measures are cost effective for controlling lead as well.

Table 4-4. Cost-Effectiveness Information for Selected Control Measures for Controlling Particulate Matter with respect to All Source Categories.

Control Measure	Cost Effectiveness* ($/ton PM)	Control Efficiency (%)
Vacuum Sweeping Paved Roads	500	50.0
Hot Asphalt Paving of Unpaved Roads	800	66.6
* Rounded to the nearest $100 and escalated from 1999 to 2011 U.S. dollars.[79]		

A review of state rules from California and Missouri suggests such control measures reasonable. Such states were chosen for review because they both have secondary lead sources (2 in each state) within the state. Missouri incorporates the federal 2007 NESHAP into state law, which only requires such control measures for major sources.[80] A California's SCAQMD rule requires paving facility grounds and daily cleaning/sweeping of such paved surfaces.[81]

4.4.8. Partially Enclosing , Wet Suppressing, and Pavement Cleaning of Operating Areas and Storage Piles; Totally Enclosing of Operating Areas and Storage Piles; and Vehicle Washing at each Facility Exit to Control Fugitive Dust Lead Emissions.

The common practices of (1) partially enclosing, wet suppressing, and pavement cleaning of operating areas and storage piles, (2) totally enclosing operating areas and storage piles, and (3) vehicle washing at each facility exit to control fugitive dust lead emissions suggests that such practices are economically feasible. All secondary lead smelting facilities have adopted such practices. Specifically, for battery breaking areas, all secondary lead smelting facilities partially enclose storage piles, wet suppress storage piles with sufficient frequency and quantity to prevent the formation of dust, and clean the pavement of such areas twice per day; or alternatively, totally enclose the battery breaking area. For furnace areas, all secondary lead smelting facilities partially enclose such areas and clean the pavement of such areas twice per day, or alternatively, totally enclose and ventilate the enclosed areas to a control device. For refining and casting areas, all secondary lead smelting facilities partially enclose and clean the pavement of such areas twice per day; or alternatively, totally enclose and ventilate such areas to a control device. For material and storage handling areas, all secondary lead smelting facilities partially enclose such areas, wet suppress the storage piles with sufficient frequency and quantity to prevent the formation of dust, wash vehicles at each exit from the such areas, and pave such areas; or alternatively, totally enclose such areas and ventilate to a control device. Moreover all facilities wash vehicles at the exits of facility property.[82]

78 EPA CoST database.
79 In order to escalate from 1999 dollars to 2011 dollars, used the formula and approach presented in EPA's Control Strategy Tool (CoST) Control Measures Database (CMDB) Documentation, Page 9.
80 Air10 CSR 10-6.075 Maximum Achievable Control Technology Regulations; Air Quality Standards, Definitions, Sampling, and Reference Methods and Air Pollution Control Regulations for the Entire State of Missouri (Published August 16, 1977). Page 91.
81 California (South Coast Air Quality Management District), Rule 1420.1 - Emission Standards for Lead from Large Lead Acid Battery Recycling Facilities (Adopted November 5, 2010).
82 Memorandum – Draft Summary of the Technology Review for the Secondary Lead Smelting Source Category, From Mike Burr, ERG, to Chuck French, EPA/OAQPS. April 2011. Page 11.

No cost-effectiveness information is available for such practices. The 1997 NESHAP for Secondary Lead Smelting requires such control measures for controlling fugitive dust process lead emissions. The old NESHAP was published June 1997. The fact that such controls were MACT 14 years ago, and have been required by all currently operating sources for 15 years, suggests such controls are RACM today.[83] The 2012 NESHAP requires the total enclosure under negative pressure with ventilation to a control device of process areas that are sources of fugitive lead emissions. The 2012 NESHAP also requires facilities to adopt a list of specified work practice standards to minimize fugitive emissions, including wet suppression, pavement cleaning, and vehicle washing at facility exits.[84]

A review of state rules from California and Missouri suggests such control measures are reasonable. Such states were chosen for review because they both have secondary lead sources (2 in each state) within the state. Missouri incorporates the federal 1997 NESHAP into state law, which only requires such a control measure for major sources.[85] California's SCAQMD rule requires such control measures and is even more stringent.[86]

4.4.9. Other Control Measures for Controlling Fugitive Dust Emissions.

A recent review revealed that, generally, facilities that adopted the following additional fugitive dust emissions controls had lower fugitive dust emissions:

1. More complete vehicle washing inside buildings.
2. Improved roadway cleaning techniques and frequency.
3. Pavement of entire facility grounds.
4. Cleaning of building roofs and exteriors.
5. Use of daily ambient monitoring to diagnose plant activities that lead to exceedances of the NAAQS for lead.
6. Timely cleaning of accidental releases.
7. Inspection of outside battery storage areas for broken batteries.[87]

Moreover, California's SCAQMD adopted a rule that requires several such control measures for controlling fugitive dust emissions, which include the following:

1. Clean roof top structures and other areas where lead-containing waste generated from housekeeping activities are stored, disposed of, recovered, or recycled by wet wash or vacuum equipped with a filter rated by the manufacturer to achieve 99.97% capture efficiency for 0.3 micron particles in a manner that does not generate fugitive lead dust (monthly or quarterly, depending on the height of the roof).
2. Monthly inspection of total enclosures and facility structures that contain fugitive dust emissions for gaps, breaks, separations, leak points, etc.
3. Pave, concrete, asphalt or encapsulate certain facility grounds.

[83] NESHAP for Secondary Lead Smelting, 40 CFR 63, Subpart X (Published June, 1997).
[84] NESHAP for Secondary Lead Smelting (Published January, 2012).
[85] Air10 CSR 10-6.075 Maximum Achievable Control Technology Regulations; Air Quality Standards, Definitions, Sampling, and Reference Methods and Air Pollution Control Regulations for the Entire State of Missouri (Published August 16, 1977). Page 91.
[86] California (South Coast Air Quality Management District), Rule 1420.1 - Emission Standards for Lead from Large Lead Acid Battery Recycling Facilities (Adopted November 5, 2010).
[87] Memorandum – Draft Summary of the Technology Review for the Secondary Lead Smelting Source Category, From Mike Burr, ERG, to Chuck French, EPA/OAQPS. April 2011. Page 11.

4. Storing all materials capable of generating any amount of fugitive lead-dust in a sealed, leak-proof container.[88]

In addition, the 2012 NESHAP for Secondary Lead Smelting requires many such control measures for controlling fugitive emissions to be installed by January 2014. Sources that will be subject to the NESHAP must prepare an operating procedures manual that describes in detail the work practice standards that will be put in place and implemented to control fugitive dust emissions from plant roadways, plant buildings, plant building exteriors, accidental releases, battery storage areas, equipment maintenance areas, material storage areas and material handling areas. Specifically, the proposed NESHAP would require the following fugitive dust control measures to be included in the operating procedures manual:

1. Cleaning certain areas by wet wash or a vacuum equipped with a filter rated by the manufacturer to achieve 99.97 percent capture efficiency for 0.3 micron particles.
2. Paving all areas subject to vehicle traffic and cleaning such pavement twice per day.
3. Monthly or quarterly cleaning of building roofs and exteriors, depending on the height of such roofs and exteriors.
4. Initiating cleaning of affected areas within one hour after any accidental release of lead dust.
5. Inspection of unenclosed battery storage areas twice each day.
6. Washing of vehicles at each exit of the material storage and handling areas.
7. Paving grounds on the facility sufficient to prevent wind-blown dust.[89]

[88] California (South Coast Air Quality Management District), Rule 1420.1 - Emission Standards for Lead from Large Lead Acid Battery Recycling Facilities (Adopted November 5, 2010).
[89] NESHAP for Secondary Lead Smelting (Published January, 2012).

5.0. RACM DEVELOPMENT FOR THE LEAD ACID BATTERY MANUFACTURING SOURCE CATEGORY.

This section presents control measures to consider for RACM development for the Lead Acid Battery Manufacturing source category. Section 5.1 provides an overview of the Lead Acid Battery source category. Section 5.2 provides a summary of operations and lead emission points for lead acid battery facilities. Section 5.3 provides a summary of the control measures utilized at lead acid battery manufacturing facilities, and Section 5.4 provides a more detailed application of the RACM criteria to each identified control measure.

5.1. Overview of Source Category.

The Lead Acid Battery Manufacturing source category includes any facility that manufactures either starting lighting/ignition batteries that are primarily used in automobiles or industrial/traction batteries that are used for uninterruptible power supply or to power electric vehicles such as forklifts.[90] The corresponding NAICS code for the Lead Acid Battery Manufacturing source category is 335911. The NAICS Description for facilities with such NAICS Code is "establishments primarily engaged in manufacturing primary batteries." The NAICS description specifically includes "lead acid storage batteries manufacturing."[91]

Today, there are approximately 60 lead acid battery manufacturing facilities in the United States, all of which are area sources. Such facilities are located throughout 23 states and Puerto Rico.[92]

5.2. Facility Operations and Lead Emission Points.

Lead acid batteries are produced from lead alloy ingots, sheet lead, and lead oxide. Lead acid battery manufacturing consists of several processes, including the following: (1) grid casting, (2) grid stamping, lead paste mixing, (3) the three-process operation of plate stacking, plate burning and plate assembly, (4) charge formation, and (5) lead reclamation.[93]

Specifically, the manufacturing process includes preparing battery grids through stamping or casting lead. Lead oxide paste is added to the grids in the grid pasting operation creating plates that are cured and assembled into a battery. Batteries are then charged using sulfuric acid in the forming operations. Lead oxide may be prepared by the battery manufacturer, as is the case for many larger battery manufacturing facilities, or may be purchased from a supplier. The control measures that are used to control such process emissions are fabric filters for the paste mixing, three-process plate operation, lead oxide manufacturing, and other lead emitting processes; and impingement scrubbers for the grid casting and lead reclamation operations.[94]

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[90] Memorandum – Lead Acid Battery Manufacturing Area Source Category Additional Information to Support Proposed Rule, From Nancy Jones, EC/R, To U.S. EPA Docket Number EPA-HQ-OAR-2006-0897. February 28, 2007. Page 1.
[91] North American Industry Classification System Website (Accessed December, 2011).
[92] Memorandum – Lead Acid Battery Manufacturing Area Source Category Additional Information to Support Proposed Rule, From Nancy Jones, EC/R, To U.S. EPA Docket Number EPA-HQ-OAR-2006-0897. February 28, 2007. Page 1.
[93] Id at 1.
[94] Id at 2.

5.3. Identification and Summary of Possible RACM Candidates.

Table 5-2 provides a summary of control measures used in the Lead Acid Battery source category for which the RACM criteria are applied in section 5.4 and the relative likelihood that each control measure is a RACM. Specifically, each control measure is assigned a rating of 1 through 3; where the higher the number, the more likely that the control measure is a RACM. Such assigned values are explained in Table 5-1.

Table 5-1. General Meanings of Assigned RACM Ratings.

RACM Rating	General Meaning of RACM Rating
1	There is limited support for identifying the control measure as a RACM.
2	There is some support for identifying the control measure as a RACM; more than for a control measure with a RACM Rating of "1."
3	There is substantial support for identifying the control measure as a RACM.
U (+ or -)	A "U" indicates that the likelihood that the control measure constitutes a RACM is undetermined due to incomplete information. A corresponding "+" indicates that despite incomplete information, an application of RACM criteria would likely suggest that the control measure is a RACM, while a "-" indicates that despite incomplete information, an application of the RACM criteria would likely suggest that the control measure is not a RACM.

Table 5-2. Lead Acid Battery Source Category - Summary of Known Control Measures and Relative Likelihood that each Control Measure is a RACM.

RACM Rating	Control Measure	Brief Reasoning for RACM Rating
3	Fabric Filters to Control Process Lead Emissions from Paste Mixing, Three-Process Plate Operation, Lead Oxide Manufacturing, and Other Lead Emitting Processes.	1. Adoption by almost all (or all) sources. 2. Cost data suggest cost effective. 3. EPA determined such control measures constitute BDT over thirty years ago and as GACT four years ago. 4. California's SCAQMD adopted a rule practically requiring such a control measure, as it requires 98% efficiency for lead for facilities exceeding specific process and emission thresholds (i.e., processing more than 2 tons of lead per year with daily emissions of lead greater than or equal to 0.5lbs/day).
3	Impingement Scrubbers to Control Process Lead Emissions from Lead Reclamation and Grid Casting Operations.	1. Adoption by almost all (or all) sources. 2. Cost data suggest cost effective. 3. EPA determined such control measures constitute BDT over thirty years ago and as GACT four years ago. 4. California's SCAQMD adopted a rule practically requiring such a control measure, as it requires 98% efficiency for lead for facilities exceeding specific process and emission thresholds (i.e., processing more than 2 tons of lead per year with daily emissions of lead greater than or equal to 0.5lbs/day).
1	Other control measures to control process lead emissions from stacks.	1. Only limited adoption by facilities revealed through a review of publicly available information

RACM Rating	Control Measure	Brief Reasoning for RACM Rating
		and correspondence with EPA employees. 2. EPA determined that cost data suggested such additional control measures not cost effective. 3. EPA refused to develop any such controls as GACT technology as recent as four years ago. 4. California's SCAQMD adopted a rule practically requiring such control measures as it requires 98% efficiency for lead for facilities exceeding specific process and emission thresholds (i.e., processing more than 2 tons of lead per year with daily emissions of lead greater than or equal to 0.5lbs/day)..
1.5	Paving unpaved roads and cleaning unpaved roads for controlling fugitive dust sources.	1. Only limited adoption by facilities revealed through a review of public available information and correspondence with EPA employees. 2. Cost data suggest cost effective. 3. Not required by any known federal regulation. 4. Required in part by California's SCAQMD. The SCAQMD rule requires cleaning surfaces subject to vehicular traffic weekly.
U -	Other Control measures to control fugitive emissions.	1. Lack of known adoption by any facilities for controlling lead emissions. 2. No known cost data. However, lead acid battery facilities are all area sources, which results in fugitive dust control measures being less likely to be cost effective. 3. Not required by any known federal regulation. 4. California's SCAQMD requires several such measures, such as requiring dust-forming material to be stored in enclosures, washing/vacuuming surfaces accumulating lead-containing dust, etc.

5.4. Application of RACM Criteria to Possible RACM Candidates.

5.4.1. Fabric Filters to Control Process Lead Emissions from Paste Mixing, the Three-Process Plate Operation, Lead Oxide Manufacturing, and Other Lead Emitting Processes; and Impingement Scrubbers to Control Process Lead Emissions from Lead Reclamation and Grid Casting Operations.

The almost complete adoption of fabric filters by lead acid battery manufacturing facilities in the United States to control process lead emissions from paste mixing, the three-process plate operation, lead oxide manufacturing, and other lead-emitting processes; and almost complete adoption of impingement scrubbers to control process emissions from lead reclamation and grid casting operations, suggests that such control measures are the most economically feasible control technologies for regulating lead emissions from such operations in the Lead Acid Battery source category. Specifically, almost all (53/58) of the lead acid battery manufacturing facilities comply with the current NSPS and NESHAP standards for the Lead Acid Battery source category, which are identical standards. The NSPS and

NESHAP emission limitations, control efficiencies, and control bases for relevant operations are listed in Table 5-3.[95]

Table 5-3. NSPS and NESHAP for Lead Acid Battery Manufacturing (40 CFR 60, Subpart KK; 40 CFR 63, Subpart PPPPPP).

Operation	Emission Limitation	Control Efficiency	Control Basis
Paste mixing	1 mg/dscm (0.00044 gr/dscf)	99%	Fabric filter (6:1 air to cloth ratio)
Three-process operation	1 mg/dscm (0.00044 gr/dscf)	99%	Fabric filter (6:1 air to cloth ratio)
Lead oxide manufacturing	5 mg/kg of lead processed	> 99%	Fabric Filter (2:1 air to cloth ratio)
Other lead emitting processes	1 mg/dscm (0.00044 gr/dscf)	90%	Fabric filter (6:1 air to cloth ratio)
Grid casting	0.4 mg/dscm (0.00024 gr/dscf)	90%	Impingement scrubber
Lead Reclamation	4.5 mg/dscm (0.0022 gr/dscf)	90%	Impingement scrubber

The available cost information might further suggest that such control measures are cost effective. For example, a recent cost analysis was conducted to determine the cost effectiveness of fabric filters for the paste mixing, three plate process, and other lead process operations for a typical lead acid battery manufacturing plant. Such cost analysis assumed the characteristics for the fabric filters and plants listed in Table 5-4. Such cost analysis revealed that the cost effectiveness of the fabric filters ranged from roughly $381,000 to $4.3 million per ton of lead.[96]

Table 5-4. Cost Effectiveness of Fabric Filters Controlling Previously Uncontrolled Lead Emissions for Paste Mixing, Three Plate Process, and Other Lead Processes in a Typical Lead Acid Battery Manufacturing Plant.

Operation	Capital Costs Low/High ($)	Annual Costs Low/High ($)	Equipment Life (Years)	Annual Emissions (Tons Lead per year)	Cost Effectiveness, Low/High ($/Ton Lead)
Paste Mixing	70,000/ 70,000	224,000 / 224,000	20	0.052	4,375,000 / 4,375,000
Three Plate Process	130,000/ 520,000	253,000 / 321,000	20	0.420	617,857 / 826,190
Other Lead Processes	234,000/ 773,000	290,000 / 385,000	20	0.790	381,898 / 536,265

Current and past federal regulations suggest that such control measures are reasonably available. Specifically, the NSPS for Lead Acid Battery Manufacturing Plants (40 CFR 60, Subpart KK),

[95] Id. at Attachment 2.
[96] Memorandum – Lead Acid Battery Manufacturing Area Source Category Costing Information in Response to Comments on Proposed Rule, From Nancy Jones, EC/R, To Sharon Nizich, EPA/OAQPS/SPPD/MICG. June 12, 2007. Page 4.

published in 1982, imposes the control technologies with corresponding emissions limitations and control efficiencies shown in Table 5-3.[97] Such standards require control technologies that are BDT. The fact that such control measures were BDT almost thirty years ago suggests that each such control measure constitutes a RACM.

Moreover, the current NESHAP for the Lead Acid Battery Manufacturing Area Sources (40 CFR 63, Subpart PPPPPP), published in 2007, incorporates the exact same control measures and corresponding emission limits and control efficiencies as the older NSPS.[98] The current NESHAP requires control technologies that are generally available control technologies (GACT). The fact that EPA determined that such control measures were GACT technologies in the source category four years ago further suggests that such control measures are RACM.

A review of rules from California and Missouri further suggests that such control measures are reasonable. Such states were chosen for review because they both have lead acid battery manufacturing sources within the state. Missouri incorporates the federal NESHAP into state law. [99] California's SCAQMD adopted a rule practically requiring such a control measure, as it requires 98% efficiency for lead for facilities exceeding specific process and emission thresholds (i.e., processing more than 2 tons of lead per year with daily emissions of lead greater than or equal to 0.5lbs/day).[100]

5.4.2. Other Control Measures to Control Process Lead Emissions from Stacks.

A review of publicly available literature and correspondence with several EPA employees revealed limited adoption of other control measures to control process lead emissions from the stacks from lead acid battery facilities. Specifically, one lead acid battery manufacturing facility has fabric filter baghouses with HEPA filter add-ons to control process lead emissions from two of its mills.[101] Such limited known adoption suggests that other control measures to control lead process emissions from stacks in lead acid battery manufacturing plants are not reasonably economically feasible.

The available cost data further suggest that other control measures to control process emissions from stacks is not cost effective. For example, a recent analysis was performed to determine the cost for a typical battery manufacturing plant to upgrade from the current 90/99.0 percent controls (i.e., controls required by current NESHAP and NSPS) to 99.9 percent controls. Such estimate revealed that the total capital investment to upgrade to 99.9 percent controls could range from more than $600,000 to almost $1.7 million, depending on the technologies selected. Moreover, the annual costs of such additional control for a typical plant would be around $1.2 million per year due to increased operator labor costs, maintenance labor/material costs, electricity/other utility costs, taxes, insurance and capital recovery costs. Such cost represents about 5 percent of the total shipments for an average lead acid battery establishment. EPA has indicated that it does not believe that such costs are appropriate for the area sources in the category. Such costs incurred per ton of lead emissions reduced would be around

[97]NSPS for Lead acid Battery Manufacturing Plants, 40 CFR 60, Subpart KK (Published April 16, 1982).
[98]NESHAP for Lead Acid Battery Manufacturing Plants, 40 CFR 63 Subpart PPPPPP (Published July 16, 2007).
[99]Air10 CSR 10-6.075 Maximum Achievable Control Technology Regulations; Air Quality Standards, Definitions, Sampling, and Reference Methods and Air Pollution Control Regulations for the Entire State of Missouri (Published August 16, 1977). Page 91.
[100]California (South Coast Air Quality Management District), Rule 1420 - Emission Standards for Lead (Published September, 1992).
[101]Correspondence with Stephanie Doolan /EPA Region 7 in December, 2011 revealed that the Exide Facility in Salina, Kansas has adopted such additional control measures that control process lead emissions from stacks.

$450,000 to $500,000 based on replacing existing control devices or installing additional devices to increase control efficiency up to 99.9 percent.[102]

In addition, the EPA decision to not incorporate other control measures to control process emissions from stacks in recent standard development further suggests that there are no other control measures that are economically feasible. Specifically, citing the excessive costs, EPA decided that other control measures to control process emissions from stacks did not constitute GACT in the recent NESHAP for the Lead Acid Battery Manufacturing Source Category.[103]

A review of state rules from California and Missouri suggests that such control measures might be within economic reach. Such states were chosen for review because they both have lead acid battery manufacturing sources within the state. Missouri only incorporates the federal NESHAP into state law.[104] However, California's SCAQMD adopted a rule that might practically require such a control measure as it requires 98% efficiency for lead for facilities exceeding specific process and emission thresholds (i.e., processing more than 2 tons of lead per year with daily emissions of lead greater than or equal to 0.5lbs/day).[105]

5.4.3. Hot Asphalt Paving of Unpaved Roads, Chemical Stabilization of Unpaved Roads, and Vacuum Cleaning of Paved Roads to Control Fugitive Dust Lead Emissions.

A review of publicly available literature and correspondence with several EPA employees revealed limited adoption of control measures, like paving unpaved roads, chemically stabilizing unpaved roads, and vacuum cleaning of paved roads, to control fugitive dust emissions from lead acid battery facilities. Specifically, one lead acid battery manufacturing facility is paved on two sides, needs repair on one side, and the state in which the facility is located wants the facility to pave the unpaved side and repair the other side to control emissions.[106] Such limited adoption of such control measures suggests that such control measures do not constitute RACM.

Cost-effectiveness data for PM suggest that such control measures might be cost effective for controlling lead emissions as well. Specifically, such control measures have been shown to be cost effective, on average, for all facilities in all source categories for controlling PM, as shown in Table 5.5.[107] However, all of the facilities in the Lead Acid Battery Manufacturing source category are area sources, which suggests that the amount of emissions are much smaller than on average for all facilities.[108] Consequently, with lower emissions, the cost effectiveness for such control measures would decrease.

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[102] Memorandum – Lead Acid Battery Manufacturing Area Source Category Costing Information in Response to Comments on Proposed Rule, From Nancy Jones, EC/R, To Sharon Nizich, EPA/OAQPS/SPPD/MICG. June 12, 2007. Page 4.

[103] Introductory text to Lead Acid Battery Manufacturing Area Source NESHAP, 40 CFR 63, Subpart PPPPPP (Published July 16, 2007).

[104] Air10 CSR 10-6.075 Maximum Achievable Control Technology Regulations; Air Quality Standards, Definitions, Sampling, and Reference Methods and Air Pollution Control Regulations for the Entire State of Missouri (Published August 16, 1977). Page 91.

[105] California (South Coast Air Quality Management District), Rule 1420 - Emission Standards for Lead (Published September, 1992).

[106] Correspondence with Stephanie Doolan /EPA Region 7 in December, 2011, regarding the Exide Facility in Salina, Kansas.

[107] EPA CoST database.

[108] Memorandum – Lead Acid Battery Manufacturing Area Source Category Additional Information to Support Proposed Rule, From Nancy Jones, EC/R, To U.S. EPA Docket Number EPA-HQ-OAR-2006-0897. February 28, 2007.

Table 5-5. Cost-Effectiveness Information for Selected Control Measures for Controlling Particulate Matter with respect to the All Source Categories.

Control Measure	Cost Effectiveness* ($/Ton of PM)	Control Efficiency (%)
Vacuum Sweeping Paved Roads	400	50.0
Hot Asphalt Paving of Unpaved Roads	700	66.6
Chemical Stabilization of Unpaved Road	2600	37.5
* Rounded to the nearest $100 and escalated from 1999 to 2011 U.S. dollars.[109]		

No federal standards adopt such control measures. A review of state rules from California and Missouri suggests such control measures are reasonable. Such states were chosen for review because they both have secondary lead sources within the state. Missouri incorporates the federal NESHAP into state law, which does not require such control measures.[110] A California SCAQMD rule partially provides for such control measures by requiring sources to clean surfaces weekly that are subject to vehicular traffic.[111]

5.4.4. Other Control Measures for Controlling Fugitive Lead Emissions.

A review of state rules from California and Missouri suggests such control measures might be within economic reach, but there is a lack of support that such control measures are reasonably available. Such states were chosen for review because they both have secondary lead sources within the state (2 in each state). Missouri only incorporates the federal NESHAP into state law, which does not require such control measures.[112] However, a California SCAQMD rule requires several such control measures including requiring dust-forming material to be stored in an enclosure, washing/vacuuming surfaces accumulating lead-containing dust, etc.[113]

[109]In order to escalate from 1999 dollars to 2011 dollars, used the formula and approach presented in EPA's Control Strategy Tool (CoST) Control Measures Database (CMDB) Documentation, Page 9.
[110]Air10 CSR 10-6.075 Maximum Achievable Control Technology Regulations; Air Quality Standards, Definitions, Sampling, and Reference Methods and Air Pollution Control Regulations for the Entire State of Missouri (Published August 16, 1977). Page 91.
[111]California (South Coast Air Quality Management District), Rule 1420 - Emission Standards for Lead (Published September, 1992).
[112]Air10 CSR 10-6.075 Maximum Achievable Control Technology Regulations; Air Quality Standards, Definitions, Sampling, and Reference Methods and Air Pollution Control Regulations for the Entire State of Missouri (Published August 16, 1977). Page 91.
[113]California (South Coast Air Quality Management District), Rule 1420 - Emission Standards for Lead (Published September, 1992).

6.0. RACM DEVELOPMENT FOR THE IRON AND STEEL FOUNDRIES SOURCE CATEGORY.

This section presents control measures to consider for RACM development for the Iron and Steel Foundries source category. Section 6.1 provides an overview of the Iron and Steel Foundries source category. Section 6.2 provides a summary of operations and lead emission points for iron and steel foundry facilities. Section 6.3 provides a summary of the control measures utilized at iron and steel foundries facilities, and Section 6.4 provides a more detailed application of the RACM criteria to each identified control measure.

6.1. Overview of Source Category.

The Iron and Steel Foundries source category is actually two source categories that are normally considered collectively due to the similarity in processes, emissions and controls. The Iron Foundries source category consists of plants engaged in producing final shape castings from grades of iron. The production steps related to the source category include raw materials handling, metal melting, mold/core production, and casting/finishing.[114] The corresponding NAICS Code for the Iron Foundries source category is 331511. The NAICS Description for facilities with such NAICS Code is "establishments primarily engaged in manufacturing iron castings and further manufacturing them into finished products that are further classified based on the specific finished product."[115]

The Steel Foundries category includes any facility engaged in producing final shape steel castings by the melting, alloying, and molding of pig iron and steel scrap. This source category also includes raw materials handling, metal melting, mold/core production, and casting/finishing.[116] The corresponding NAICS codes for the Steel Foundries source category are 331512 and 331513. The NAICS Descriptions for facilities with NAICS Codes of 331512 and 331513 are "establishments primarily engaged in manufacturing steel casings (except steel investment castings) and manufacturing steel investment castings and further manufacturing them into finished products" and "establishments primarily engaged in manufacturing steel investment castings and manufacturing steel castings and further manufacturing them into finished products," respectively.[117]

A 1992 census revealed that there were roughly 2800 iron and steel foundries in the United States at that time. Exactly 595 iron and steel foundries returned survey data from an EPA Information Collection Request in 2002, and roughly 100 of such sources are major sources, while the remaining are area sources.[118]

[114] National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0056-0002-1 (Published December 2002). Page 1-2.
[115] North American Industry Classification System Website.
[116] National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0056-0002-1 (Published December 2002). Page 1-2.
[117] North American Industry Classification System Website.
[118] National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0056-0002-1 (Published December 2002). Page 5-12.

6.2. Facility Operations and Lead Emission Points.

The operations and processes for iron and steel foundries include the following: (1) pattern making, (2) mold/core making, (3) scrap preparation, (4), metal melting, (5) pouring, cooling, and shakeout, (6) sand handling, (7) mechanical finishing, and (8) cleaning and coating.[119]

The first step in production of castings is making a pattern, which is a metal, wood, or plaster replica of a finishing casting, which can be used to create molds into which molten metal is poured. The next step in production of castings is preparing and melting metal, where typically recycled scrap metals are used as the source of metal. Such scrap metals typically undergo some type of preparation prior to melting such as sizing, cleaning, and drying. Then such scrap is "charged" to a furnace for melting, and the molten metal is poured from the furnace (i.e., tapped) into either a holding furnace or a transfer ladle, and then the molten metal is transported to the pouring location. Upon reaching the pouring area, the molten metal is poured into a mold. After it has solidified and cooled, it is separated from the mold, and the casting is transferred to a finishing and cleaning area. Specific finishing and cleaning operations will vary depending on the type of mold used to produce the casting and casting specifications. Finishing typically involves mechanical operations such as abrasive cleaning, torch cutoff, air-carbon arc cleaning, chipping, core knockout, and grinding. Cleaning usually involves the use of organic solvents to remove rust, oil, grease, and dirt from the surface of the casting. The casting may also be given a coating.[120]

Emissions points for lead are associated with the following operations: (1) scrap preparation, (2) metal melting, and (3) pouring, cooling, and shakeout. With respect to scrap preparation, the primary lead emissions come from preheaters, which are used to preheat the scrap for melting in the furnace. The control devices used to control lead emissions from preheaters are generally fabric filters.[121]

With respect to the metal melting process, the predominant types of furnaces used to melt metal include cupolas, which are used only at iron foundries; electric arc furnaces (EAF), which are used mainly at steel foundries; and electric induction furnaces (EIF), which are commonly used at both iron and steel foundries. For lead emissions from cupolas, such emissions arise primarily from the melting operations. The control devices used to control lead emissions from cupolas are generally fabric filters and also wet scrubbers (usually Venturi scrubbers).[122]

For lead emissions from electric furnaces, such furnaces do not have well-defined stacks like cupolas. Consequently, control systems for these furnaces must include hoods or other types of capture mechanisms ducted to the control device. Moreover, the charging, melting, and tapping phases of the melting cycle occur in sequence, not simultaneously as with cupolas. Consequently, it is more likely that the charging and melting emissions may be captured by different systems because the furnace is different for the two operations. The two exhaust streams may be ducted to separate control devices or to the same device. Depending on the capture systems used, tapping emissions may also be captured, usually incidentally because these emissions are relatively insignificant and no system dedicated to these emissions is normally used. The control devices used to control lead emissions from electric furnaces include fabric filters and wet scrubbers. Similar control devices are used for EAFs. Capture systems

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[119] Id. at 3-3.
[120] Id.
[121] Id.
[122] Id.

used for EAFs and EIFs include side draft hoods, direct evacuation control system, fume rings, close-fitting hoods, canopy hoods, total furnace enclosures, and building and bay evacuation.[123]

With respect to the pouring, cooling, and shakeout operations, lead emissions are primarily a problem in the shakeout process. Such emissions are usually controlled by fabric filters and cartridge filters, but wet scrubbers and other devices are also used.[124]

6.3. Identification and Summary of Possible RACM Candidates.

Table 6-2 provides a summary of control measures used in the Iron and Steel Foundries source category for which the RACM criteria are applied in section 6.4 and the relative likelihood that each control measure is a RACM. Specifically, each control measure is assigned a rating of 1 through 3; where the higher the number, the more likely that the control measure is a RACM. Such assigned values are explained in Table 6-1.

Table 6-1. General Meanings of Assigned RACM Ratings.

RACM Rating	General Meaning of RACM Rating
1	There is limited support for identifying the control measure as a RACM.
2	There is some support for identifying the control measure as a RACM; more than for a control measure with a RACM Rating of "1."
3	There is substantial support for identifying the control measure as a RACM.
U (+ or -)	A "U" indicates that the likelihood that the control measure constitutes a RACM is undetermined due to incomplete information. A corresponding "+" indicates that despite incomplete information, an application of RACM criteria would likely suggest that the control measure is a RACM, while a "-" indicates that despite incomplete information, an application of the RACM criteria would likely suggest that the control measure is not a RACM.

123 Id.
124 Id.

Table 6-2. Iron and Steel Foundries Source Category - Summary of Known Control Measures and Relative Likelihood that each Control Measure is a RACM.

RACM Rating	Control Measure	Brief Reasoning for RACM Rating
1	Control devices (e.g., filters, cyclones, scrubbers) to control process lead emissions from preheaters during scrap preparation operations (e.g., loading, heating, and discharging).	1. Minority, albeit significant, adoption by sources. 2. Cost data suggest not cost effective. 3. Not identified as GACT for recent NESHAP. 4. Lack of adoption of such controls by state regulations. 5. California's SCAQMD adopted a rule practically requiring such a control measure, as it requires 98% efficiency for lead for facilities exceeding specific process and emission thresholds (i.e., processing more than 2 tons of lead per year with daily emissions of lead greater than or equal to 0.5lbs/day).
3	Control devices (e.g., filters, wet scrubbers, electrostatic precipitators) to control process lead emissions from cupolas during the melting operations at iron foundries.	1. Almost complete adoption by sources. 2. Cost data suggest cost effective for large and medium sources, but less cost effective for small sources. 3. Identified as GACT for larger area sources and MACT for major sources. 4. Many state regulations practically require such controls for cupolas. 5. California's SCAQMD adopted a rule practically requiring such a control measure, as it requires 98% efficiency for lead for facilities exceeding specific process and emission thresholds (i.e., processing more than 2 tons of lead per year with daily emissions of lead greater than or equal to 0.5lbs/day).
3	Control devices (e.g., filters and wet scrubbers) to control process lead emissions from electric arc furnaces (EAFs) during the melting operations.	1. Almost complete adoption by sources. 2. Cost data suggest cost effective for large and medium sources, but less cost effective for small sources. 3. Identified as GACT for larger area sources and MACT for major sources. 4. Many state regulations practically require such controls for EAFs. 5. California's SCAQMD adopted a rule practically requiring such a control measure, as it requires 98% efficiency for lead for facilities exceeding specific process and emission thresholds (i.e., processing more than 2 tons of lead per year with daily emissions of lead greater than or equal to 0.5lbs/day).
2.5	Control devices (e.g., filters and wet scrubbers) to control process lead emissions from electric induction furnaces (EIFs).	1. Minority, and less widespread, adoption by sources. 2. Cost effective for large foundries, but less cost effective for medium and small foundries. 3. Identified as GACT for larger area sources and MACT for major sources. 4. Some state regulations might practically require such controls for EIFs. 5. California's SCAQMD adopted a rule practically requiring such a control measure, as it requires 98% efficiency for lead for facilities exceeding specific process and emission thresholds (i.e., processing more than 2 tons of lead per year with daily emissions of lead greater than or

RACM Rating	Control Measure	Brief Reasoning for RACM Rating
		equal to 0.5lbs/day).
1	Control devices (e.g., filters) to control process lead emissions from the shakeout process.	1. Minority, albeit significant, adoption by sources. 2. Cost data suggest not cost effective. 3. Not identified as GACT for recent NESHAP. 4. Lack of adoption of such controls by state regulations.
U +	Improving currently installed control devices (e.g., filters and wet scrubbers) to more efficiently control process lead emissions (e.g., decreasing air to cloth ratio, increasing pressure differential, using horizontally hanging bags instead of vertically hanging bags).	1. Evidence suggests that such measures are more efficient, but there are limited cost data available.
2	Capture systems (e.g., side draft hoods, direct evacuation control systems, fume rings, close-fitting hoods, canopy hoods, total furnace enclosures, and building and bay evacuation) to control process fugitive lead emissions from EAFs during melting operations.	1. Majority use for at least some operations. 2. No cost data identified. 3. Identified as GACT for large area source foundries, but not for small foundries. 4. Many state regulations practically require such controls.
2	Capture systems (e.g., side draft hoods, direct evacuation control systems, fume rings, close-fitting hoods, canopy hoods, total furnace enclosures, and building and bay evacuation) to control process fugitive lead emissions from EIFs during melting operations.	1. Less widespread use compared to EAFs. 2. No cost data identified. 3. Identified as GACT for large area source foundries, but not for small foundries. 4. Many state regulations practically require such controls.
2.5	Pollution prevention measure of using scrap management practices and materials specifications to reduce lead content of scrap.	1. Extent of use not identified. 2. Cost data suggest cost effective. 3. Identified as GACT for both large and small area source foundries.
U +	Fugitive dust control measures.	1. Extent of use not identified. 2. No cost data identified. 3. A GACT emission limit exists, which prohibits foundries from discharging certain levels of fugitive emissions.

6.4. Application of RACM Criteria to Possible RACM Candidates.

6.4.1. Control devices (e.g., filters, cyclones, and scrubbers) to control process lead emissions from preheaters during scrap preparation operations (i.e., loading, heating, and discharging).

The common, but less than majority, use of control devices (e.g., filters, cyclones and scrubbers) for controlling process lead emissions from preheaters during scrap preparation operations suggests that such controls are somewhat economically feasible for larger foundries but less economically feasible for smaller foundries. For example, a majority of the total number of preheaters at iron and steel foundries are uncontrolled. Specifically, about 61 % of the total number of preheaters at iron foundries (68 of the 113 preheaters) and about 48% of iron foundries (76 of 157 iron foundries) use no controls to control process emissions from preheaters during all scrap preparation operations (i.e., loading, heating and discharging); [125] and about 78% of the total number of preheaters at steel foundries (7 of the 9 preheaters) and 90 % of the steel foundries (18 of the 20 steel foundries) use no controls to control process emissions from preheaters during scrap preparation operations (i.e., loading, heating and discharging).[126]

However there is a significant, albeit minority, use of such controls to control process emissions from preheaters at iron and steel foundries. Specifically, about 15% of the total number of preheaters at iron foundries (17 of the 113 preheaters) and about 15% of iron foundries (24/157 iron foundries) use filters to control process emissions from preheaters during all scrap preparation operations (i.e., loading, heating and discharging).[127] About 25% of the total number of preheaters at iron foundries (28 of 113 preheaters) and about 44% of iron foundries (50 of 113 iron foundries) use a control device (i.e., filter, scrubber, cyclone) to control process emissions from preheaters during some scrap preparation operations (i.e., loading, heating, discharging), but not all scrap preparation operations.[128] No steel foundries use filters to control process emissions from preheaters during all scrap preparation operations (i.e., loading, heating, and discharging).[129] One steel foundry uses a filter on one preheater to control process emissions from preheaters during scrap preparation for heating and discharging operations, but not for loading. One steel foundry uses a scrubber on one preheater to control process emissions during scrap preparation during discharging operations, but not for heating or loading.[130]

Available cost-effectiveness data suggest that such controls to control lead process emissions from preheaters is not cost effective. Specifically, EPA determined from an assessment of the impacts of meeting different candidate control options using three different model plants (small model plant with capacity of 500 TPY, medium model plant with capacity of 5,000 TPY, and large model plant with capacity of 50,000 TPY) that such controls were not reasonably cost effective for reducing emissions of PM and HAP metal compounds from sources for scrap preparation options (e.g., preheaters).[131] This suggests that using such controls to control lead emissions from preheaters is also not cost effective.

The recent NESHAP for Iron and Steel Foundries Area Sources (40 CFR 63, Subpart ZZZZZ) provides support that controls to control the process lead emissions from preheaters at foundries are not reasonably available.[132] Specifically, such standard does not require controls on preheaters. EPA's recent refusal to identify such controls as GACT suggests that such controls may not be RACM.

The current NESHAP for Iron and Steel Foundries Majors Sources (40 CFR 63, Subpart EEEEE) provides some support that controls to control the process lead emissions from preheaters at foundries are reasonably available. Specifically, such NESHAP requires that each scrap preheater at a new iron and steel foundry must not discharge emissions through a conveyance to the atmosphere that exceed either the of following limits for PM and total metal HAP: (1) 0.001 gr/dscf of PM, or (2) 0.0008 gr/dscf of total metal HAP; and requires that an existing iron and steel foundry must not discharge emissions

[125] Id. at 4-8.
[126] Id.
[127] Id.
[128] Id.
[129] Id.
[130] Id.
[131] Memorandum – Impact Estimates for Area Source Iron and Steel Foundries, From Conrad Chin, EPA/SPPD, To EPA Docket Number EPA-HQ-OAR-2006-0359-0005-1. September 4, 2007. Page 4.
[132] NESHAP for Iron and Steel Foundries Area Sources, 40 CFR 63, Subpart ZZZZZ (Published April 22, 2004).

through a conveyance to the atmosphere that exceed either of the following limits for PM and total metal HAP: (1) 0.005 gr/dscf of PM, or (2) 0.0004 gr/dscf of total metal HAP.[133]

The lack of adoption of such controls in state regulations suggests that such controls are not highly reasonable for preheaters. Specifically, Table 6-3 lists state regulations from the six states with the highest foundry metal melting rates.[134] While one has a PM emission limit that applies to all foundry operations that might practically require implementation of such control measures on preheaters, no other of such states have such PM limits.

California's SCAQMD Rule 1420 requires a control efficiency of 98% for all operations.[135] Consequently, this requirement would apply to control devices to control process lead emissions from preheaters during scrap preparation operations (i.e., loading, heating, and discharging). Notwithstanding, this requirement only applies to facilities processing more than 2 tons of lead per year with daily emissions of lead greater than or equal to 0.5lbs/day.

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[133] Id.

[134] National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0056-0002-1 (Published December 2002). Page 4-49.

[135] California (South Coast Air Quality Management District), Rule 1420 - Emission Standards for Lead (Published September, 1992).

Table 6-3. State Regulations from the Six States with the Highest Foundry Metal Melting Rates that Practically Require Implementation of Lead Control Measures.

	Melting Furnace – Cupolas (gr PM/dscf)	Melting Furnace – EAFs (gr Lead/dscf)	Melting Furnace – EIFs (gr Lead/dscf)	All Foundry Operations (gr PM/dscf)	Opacity Limit for Buildings that House Process Equipment[136]
Michigan	Existing cupolas: 0.2 (where melting capacity <10 tons/hour) to 0.08 (where melting capacity > 20 tons/hour). New cupolas: emission factor limits.	0.05	None	None	Opacity emission limits were found for five states, which generally apply to general roof vents that may contain fugitive emissions from various sources throughout the foundry. Four of the five states (Alabama, Wisconsin, Michigan, and Ohio) have 20 % opacity limits, while one state (Indiana) has a 30% to 40% opacity limit, depending on the location of the source.
Wisconsin	0.24	0.05	0.05		
Indiana	0.15	None	None	Cannot discharge any gases > 0.07	
Ohio	Based on process rate capacity of a generic PM emission source – vary widely.	Based on process rate capacity of a generic PM emission source – vary widely.	Based on process rate capacity of a generic PM emission source – vary widely.	None	
Illinois	Based on process weight rates – vary widely.	Based on process weight rates – vary widely.	Based on process weight rates – vary widely.	None	
Alabama	Based on process weight rates – vary widely	Based on process weight rates – vary widely	Based on process weight rates – vary widely	None	

6.4.2. Control devices (e.g., filters, wet scrubbers, electrostatic precipitators) to control process lead emissions from cupolas during the melting operations at iron foundries.

The almost complete adoption of control devices (e.g., filters, scrubbers, and electrostatic precipitators) for controlling process lead emissions from cupola furnaces during melting operations (i.e., charging, melting, tapping) at iron foundries suggests that such controls are economically feasible. Specifically, about 44% of foundries (48/110) and about 43% (62/143) of the total number of cupolas at iron foundries use a filter to control process emissions from cupolas during melting operations (charging, melting, and tapping). About 48% of foundries (53/110) and 50% of cupolas (71/143) at such foundries

[136]EPA examined such limits and determined that almost all States apply an opacity limit for buildings that house the process equipment. EPA determined that fugitive emissions from such equipment are effectively regulated by such opacity limits. NESHAP for Iron and Steel Foundries –Background Information for Promulgated Standards. EPA Document # EPA-HQ-OAR-2002-0034-0144 (Published August 2003). Page 109.

use wet scrubbers to control process emissions from cupolas during melting operations. Exactly 1/110 foundries and 1/143 cupolas at such foundries use electrostatic precipitator to control process emission from cupolas during melting (i.e., charging, melting, and tapping). Only about 7% (8/110) of foundries and about 6% (9/143) of the cupolas at such foundries did not use any control.[137]

Available cost-effectiveness data suggest that such controls to control lead process emissions from cupolas is generally cost effective. EPA determined from an assessment of the impacts of meeting different candidate control options using three different model plants (small model plant with capacity of 500 TPY, medium model plant with capacity of 5,000 TPY, and large model plant with capacity of 50,000 TPY) that add-on controls, such as filters (and cyclones or scrubbers) are reasonably cost effective for reducing emissions of PM and HAP metal compounds from medium and large sources for melting operations on furnaces, but less cost effective for smaller foundries.[138] Specifically, the model plant analysis also indicated that add-on controls for metal melting furnaces are much less cost effective for the small model plant than for the large model plant (costs exceeded $60,000/ton of PM removed for the 500 TPY model plant versus $3,000/ton of PM removed or less for the 50,000 TPY model plant). EPA further noted that the cost effectiveness for add-on controls for the medium model plants appeared to be reasonable for cupolas.[139] This suggests that using such controls to control lead from cupolas is cost effective, especially for medium and large plants.

The current NESHAP for Iron and Steel Foundries Area Sources (40 CFR 63, Subpart ZZZZZ) suggests that such controls are reasonably available. Specifically, such NESHAP requires that large foundries (existing source with annual metal melt production > 20,000 tons or new source with an annual metal melt capacity > 10,000 tons), but not small foundries (existing source with annual melt production of ≤ 20,000 tons or less or new source with an annual metal melt capacity of ≤ 10,000 tons or less) must not discharge to the atmosphere emissions from any metal melting furnace or group of all metal melting furnaces that exceed the applicable limits: (1) for an existing iron and steel foundry, 0.8 pounds of PM per ton of metal charged or 0.06 pounds of total metal HAP per ton of metal charged and (2) for a new iron and steel foundry, 0.1 pounds of PM per ton of metal charged or 0.008 pounds of total metal HAP per ton of metal charged.[140] The fact that EPA recently decided that such controls are GACT for some area sources suggests that such controls are RACM.

Moreover, such controls are required by the NESHAP for Iron and Steel Foundries Major Sources (40 CFR 63, Subpart EEEEE) for both new and existing sources. This provides support that such controls are RACM, since such controls represent MACT standards that are 7 years old.[141]

The fact that many state regulations practically require such controls for cupolas suggests that such controls are reasonable. Specifically, Table 6-3 lists state regulations from the six states with the highest foundry metal melting rates.[142] All states require PM emission limits that might practically require implementation of such control measures on cupolas.

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[137] National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0056-0002-1 (Published December 2002). Page 4-11.

[138] Memorandum – Impact Estimates for Area Source Iron and Steel Foundries, From Conrad Chin, EPA/SPPD, To EPA Docket Number EPA-HQ-OAR-2006-0359-0005-1. September 4, 2007. Page 4.

[139] Id. at 4.

[140] NESHAP for Iron and Steel Foundries Area Sources, 40 CFR 63, Subpart ZZZZZ (Published April 22, 2004).

[141] Id.

[142] National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0056-0002-1 (Published December 2002). Page

California's SCAQMD Rule 1420 requires a control efficiency of 98% for all operations.[143] Consequently, this requirement would apply to control devices to control process lead emissions from cupolas during the melting operations at iron foundries. Notwithstanding, this requirement only applies to facilities processing more than 2 tons of lead per year with daily emissions of lead greater than or equal to 0.5lbs/day.

6.4.3. Control devices to control process emissions from EAFs during the melting operations at iron and steel foundries.

The almost complete adoption of control devices (mostly filters) for controlling emissions from EAFs during melting operations (i.e., charging, melting, tapping) at iron and steel foundries suggests that such controls are economically feasible. Specifically, there were no uncontrolled EAFs at iron foundries. One hundred percent of the total number of EAFs at iron foundries (28 of the 28) and one hundred percent of iron foundries (11 of 11) use controls (mostly filters) to control process emissions from EAFs during at least some melting operations (i.e., charging, melting or tapping).[144]

Moreover, only about 2% (3/136) of the total number of EAFs at steel foundries and about 2% (3/71) of the total number of steel foundries are uncontrolled.[145] About 73% (99/135) of the total number of EAFs at steel foundries and about 70% (50/71) of steel foundries used filters to control emissions from EAFs during some melting operations (i.e., charging, melting, tapping) at steel foundries.[146] About 24% (33/135) of the total number of EAFs at steel foundries and about 30% (21/71) foundries used filters to control emissions from EAFs during the melting operations (i.e., charging, melting, and tapping) at steel foundries.[147]

Available cost-effectiveness data suggest that such controls to control EAFs are cost effective. EPA determined from an assessment of the impacts of meeting different candidate control options using three different model plants (small model plant with capacity of 500 TPY, medium model plant with capacity of 5,000 TPY, and large model plant with capacity of 50,000 TPY) that add-on controls, such as filters (and cyclones or scrubbers) are reasonably cost effective for reducing emissions of PM and HAP metal compounds from medium and large sources for melting operations on furnaces, but less cost effective for smaller foundries.[148] Specifically, the model plant analysis also indicated that add-on controls for metal melting furnaces are much less cost effective for the small model plant than for the large model plant (costs exceeded $60,000/ton of PM removed for the 500 TPY model plant versus $3,000/ton of PM removed or less for the 50,000 TPY model plant). EPA further noted that the cost effectiveness for add-on controls for the medium model plants appeared to be reasonable for EAFs.

The current NESHAP for Iron and Steel Foundries Area Sources (40 CFR 63, Subpart ZZZZZ) suggests that such controls are reasonably available. Specifically, such NESHAP requires that large foundries

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4-49.
[143] California (South Coast Air Quality Management District), Rule 1420 - Emission Standards for Lead (Published September, 1992).
[144] National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0056-0002-1 (Published December 2002). Page 4-27.
[145] Id. at 4-27.
[146] Id.
[147] Id.
[148] Memorandum – Impact Estimates for Area Source Iron and Steel Foundries, From Conrad Chin, EPA/SPPD, To EPA Docket Number EPA-HQ-OAR-2006-0359-0005-1. September 4, 2007. Page 4.

(existing source with annual metal melt production > 20,000 tons or new source with an annual metal melt capacity > 10,000 tons), but not small foundries (existing source with annual melt production of ≤ 20,000 tons or less or new source with an annual metal melt capacity of ≤ 10,000 tons or less) must not discharge to the atmosphere emissions from any metal melting furnace or group of all metal melting furnaces that exceed the applicable limits: (1) for an existing iron and steel foundry, 0.8 pounds of PM per ton of metal charged or 0.06 pounds of total metal HAP per ton of metal charged and (2) for a new iron and steel foundry, 0.1 pounds of PM per ton of metal charged or 0.008 pounds of total metal HAP per ton of metal charged.[149] The fact that EPA recently decided that such controls are GACT for some area sources suggests that such controls are RACM.

Moreover, such controls are required by the NESHAP for Iron and Steel Foundries Major Sources (40 CFR 63, Subpart EEEEE) for both new and existing sources. This further provides support that such controls are RACM, since such controls represent MACT standards that are 7 years old.[150]

The fact that many state regulations practically require such controls for EAFs suggests that such controls are reasonable. Specifically, Table 6-3 lists state regulations from the six states with the highest foundry metal melting rates.[151] Five of the six states require PM emission limits that might practically require implementation of such control measures on EAFs.

California's SCAQMD Rule 1420 requires a control efficiency of 98% for all operations.[152] Consequently, this requirement would apply to control devices to control process emissions from EAFs during the melting operations at iron and steel foundries. Notwithstanding, this requirement only applies to facilities processing more than 2 tons of lead per year with daily emissions of lead greater than or equal to 0.5lbs/day.

6.4.4. Control devices (e.g., filters, wet scrubbers, and cyclones) used to control the process emissions from EIFs during the melting operations at iron and steel foundries.

The less widespread adoption of control devices used to control the process emissions from EIFs during the melting operations at iron and steel foundries suggests that such controls are less economically feasible for EIFs than for EAFs or cupolas. For example, most iron foundries do not control EIFs with a control device. Specifically, about 58% (438 of the 754) of the total number of EIFs at iron foundries and about 64% (181 of 286) of iron foundries (64%) use no controls to control process emissions from EIFs during melting (i.e., charging, melting, tapping). Only about 28% (210 of the 754) of the total number of EIFs at iron foundries and about 24% (69 of 286) of iron foundries use filters to control process emissions from EIF during melting (i.e., charging, melting, tapping). About 12 % (88 of the 754) of the total number of EIFs at iron foundries and about 10% (30 of 286) of iron foundries (10%) use filters to control process emissions from EIF during some melting operations (charging, melting, tapping) but not all.[153] About 2% (17 of 754) of the total number of EIFs at iron foundries and about 2% (6 of 286) of iron foundries use wet scrubbers to control process emissions from EIF during some melting (i.e., charging, melting, tapping) but not all. Less than 1% (2 of 754) of the total number of EIFs

[149] NESHAP for Iron and Steel Foundries Area Sources, 40 CFR 63, Subpart ZZZZZ (Published April 22, 2004).
[150] NESHAP for Iron and Steel Foundries Major Sources, 40 CFR 63, Subpart EEEEE (Published April 22, 2004).
[151] National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0056-0002-1 (Published December 2002). Page 4-49.
[152] California (South Coast Air Quality Management District), Rule 1420 - Emission Standards for Lead (Published September, 1992).
[153] Id. at 4-21 through 4-22.

at iron foundries and less than 1% (2 of 286) of the iron foundries use cyclones to control process emissions from EIFs during some melting operations (i.e., charging, melting, and tapping) but not all.[154]

Most steel foundries also do not control EIFs with a control device. Specifically, about 79% (509 of the 643) of the total number of EIFs at steel foundries and about 77% (144 of 186) of steel foundries use no controls to control process emissions from EIFs during melting (i.e., charging, melting, tapping).[155] About 13% (81 of the 643) of the total number of EIFs at steel foundries, and about 12% (23 of 186) of steel foundries use filters to control process emissions from EIFs during melting (i.e., charging, melting, tapping).[156] About 5% (34 of the 643) of the total number of EIFs at steel foundries, and about 7% of (13 of 186) steel foundries use filters to control process emissions from EIFs during some melting (i.e., charging, melting or tapping).[157] Less than 1% (6 of the 643) of the total number of EIFs at steel foundries, and about 1% (2 of 186) of steel foundries use wet scrubbers to control process emissions from EIFs during some melting (charging, melting or tapping).[158] Less than 1 % (6 of the 643) of the total number of EIFs at steel foundries, and about 1% (2 of 186) of steel foundries, use cyclones to control process emissions from EIFs during some melting (i.e., charging, melting or tapping).[159]

Available cost-effectiveness data suggest that such controls to control for lead process emissions from EIFs are less cost effective than for cupolas and EAFs. EPA determined from an assessment of the impacts of meeting different candidate control options using three different model plants (small model plant with capacity of 500 TPY, medium model plant with capacity of 5,000 TPY, and large model plant with capacity of 50,000 TPY) that add-on controls, such as filters (and cyclones or scrubbers) are reasonably cost effective for reducing emissions of PM and HAP metal compounds from sources for melting operations on furnace, but less cost effective for smaller foundries. Specifically, the model plant analysis also indicated that add-on controls for metal melting furnaces are much less cost effective for the small model plant than for the large model plant (costs exceeded $60,000/ton of PM removed for the 500 TPY model plant versus $3,000/ton of PM removed or less for the 50,000 TPY model plant). EPA further noted that the cost effectiveness for add-on controls for the medium model plants appeared to be reasonable for cupolas and EAFs, but were less reasonable for EIFs due to the lower emissions from uncontrolled EIFs as compared to cupolas and EAFs.[160]

The current NESHAP for Iron and Steel Foundries Area Sources (40 CFR 63, Subpart ZZZZZ) suggests that such controls are reasonably available. Specifically, such NESHAP requires that large foundries (existing source with annual metal melt production > 20,000 tons or new source with an annual metal melt capacity > 10,000 tons), but not small foundries (existing source with annual melt production of ≤ 20,000 tons or less or new source with an annual metal melt capacity of ≤ 10,000 tons or less) must not discharge to the atmosphere emissions from any metal melting furnace or group of all metal melting furnaces that exceed the applicable limits: (1) for an existing iron and steel foundry, 0.8 pounds of PM per ton of metal charged or 0.06 pounds of total metal HAP per ton of metal charged and (2) for a new iron and steel foundry, 0.1 pounds of PM per ton of metal charged or 0.008 pounds of total metal HAP

[154] National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0056-0002-1 (Published December 2002). Page 4-22.
[155] Id. at 4-23.
[156] Id. at 4-23.
[157] Id.
[158] Id.
[159] Id.
[160] Memorandum – Impact Estimates for Area Source Iron and Steel Foundries, From Conrad Chin, EPA/SPPD, To EPA Docket Number EPA-HQ-OAR-2006-0359-0005-1. September 4, 2007. Page 4.

per ton of metal charged.[161] The fact that EPA has recently decided that such controls are GACT for some area sources provides some support that such controls are reasonably available.

Moreover, such controls are required by the NESHAP for Iron and Steel Foundries Major Sources (40 CFR 63, Subpart EEEEE) for both new and existing sources. This further provides support that such controls are RACM, since such controls represent MACT standards that are 7 years old.[162]

The fact that some state regulations practically require such controls for EIFs might suggest that such controls are reasonable. Specifically, Table 6-3 lists state regulations from the six states with the highest foundry metal melting rates.[163] Four of the six states require PM emission limits that might practically require implementation of such control measures for EIFs.

California's SCAQMD Rule 1420 requires a control efficiency of 98% for all operations.[164] Consequently, this requirement would apply to control devices used to control the process emissions from EIFs during the melting operations at iron and steel foundries. Notwithstanding, this requirement only applies to facilities processing more than 2 tons of lead per year with daily emissions of lead greater than or equal to 0.5lbs/day.

6.4.5. Control devices (e.g., filters, wet scrubbers) to control the process emissions from the shakeout process.

The less widespread adoption of control devices used to control the process emissions from shakeout processes at iron and steel foundries suggests that such controls are less economically feasible for shakeout stations than for melting operations. For example, about 33% (384 of the 1156) of shakeout stations and about 40% (225 of 569) of foundries use no controls to control process emissions from shakeout stations.[165] Meanwhile, about 53% (602 of the 1156) of shakeout stations and about 63% (360 of the 569) foundries use filters to control process emissions from shakeout stations.[166] About 14% (161 of the 1156) of shakeout stations and 14% (79 of the 569) of foundries use wet scrubbers to control process emissions from shakeout stations. Less than 1% (9 of the 1156) of shakeout stations and less than 2% (7 of the 569) of foundries use other control devices (cyclones) to control process emissions from shakeout stations.

Available cost-effectiveness data suggest that such controls to control preheaters are not cost effective. Specifically, EPA determined from an assessment of the impacts of meeting different candidate control options using three different model plants (small model plant with capacity of 500 TPY, medium model plant with capacity of 5,000 TPY, and large model plant with capacity of 50,000 TPY) that add-on controls, such as filters (and cyclones or scrubbers) were not cost effective for reducing emissions of PM and HAP metal compounds from sources for shakeout processes.[167] This suggests that using such controls for controlling lead is also not cost effective.

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[161] NESHAP for Iron and Steel Foundries Area Sources, 40 CFR 63, Subpart ZZZZZ (Published April 22, 2004).
[162] NESHAP for Iron and Steel Foundries Major Sources, 40 CFR 63, Subpart EEEEE (Published April 22, 2004).
[163] National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0056-0002-1 (Published December 2002). Page 4-49.
[164] California (South Coast Air Quality Management District), Rule 1420 - Emission Standards for Lead (Published September, 1992).
[165] Id. at 4-41
[166] Id.
[167] Memorandum – Impact Estimates for Area Source Iron and Steel Foundries, From Conrad Chin, EPA/SPPD, To EPA

Moreover, such controls are required by the NESHAP for Iron and Steel Foundries Major Sources (40 CFR 63, Subpart EEEEE) for both new and existing sources. This further provides support that such controls are RACM, since such controls represent MACT standards that are 7 years old.[168]

The lack of adoption of such controls in state regulations suggests that such controls are not highly reasonable for the shakeout process. Specifically, Table 6-3 lists state regulations from the six states with the highest foundry metal melting rates.[169] While one has a PM emission limit that applies to all foundry operations that might practically require implementation of such control measures for the shakeout process, no other of such states have such PM limits.

6.4.6. Improving current control devices used to control the process emissions from iron and steel foundries.

Several measures could possibly improve the efficiency of controls that control process lead emissions from iron and steel foundries. Such measures include increasing the pressure differential of Venturi scrubbers, increasing the air-to-cloth ratio of fabric filters, and using horizontally hanging instead of vertically hanging bags for fabric filters.

For example, pressure differential is a key factor affecting the efficiency of a scrubber in removing PM, and similarly, lead. As a rule of thumb, a high-efficiency scrubber is one with a pressure differential greater than 50 inches of water column.[170] The pressure differential at Venturi scrubbers used on cupolas is in Table 6-4.[171] Many of the pressure differentials are less than 50 inches of water column. Such pressure differentials might be increased to increase the efficiency of such controls.

Table 6-4. Pressure Differentials of Venturi Scrubbers used on Cupola Furnaces at Iron Foundries

Pressure differential, inches of water column	Number of Scrubbers
≤ 8	9
20 to 29	5
30 to 39	14
40 to 49	11
50 to 59	9
60 to 70	7

Similarly, the air-to-cloth ratio, which is the major design factor that affects the efficiency of fabric filters, might be decreased to increase the efficiency of fabric filters.

A more uncertain method of increasing the efficiency of fabric filters is to use horizontally hanging instead of vertically hanging bags. Specifically, two sources have implemented horizontally hanging bags rather than the traditional vertically hanging bags, and allege that such horizontally hanging bags are cheaper and more efficient. According to an operator of one of these novel fabric filters, a lighter

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Docket Number EPA-HQ-OAR-2006-0359-0005-1. September 4, 2007. Page 4.
[168] NESHAP for Iron and Steel Foundries Major Sources, 40 CFR 63, Subpart EEEEE (Published April 22, 2004).
[169] National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0056-0002-1 (Published December 2002). Page 4-49.
[170] Id. at 4-12.
[171] National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0056-0002-1 (Published December 2002). Page 4-16.

weight fabric can be used when the bags are horizontally supported. When bags hang vertically, the tops of the bags must be strong enough to hold up the weight of the entire bag, and the entire filter cake on that bag. A light-weight bag would not be able to support the weight, and would tear. By having the bags supported horizontally, they are able to reduce the weight that the bag material supports to only the small amount under the horizontal support. The light-weight bag is easier to clean and is more permeable, which allows for a more even distribution of the air flow. Heavier-weight bags tend to get more material caught in the bag material, and as a result need to be cleaned more frequently and more vigorously. One source indicated that, "since 80% of emissions are associated with cleaning," by lowering the cleaning frequency, the fabric filter emissions are lowered. The light-weight bag is also more permeable, so that pressure drop is reduced, and air flow is more evenly distributed. This, along with the low air-to-cloth ratio for these fabric filters, allows more of the PM material, and associated lead, to be collected on the bag surface, rather than becoming impregnated into the fabric, making it easier to clean the bags.[172]

6.4.7. Capture systems used for EAFs and EIFs including side draft hoods, direct evacuation control systems, fume rings, close-fitting hoods, canopy hoods, total furnace enclosures, and building and bay evacuation.

Capture systems consist of two general types: close capture and general capture. Close-capture systems, which are more effective, use techniques such as side draft hoods, direct evacuation systems, fume rings, and close-fitting hoods that capture emissions before they escape from the immediate vicinity of the furnace. These systems require only a small volume of air flow, which is drawn through attached ductwork to a control device that can be dedicated to specific operations. General-capture systems employ canopy hoods or total enclosures, both of which can be used with dedicated control devices but require a higher volume of air flow than close-capture systems, or building or bay evacuation systems, which also require large volumes of air and must serve the entire building or a large segment of it.[173]

Tables 6-5 and 6-6 show the extent of adoption of capture systems to control fugitive process emissions from control devices attached to EIFs and EAFs at foundries, respectfully.[174] Such tables demonstrate that capture devices are much more widely adopted for use on EAFs than EIFs. Moreover, for both EIFs and EAFs, close-captures are more generally adopted than other types of capture devices.[175]

[172] Id. at 4-15 through 4.16.
[173] Id. at 4-30.
[174] In the following tables, close capture includes side draft hood, fume ring, close-fitting hood, and direct evacuation. Others include canopy hood, draft system or ventilation to a fabric filter, area ducting, section tube, and building evacuation to a fabric filter. No capture includes not reported, roof vent, exhaust fan, lid or cover, or general ventilation.
[175] Id. at 4-31.

Table 6-5. Use of Capture Systems on EIFs at Iron and Steel Foundries.

Capture system type	Melting furnace operation serviced		
	Charging	**Melting**	**Tapping**
Close Capture			
Number of furnaces	211	261	160
Number of foundries	66	78	53
Other Type			
Number of furnaces	185	200	169
Number of foundries	69	84	63
No Capture			
Number of furnaces	1001	936	1068
Number of foundries	334	315	353
Total number furnaces: 1397		**Total number foundries: 445**	

Table 6-6. Use of Capture Systems on EAFs at Iron and Steel Foundries.

Capture system type	Melting furnace operation serviced		
	Charging	**Melting**	**Tapping**
Close Capture			
Number of furnaces	32	120	33
Number of foundries	20	62	19
Other Type			
Number of furnaces	41	26	17
Number of foundries	18	9	11
No Capture			
Number of furnaces	92	17	113
Number of foundries	46	10	52
Total number furnaces: 168		**Total number foundries: 81**	

The NESHAP for Iron and Steel Foundries Area Sources (40 CFR 63, Subpart ZZZZZ) suggests that such controls are reasonably available. Specifically, such NESHAP requires that large foundries (existing source with annual metal melt production > 20,000 tons or new source with an annual metal melt capacity > 10,000 tons), but not small foundries (existing source with annual melt production of ≤ 20,000 tons or less or new source with an annual metal melt capacity of ≤ 10000 tons or less) must operate a capture and collection system for each metal melting furnace at a new or existing iron and steel foundry where each capture and collection system must meet accepted engineering standards.[176] The fact that EPA has recently decided that such controls are generally available for some area sources provides support that such controls are reasonably available.

The fact that many state regulations practically require such controls for EIFs suggests that such controls might be reasonable. Specifically, Table 6-3 lists state regulations from the six states with the highest foundry metal melting rates.[177] Five of the six states require opacity limits resulting from fugitive process emissions, and therefore might practically require implementation of such control measures to control fugitive process lead emissions.

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[176] NESHAP for Iron and Steel Foundries Area Sources, 40 CFR 63, Subpart ZZZZZ (Published April 22, 2004).

[177] National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0056-0002-1 (Published December 2002). Page 4-49.

6.4.8. Pollution prevention measure of using scrap management practices and materials specifications to reduce HAP content of scrap.

EPA conducted an assessment of the impacts of meeting different candidate control options using three different model plants (small model plant with capacity of 500 TPY, medium model plant with capacity of 5,000 TPY, and large model plant with capacity of 50,000 TPY). One such control option was use of scrap management practices to reduce HAP content of scrap.[178] EPA decided such measure was cost effective enough to include as GACT for small and large area sources. Moreover, the source must prepare and operate at all times according to written material that (1) provides for the purchase and use of only iron and steel scrap that has been depleted (to the extent practicable) of HAP metals in the charge materials used by the iron and steel foundry; (2) provides for metallic scrap materials charged to a scrap preheater or metal melting furnace to be depleted (to the extent practicable) of the presence of accessible lead-containing components (such as batteries and wheel weights), except that for scrap charged to a cupola metal melting furnace that is equipped with an afterburner, specifications for metallic scrap materials to be depleted (to the extent practicable) of the presence of chlorinated plastics and accessible lead-containing components (such as batteries and wheel weights), and (3) must provide specifications of a program to ensure the scrap materials are drained of free liquids.[179]

6.4.9. Other control measures for controlling fugitive process and dust emissions.

The NESHAP for Iron and Steel Foundries Area Sources (40 CFR 63, Subpart ZZZZZ) prohibits discharging to the atmosphere fugitive emissions from foundry operations that exhibit a certain opacity limit. This suggests that there might be other fugitive control measures that might be reasonably available since EPA decided such a limit was generally available.

[178] NESHAP for Iron and Steel Foundries Area Sources, 40 CFR 63, Subpart ZZZZZ (Published April 22, 2004).
[179] Memorandum – Impact Estimates for Area Source Iron and Steel Foundries, From Conrad Chin, EPA/SPPD, To EPA Docket Number EPA-HQ-OAR-2006-0359-0005-1. September 4, 2007. Page 4.

7.0. RACM DEVELOPMENT FOR THE INTEGRATED IRON AND STEEL MILLS SOURCE CATEGORY.

This section presents control measures to consider for RACM development for the Iron and Steel Mills source category. Section 7.1 provides an overview of the Iron and Steel Mills source category. Section 7.2 provides a summary of operations and lead emission points for iron and steel mill facilities. Section 7.3 provides a summary of the control measures utilized at iron and steel mill facilities, and Section 7.4 provides a more detailed application of the RACM criteria to each identified control measure.

7.1. Overview of Source Category.

The Iron and Steel Mills source category includes plants engaged in producing steel. A fully integrated facility produces steel from raw materials of coal, iron ore, and scrap; whereas non-integrated plants do not have all of the equipment to produce steel from coal, iron ore, and scrap on-site.[180] The corresponding NAICS Code for the Integrated Iron and Steel Mills source category is 331111. The NAICS Description for facilities with such NAICS Code is "establishments primarily engaged in one or more of the following: direct reduction of iron ore, manufacturing pig iron in molten or solid form, converting pig iron into steel, making steel, making steel and manufacturing shapes, and making steel and forming tube and pipe.[181]

As of 2001, there are roughly twenty integrated iron and steel mills in the United States. The highest geographic concentration of mills is in the Great Lakes Region. Large, fully-integrated iron and steel mills have declined considerably in the fifteen year time period before 2001. For example, of the iron and steel mills that were open during such fifteen year period and still open in 2001, such plants experienced a 61 percent reduction in the number of production employees over the 15 year period.[182]

7.2. Facility Operations and Lead Emission Points.

Integrated iron and steel mills engage in processes that include the following process units: (1) sinter production, (2) iron production (hot metal desulfurization), (3) steel production, (4) semi-finished product preparation, (6) finished product preparation, and (7) handling and treatment of raw, intermediate, and waste materials. The iron production process includes the production of iron in blast furnaces by reduction. The steel production process includes basic oxygen process furnaces (BOPF).

The discussion of emission points for lead will be discussed by the following three categories: sinter plants, blast furnaces, and BOPF shops.[183] Sintering is a process that recovers the raw material value of waste materials generated at iron and steel plants that would otherwise be landfilled or stockpiled. An important function of the sinter plant is to return waste iron-bearing materials to the blast furnace to produce iron and to also provide part or all of the flux material for the iron-making process.[184]
The sinter plant windbox serves as the capture system for the sintering machine and is the most critical source of emissions in the sinter plant. After the sinter materials are mixed, they are ignited on the

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[180] National Emission Standards for Hazardous Air Pollutants (NESHAP) for Integrated Iron and Steel Plants – Background Information for Proposed Standards. EPA-453/R-01-005 (Published January 2001). Page 2-1.
[181] The North American Industry Classification System Website.
[182] National Emission Standards for Hazardous Air Pollutants (NESHAP) for Integrated Iron and Steel Plants – Background Information for Proposed Standards. EPA-453/R-01-005 (Published January 2001). Page 2-3.
[183] Id. at 1-2.
[184] Id. at 3-1.

surface by gas burners, and as the materials move through the sinter bed, air is pulled down through the mixture to burn the fuel by downdraft combustions through a series of windboxes, and evacuated to a control device. The control devices used to control lead emissions from windboxes are fabric filters and wet scrubbers.[185]

The sinter plant emission points on the discharge end include sinter discharge, crusher, hot screen, sinter cooler, and cold screen. Such emissions points are generally hooded individually with an enclosed hood or a suspended hood and evacuated to one or more control devices. Possible control devices include fabric filters and water sprays at various transfer points. Possible controls for storage areas include chemical dust suppression.[186]

Casthouse emissions from molten iron and slag occur primarily at the tape hole of the blast furnace in the iron trough immediately adjacent to it. Emissions also result from the runner that transports the iron and slag and from the ladle that receives the molten iron. The capture and control systems in place for such emissions include a combination of flame suppression and covered runners, and also evacuation of such emissions to a control device, most commonly a fabric filter (which requires total enclosures of the casthouse) and scrubbers.[187]

The BOPH primary emissions refer to those emissions leaving the mouth of the furnace vessel during the oxygen blow that are captured by the primary hood. The associated controls for BOPH depend on whether the BOPH is associated with an open-hood design or a closed-hood design. Open-hood BOPF shops are controlled with scrubbers and ESP. Closed-hood designs are controlled with Venturi scrubbers.[188]

The BOPF secondary emissions include a hot metal transfer, desulfurization, slag skimming, charging, turndown, tapping, deslagging, teeming, ladle maintenance, flux handling slag handling and disposal, and ladle metallurgy operations. Fabric filters, and less frequently, wet scrubbers, are used to control secondary BOPF shop emissions.[189]

One source of secondary emissions are emissions that occur during the steps of the furnace cycle that require the vessel to be tipped out from the hood include scrap charging, hot metal charging, sampling, tapping, and deslagging. When the vessel is tipped, the primary control system may be rendered entirely ineffective. Such emissions are captured and controlled by furnace enclosures and partial building evacuation.[190]

Other sources of secondary emissions are ancillary operations, including hot metal transfer, desulfurization, and slag skimming. Such emissions are usually controlled by hooding ducted to a control device separate from the primary control device.[191]

After hot metal is refined into steel in the BOPH, further alloy additions and refining of the steel occur during ladle treatment and vacuum degassing. Most BOPF shops have a separate ladle metallurgy

[185] Id. at 4-1.
[186] Id. at 4-7.
[187] Id. at 4-9.
[188] Id. at 4-17.
[189] Id. at 4-25.
[190] Id.
[191] Id.

stations. Such emissions are generally captured and controlled from ladle metallurgy operations using a fabric filter, although wet scrubbers are also used.[192]

7.3. Identification and Summary of Possible RACM Candidates.

Table 7-3 provides a summary of control measures used in the Iron and Steel Foundries source category for which the RACM criteria are applied in section 7.4 and the relative likelihood that each control measure is a RACM. Specifically, each control measure is assigned a rating of 1 through 3; where the higher the number, the more likely that the control measure is a RACM. Such assigned values are explained in Table 7-1.

Table 7-1. General Meanings of Assigned RACM Ratings.

RACM Rating	General Meaning of RACM Rating
1	There is limited support for identifying the control measure as a RACM.
2	There is some support for identifying the control measure as a RACM; more than for a control measure with a RACM Rating of "1."
3	There is substantial support for identifying the control measure as a RACM.
U (+ or -)	A "U" indicates that the likelihood that the control measure constitutes a RACM is undetermined due to incomplete information. A corresponding "+" indicates that despite incomplete information, an application of RACM criteria would likely suggest that the control measure is a RACM, while a "-" indicates that despite incomplete information, an application of the RACM criteria would likely suggest that the control measure is not a RACM.

Table 7-2. Iron and Steel Foundries Source Category - Summary of Known Control Measures and Relative Likelihood that each Control Measure is RACM.

RACM Rating	Control Measure	Brief Reasoning for RACM Rating
3	Control devices (e.g., fabric filters and wet scrubbers) to control process lead emissions from sinter plant windboxes.	1. Complete adoption by sources. 2. Cost data suggest cost effective. 3. Identified as MACT roughly 8 years ago. 4. All sources are subject to state regulations or permits that practically require such controls.
3	Control devices to control process lead emissions from sinter plant discharge end emissions points (e.g., discharges, crushers, hot screens, coolers, and cold screens).	1. Almost complete adoption by sources for such emissions points. 2. Cost data suggest cost effective. 3. Identified as MACT roughly 8 years ago. 4. All sources are subject to state regulations or permits that practically require such controls.
1.5	Control measures to control fugitive lead dust emissions from material handling (i.e., material storage, material mixing, and sinter storage) at sinter plants.	1. Low adoption of such measures by sources. 2. No cost data identified. 3. Not required by any known federal regulations. 4. Five of the 7 operating sinter plants are subject to a building opacity standard to limit releases of fugitive emissions that might practically require such controls.
3	Control measures (e.g., flame suppression, covered runners, and control devices) to control process	1. Widespread adoption of such measures by sources. 2. Cost data suggest cost effective.

[192] Id. at 4-30.

RACM Rating	Control Measure	Brief Reasoning for RACM Rating
	lead emissions from casthouses at iron and steel mills.	3. Identified as MACT roughly 8 years ago. 4. 24/29 casthouses are subject to visible emissions standards that limit the opacity of emissions discharged from casthouse openings that might practically require such controls.
3	Control devices (e.g., scrubbers and ESPs) to control process lead emissions from BOPF shops at iron and steel mills.	1. Complete adoption by sources. 2. Cost data suggest cost effective. 3. Identified as MACT roughly 8 years ago. 4. All BOPH shops are subject to state regulations or permit requirements that might practically require such controls.
3	Control measures to control fugitive process lead emissions from BOPF shops at iron and steel mills for various operations (e.g., hot metal reladling, hot metal desulfurization, skimming, charging, tapping).	1. Complete adoption by sources. 2. Cost data suggest cost effective. 3. Identified as MACT roughly 8 years ago. 4. All BOPH shops are subject to state regulations or permit requirements that might practically require such controls.
3	Control devices (e.g., wet scrubbers and fabric filters) to control fugitive process lead emissions from ladle metallurgy stations at iron and steel mills.	1. Complete adoption by sources. 2. Cost data suggest cost effective. 3. Identified as MACT roughly 8 years ago. 4. All ladle metallurgy processes are subject to state regulations or permit requirements that might practically require such controls.
U +	Replacing old control devices with new control devices.	1. At least two sources have been identified as needing to replace old control devices (> 30 years old) to meet new emission standards. 2. No cost data identified. 3. Not required by any known federal regulations.

7.4. Application of RACM Criteria to Possible RACM Candidates.

7.4.1. Control devices (e.g., fabric filters and wet scrubbers) to control process lead emissions from sinter plant windboxes.

The complete adoption of control devices (e.g., fabric filters and wet scrubbers) for controlling process lead emissions from sinter plant windboxes suggests that such controls are economically feasible. Specifically, all nine sinter plants use a control device to control process lead emissions from sinter plant windboxes. Four plants use a fabric filter and five plants use a wet scrubber to control windbox emissions.[193]

In addition, the available data suggest that such controls are cost effective for regulating process lead emissions. Specifically, cost-effectiveness information for PM was available for selected control technologies in the source category of Iron and Steel Production, as shown in Table 7-3.[194] This information suggests that such controls are cost effective for regulating lead as well.

[193] Id. at 4-1.
[194] EPA CoST database.

Table 7-3. Cost-Effectiveness Information for Selected Control Technologies for Controlling Particulate Matter with respect to the Iron and Steel Production Source Category.

Control Technology	Cost Effectiveness ($/ton PM)	Low/High Control Efficiency (%)
Dry Electrostatic Precipitator – Wire Plate Type	200	95/98
Fabric Filter – Reverse-Air Cleaned Type	250	99/99.5
Fabric Filter (Mech. Shaker Type)	200	99/99.5
Fabric Filter – (Pulse Jet Type)	200	99/99.5
Venturi Scrubber	3350	25/73
WESP – Wire Plate Type	350	99/99.5
* Rounded to the nearest $50 and escalated from 1999 to 2011 U.S. dollars.[195]		

Moreover, such controls are practically required by the NESHAP for Integrated Iron and Steel Plants (40 CFR 63, Subpart FFFFF) for both new and existing sources, as such NESHAP provides emissions limits for sinter plant windboxes. This might further provide some support that such controls are RACM, since such controls represent MACT standards that are over 8 years old.[196]

State regulations and permits further suggest such controls are reasonably available. Specifically, all sinter plants are subject to state regulations or permit requirements that practically require such control devices for sinter plant windoxes.[197]

7.4.2. <u>Control devices (e.g., fabric filters and wet scrubbers) to control process lead emissions from sinter plant discharge end emissions points (e.g., discharges, crushers, hot screens, coolers, and cold screens).</u>

The almost complete adoption of control devices (e.g., fabric filters and wet scrubbers) for controlling process lead emissions from sinter plant discharge and emission points (i.e., discharges, crushers, hot screens, coolers, and cold screens) suggests that such controls are economically feasible. Specifically, all 9 sinter plants with discharge emission points use a control device (7 fabric filters, 1 scrubber, 1 rotozone) to control process lead emissions from discharge emissions points; all 7 sinter plants with sinter plant crusher emission points use a control device (6 fabric filters, 1 scrubber) to control process lead emissions from crusher emission points; all 8 sinter plants with sinter plant hot screen emission points use a control device (6 fabric filters, 1 scrubber, 1 rotozone) to control process lead emissions from hot screen emission points; 5 of the 8 (3 fabric filters, 1 cyclone, 1 water sprays) sinter plants with sinter plant cooler emission points use a control to control process lead emissions from cooler emissions points; and 5 of the 7 sinter plants with sinter plant cold screen emission points control (3 fabric filters, 2 water sprays) cold screen emission points.[198]

In addition, the available data suggest that such controls are cost effective for regulating process lead emissions. Specifically, cost-effectiveness information for PM was available for selected control

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[195] In order to escalate from 1999 dollars to 2011 dollars, used the formula and approach presented in EPA's Control Strategy Tool (CoST) Control Measures Database (CMDB) Documentation, Page 9.
[196] NESHAP for Integrated Iron and Steel Plants Major Sources, 40 CFR 63, Subpart FFFFF (Published May 20, 2003).
[197] National Emission Standards for Hazardous Air Pollutants (NESHAP) for Integrated Iron and Steel Plants – Background Information for Proposed Standards. EPA-453/R-01-005 (Published January 2001). Page 5-1.
[198] Id. at 4-30.

technologies in the source category of Iron and Steel Production, as shown in Table 7-3.[199] This information suggests that such controls are cost effective for regulating lead as well.

Moreover, such controls are practically required by the NESHAP for Integrated Iron and Steel Plants (40 CFR 63, Subpart EEEEE) for both new and existing sources, as such NESHAP provides PM emissions limits for discharge ends at sinter plants. This provides some support that such controls are RACM, since such controls represent MACT standards that are over 8 years old.[200]

State regulations and permit requirements further suggest such controls are reasonably available. Specifically, sinter plants are subject to state regulations or permit requirements that practically require such control devices to control sinter plant discharge and emission points.[201]

7.4.3. Control measures to control fugitive lead dust emissions from material handling (i.e., material storage, material mixing, and sinter storage) at sinter plants.

The less widespread control of fugitive lead dust emissions from material handling (i.e., material storage, material mixing, and sinter storage) at sinter plants suggests that such controls are not economically feasible. Specifically, emissions from material handling are generally fugitive emissions and are usually uncontrolled. Only one sinter plant in the country uses a fabric filter to control emissions from material storage; the remaining plants use no control. One plant uses water sprays to wet the materials at the various transfer points. One plant uses chemical dust suppression on the product to control material storage.[202]

State regulations and permit requirements provide some support that there are control measures that might be reasonable. Specifically, 5 of the 7 operating sinter plants are subject to state regulation or permit requirements that require building opacity limits that might practically require such controls.[203]

7.4.4. Control measures (i.e., flame suppression, covered runners, and control devices) to control process lead emissions from casthouses at iron and steel mills.

The widespread use of control measures (i.e., flame suppression, covered runners, and control devices) to control process lead emissions from casthouses at iron and steel mills suggests that such control measures are economically feasible. Specifically, 12 of the 20 iron and steel mills use flame suppression at casthouses to control process lead emissions; 15 of the 20 iron and steel mills use covered runners at casthouses to control process lead emissions; and 13 of the 20 iron and steel mills evacuate process lead emissions to a control device (12 fabric filters, 1 scrubber).[204]

In addition, the available data suggest that the control devices used are cost effective for regulating process lead emissions. Specifically, cost-effectiveness information for PM was available for selected control technologies in the source category of Iron and Steel Production, as shown in Table 7-3, where

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[199] EPA CoST database.
[200] NESHAP for Integrated Iron and Steel Plants Major Sources (40 CFR 63, Subpart FFFFF).
[201] National Emission Standards for Hazardous Air Pollutants (NESHAP) for Integrated Iron and Steel Plants – Background Information for Proposed Standards. EPA-453/R-01-005 (Published January 2001). Page 5-1.
[202] Id. at 4-7 to 4-8.
[203] Id. at 5-1.
[204] Id. at 4-10.

cost-effectiveness values for fabric filters, ESPs and scrubbers all seem reasonable when used.[205] This information suggests that such controls are cost effective for regulating lead as well.

Moreover, such controls are practically required by the NESHAP for Integrated Iron and Steel Plants (40 CFR 63, Subpart EEEEE) for both new and existing sources, as such NESHAP provides PM emissions limits for casthouses at blast furnaces. This might further provide some support that such controls are RACM, since such controls represent MACT standards that are over 8 years old.[206]

State regulations and permit requirements suggest that such controls measures are reasonable. Specifically, 24 of the 29 casthouses are subject to visible emission standards by state regulations or permits that limit the opacity of emissions discharged from casthouse openings, and therefore that might practically require such control measures.[207]

7.4.5. Control devices (e.g., scrubbers and ESPs) to control process lead emissions from BOPF shops at iron and steel mills

The complete adoption of control measures to control process lead emissions from BOPH shops at iron and steel mill suggests that such controls are economically feasible. Specifically, all BOPH shops at iron and steel mills use a capture system and control device to control process lead emissions from BOPF shops. Specifically, all 16 open-hood BOPF shops use control devices (8 Venturi scrubbers, 8 ESPs) to control such emissions, and all 8 of the closed-hood BOPH shops use control devices (8 Venturi scrubbers) to control such emissions.[208]

In addition, the available data suggest that such controls are cost effective for regulating process lead emissions. Specifically, cost-effectiveness information for PM was available for selected control technologies in the source category of Iron and Steel Production, as shown in Table 7-3, where cost-effectiveness values for fabric filters, ESPs and scrubbers are reasonable when used.[209] This information suggests that such controls are cost effective for regulating lead as well.

Moreover, such controls are practically required by the NESHAP for Integrated Iron and Steel Plants (40 CFR 63, Subpart EEEEE) for both new and existing sources, which provides PM emissions limits for BOPFs. This might further provide some support that such controls are RACM, since such controls represent MACT standards that are over 8 years old.[210]

State regulations and permit requirements suggest that such controls measures are reasonable. Specifically, all BOPH shops are subject to states regulations or permit requirements that might practically require such controls.[211]

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[205] EPA CoST database.
[206] NESHAP for Integrated Iron and Steel Plants Major Sources, 40 CFR 63, Subpart FFFFF (Published May 20, 2003).
[207] Id. at 5-1.
[208] Id. at 4-20 to 4-21.
[209] EPA CoST database.
[210] NESHAP for Integrated Iron and Steel Plants Major Sources, 40 CFR 63, Subpart FFFFF (Published May 20, 2003).
[211] National Emission Standards for Hazardous Air Pollutants (NESHAP) for Integrated Iron and Steel Plants – Background Information for Proposed Standards. EPA-453/R-01-005 (Published January 2001). Page 5-9.

7.4.6. Control measures to control fugitive process lead emissions from BOPF shops at iron and steel mills for various operations (e.g., hot metal reladling, hot metal desulfurization, skimming, charging, tapping).

The widespread use of control measures to control fugitive process lead emissions from BOPH shops at iron and steel mills for various operations (e.g., hot metal reladling, hot meal desulfurization, skimming, charging, and tapping) suggests that such measures are economically feasible. Generally, iron and steel mills use control measures to control process fugitive lead emissions from BOPH shops for hot metal reladling, hot metal desulfurization, skimming, and charging. Specifically, 22 of the 23 BOPHs control such emissions for hot metal reladling (13 fabric filters, 4 fabric filters with hoods, 2 fume suppression, 1 flame suppression, 1 with two fabric filters); 23 of the 23 BOPHs control such emissions for hot metal desulfurization (17 fabric filters, 5 fabric filters with hoods, 1 with two fabric filters); 17 of the 23 BOPHs control such emissions for skimming (12 fabric filters, 5 fabric filters with hoods); 21 of the 23 BOPHs control such emissions for charging (4 fabric filters, 6 fabric filters with hoods, 5 scrubbers, 6 electrostatic precipitators).[212]

Moreover, such controls are practically required by the NESHAP for Integrated Iron and Steel Plants (40 CFR 63, Subpart EEEEE) for both new and existing sources, which provides PM emissions limits for each hot metal transfer, skimming, and desulfurization operation. This provides support that such controls are RACM, since such controls represent MACT standards that are over 8 years old.[213]

State regulations and permit requirements suggest that such controls measures are reasonable. Specifically, all BOPH shops are subject to states regulations or permit requirements that might practically require such controls.[214]

7.4.7. Control devices (e.g., wet scrubbers and fabric filters) to control fugitive process lead emissions from ladle metallurgy stations at iron and steel mills.

The complete adoption of control devices (e.g., wet scrubbers and fabric filters) to control fugitive process lead emissions from ladle metallurgy stations at iron and steel mills suggests that such controls are economically feasible. All ladle metallurgy stations at iron and steel mills control process lead emissions with control devices (3 wet scrubbers, 21 fabric filters).[215]

In addition, the available data suggest that such controls are cost effective for regulating process lead emissions. Specifically, cost-effectiveness information for PM was available for selected control technologies in the source category of Iron and Steel Production, as shown in Table 7-3, where cost-effectiveness values for fabric filters, ESPs and scrubbers are reasonable when used.[216] This information suggests that such controls are cost effective for regulating lead as well.

Moreover, such controls are practically required by the NESHAP for Integrated Iron and Steel Plants (40 CFR 63, Subpart EEEEE) for both new and existing sources, as such NESHAP provides PM emissions

[212] Id. at 4-30.
[213] NESHAP for Integrated Iron and Steel Plants Major Sources, 40 CFR 63, Subpart FFFFF (Published May 20, 2003).
[214] National Emission Standards for Hazardous Air Pollutants (NESHAP) for Integrated Iron and Steel Plants – Background Information for Proposed Standards. EPA-453/R-01-005 (Published January 2001). Page 5-12.
[215] Id. at 4-35 to 4-37.
[216] EPA CoST database.

limits for each ladle metallurgy operation. This might further provide some support that such controls are RACM, since such controls represent MACT standards that are over 8 years old.[217]

State regulations and permit requirements suggest that such control measures are reasonable. Specifically, all ladle metallurgy stations are subject to state regulations or permit requirements that might practically require such controls.[218]

7.4.8. Replacing Old Control Devices with New Control Devices.

The age and recent identification of plants that need to replace old control devices with new control devices to meet emission standards suggests that such a measure may become more economically feasible. Specifically, scrubbers over 30 years old have been identified to be replaced in order to meet emission limits at two plants.[219]

[217] NESHAP for Integrated Iron and Steel Plants Major Sources, 40 CFR 63, Subpart FFFFF (Published May 20, 2003).
[218] National Emission Standards for Hazardous Air Pollutants (NESHAP) for Integrated Iron and Steel Plants – Background Information for Proposed Standards. EPA-453/R-01-005 (Published January 2001). Page 5-15.
[219] Economic Impact Analysis of Final Integrated Iron and Steel NESHAP. EPA 452/R-02-009 (Published September 2002). Page 3.

8.0. RACM DEVELOPMENT FOR FUGITIVE DUST CONTROL MEASURES

Sections 4 through 7 supported RACM development with respect to certain source categories – Secondary Lead Smelting, Lead Acid Battery Manufacturing, Iron and Steel Foundries, and Iron and Steel Mills. Such previous sections generally provided an undetermined likelihood that fugitive dust control measures would be RACM for most of the source categories. This section applies the RACM criteria to fugitive dust control measures to glean what considerations are most vital for determining whether fugitive dust control measures, in general, are reasonably available.

8.1. The Economic Feasibility of Fugitive Dust Control Measures.

Support documents drafted from information collection requests for NESHAP development for the Secondary Lead Smelting, Lead Acid Battery Manufacturing, and Iron and Steel Foundries suggest that fugitive dust control measures are most economically feasible for the largest emitting sources.

Table 8.1 shows the average lead emissions emitted per facility for a given source category. Such table indicates that on average, there is 3 to greater than 10 times more lead being emitted per secondary lead smelting facility than from any typical source from one of other source categories included in Table 8.1. Table 8.2 shows the extent to which facilities have adopted fugitive dust control measures, as indicated from the most recent information collection requests for NESHAP development. The source category of secondary lead smelting is the only source category with sources to have adopted several fugitive dust control measures. This suggests that fugitive dust controls are most economically feasible for sources that emit a high level of emissions.

Table 8-1. Calculation of the Average Annual Lead Emissions Emitted per Facility in a Given Source Category.

Source Category	Annual Emission (Tons/Year) [220]	% of Total Emissions from All Source Categories[221]	Number of Sources	Calculated Average Lead Emissions per Facility (Tons/Year)
Iron and Steel Foundries	83	6.05	> 2000 [222]	0.04
Secondary Lead Smelting	14	3.21	15 [223]	1.00
Lead Acid Battery Manufacturing	17	1.24	60 [224]	0.12

[220] The Regulatory Impact Analysis of the Proposed Revisions to the National Ambient Air Quality Standards for Lead (Published October 2008). Page 7.
[221] Id.
[222] National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0056-0002-1 (Published December 2002). Page 1-2.
[223] Memorandum – Draft Summary of the Technology Review for the Secondary Lead Smelting, From Mike Burr, ERG, To Chuck French, EPA/OAQPS. April 2011.
[224] Memorandum – Lead Acid Battery Manufacturing Area Source Category Additional Information to Support Proposed Rule, From Nancy Jones, EC/R, To U.S. EPA Docket Number EPA-HQ-OAR-2006-0897. February 28, 2007.

Table 8-2. Extent of Known Adoption of Fugitive Dust Control Measures in the Secondary Lead Smelting, Lead Acid Battery Manufacturing, and Iron and Steel Foundry Source Categories.

	Secondary Lead Smelting[225]	Lead Acid Battery Manufacturing[226]	Iron and Steel Foundries[227]
Paving unpaved roads	Adoption by all sources	No known widespread adoption[228]	No known adoption
Cleaning paved road	Adoption by all sources	No known adoption	No known adoption
Chemical stabilization of unpaved roads	No known adoption	No known adoption	No known adoption
Paving of entire facility grounds	Adoption by several sources	No known adoption	No known adoption
Cleaning of building roofs and exteriors	Adoption by several sources	No known adoption	No known adoption
Enclosure hoods and partial enclosures for storage areas	Adoption by all sources	No known adoption	No known adoption
Wet suppression on storage piles	Adoption by all sources	No known adoption	No known adoption
Negative pressure total enclosures for storage areas	Adoption by 11 of the14 sources	No known adoption	No known adoption
Vehicle washing at each facility exit	Adoption by all sources	No known adoption	No known adoption
Vehicle washing inside building	Adoption by several sources	No known adoption	No known adoption
Use of daily ambient monitoring to diagnose activities that lead to NAAQS exceedances for lead.	Adoption by several sources	No known adoption	No known adoption

8.2. The Capital Costs, Annualized Costs, and Cost Effectiveness of Fugitive Dust Control Measures.

Cost-effectiveness data for fugitive dust control measures are not well-developed. This might be due to the fact that the cost effectiveness of a specific fugitive dust control measure is highly variable from plant-to-plant. The cost effectiveness will depend on many variables that can change from plant-to-plant with even similar levels of emissions, such as the length of roads to be paved, the historic use of emissions that might already be deposited around the plant, etc.

However, the available cost-effectiveness data indicate that process emission control measures are much more cost effective (by a factor of 2-4) than fugitive dust control measures. Table 8.3 displays the cost-effectiveness data for three fugitive dust control measures averaged for all sources in all source categories compared to cost effectiveness of mechanical shaker type fabric filters at iron and steel foundries, iron and steel mills, and lead processing facilities.[229] Such comparison indicates the fugitive dust control measures are much less cost effective than the use of fabric filters.

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[225] Memorandum – Draft Summary of the Technology Review for the Secondary Lead Smelting, From Mike Burr, ERG, To Chuck French, EPA/OAQPS. April 2011.

[226] Memorandum – Lead Acid Battery Manufacturing Area Source Category Additional Information to Support Proposed Rule, From Nancy Jones, EC/R, To U.S. EPA Docket Number EPA-HQ-OAR-2006-0897. February 28, 2007..

[227] National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards. Document # EPA-HQ-OAR-2006-0359-0056-0002-1 (Published December 2002). Page 1-2.

[228] One battery manufacturing facility - the Exide Battery Manufacturing facility in Salina, KS – has paved unpaved roads to control fugitive emissions. Stephanie Doolan / EPA Region 7.

[229] EPA CoST database.

Table 8-3. Cost Effectiveness of Fugitive Dust Control Measures Compared to Fabric Filters.

Control Measure	**Source Category**	**Cost Effectiveness ($/ton PM)**	**Control Efficiency (%)**
Vacuum Sweeping Paved Roads	Average of all	550	50.0
Hot Asphalt Paving of Unpaved Roads	Average of all	700	66.6
Chemical Stabilization of Unpaved Road	Average of all	3200	37.5
Fabric Filter (Mech. Shaker Type)	Average of Iron and Steel Foundries	200	99.5
Fabric Filter (Mech. Shaker Type)	Iron and Steel Production	200	99.5
Fabric Filter (Mech. Shaker Type)	Lead Processing	450	99.5
* Rounded to the nearest $100 and escalated from 1999 to 2011 U.S. dollars.[230]			

8.3. Fugitive Dust Control Measures Adopted in Federal and State Regulations.

The extent to which state and federal regulations require fugitive dust control measures further suggest that such control measures are more reasonable for larger sources. Table 8.4 shows the extent of adoption of several fugitive control measures by California's SCAQMD and the NESHAPs for Secondary Lead Smelting Major Sources, Lead Acid battery Manufacturing Area Sources, Iron and Steel Foundry Area Sources, and Iron and Steel Foundry Major Sources. Several fugitive dust control measures are adopted by the NESHAP for Secondary Lead Smelting for Major Sources, where the average lead emissions per facility are highest; whereas no fugitive dust control measures are adopted by the NESHAP for Lead Acid Battery Manufacturing for Area Sources, where the average lead emitted per facility is smaller. Moreover, no fugitive dust control measures are required by the NESHAP for Iron and Steel Foundries Area Sources, but there is at least a limit that applies to fugitive dust lead emissions in the NESHAP for Iron and Steel Foundries Major Sources. This further indicates that the amount of lead emissions emitted for a facility is a key consideration when determining whether fugitive dust control measures are reasonable.

Moreover, California's SCAQMD Rule 1420, requires secondary lead smelting and lead acid battery manufacturing facilities to implement several fugitive dust control measures. The fact that California requires such adoption might suggest that fugitive dust control measures are not out of economic reach for small lead acid battery area sources. However, California's SCAQMD Rule 1420.1 applies only to large secondary lead smelting sources, and requires even more stringent fugitive dust control measures than Rule 1420, which further suggests that fugitive dust control measures are more cost effective for the largest lead emitting sources.

[230] In order to escalate from 1999 dollars to 2011 dollars, used the formula and approach presented in EPA's Control Strategy Tool (CoST) Control Measures Database (CMDB) Documentation, Page 9.

Table 8-4. Extent of Known Adoption of Fugitive Dust Control Measures in Selected Federal and State Regulations

	1997 NESHAP Secondary Lead Smelting for Major Sources[231]	NESHAP Lead Acid Battery Manufacturing Areas Sources[232] & NESHAP Iron and Steel Foundries Area Sources[233]	NESHAP Iron and Steel Foundries Major Sources[234]	California's SCAQMD Rule for Lead Processing Facilities (includes Lead Acid Battery Manufacturing Secondary Lead Smelting, Iron and Steel Foundries), Rule 1420 [235, 236]	California's SCAQMD Rule for Lead from Large Lead Acid Battery Recycling Facilities, Rule 1420.1. [237, 238]
Paving unpaved roads	Adopted	Not adopted	Not adopted	Not adopted	Requires paving facility grounds.
Cleaning paved road (e.g., vacuum sweeping)	Adopted			Requires that surfaces that accumulate lead-containing dust due to traffic be washed, vacuumed once / week or chemically suppressed.	Requires frequent cleaning by wet wash or vaccum of such areas.
Chemical stabilization of unpaved roads	Not adopted			Not adopted	Not adopted
Paving of entire facility grounds	Not adopted			Not adopted	Requires paving facility grounds.
Cleaning of building roofs and exteriors	Not adopted			Not adopted	Requires frequent cleaning of building roofs and exteriors.
Enclosure hoods and partial enclosures for storage areas	Adopted			Requires that dust forming material to be stored in an enclosed storage area.	Requires total enclosures under negative pressure for several areas.
Wet suppression on storage piles	Adopted			Not adopted	Requires total enclosures under negative pressure for several storage areas.
Cleaning of pavement around operation / storage area	Adopted			Requires surfaces that accumulate lead dust due to foot traffic be washed, vacuumed, or wet-	Requires frequent cleaning of such areas by wet wash or vacuum.

[231] NESHAP for Secondary Lead Smelting, 40 CFR 63, Subpart X (Published June 13, 1997).
[232] NESHAP for Lead Acid Battery Manufacturing Plants, 40 CFR 63 Subpart PPPPPP (Published July 16, 2007)..
[233] NESHAP for Iron and Steel Foundries Area Sources, 40 CFR 63, Subpart ZZZZZ (Published April 22, 2004).
[234] NESHAP for Iron and Steel Foundries Major Sources, 40 CFR 63, Subpart EEEEE (Published April 22, 2004).
[235] California (South Coast Air Quality Management District), Rule 1420 - Emission Standards for Lead (Published September, 1992).
[236] The fugitive dust control requirements of California's SCAQMD Rule 1420 only apply to facilities that exceed specified processing thresholds (more than 2 tons of lead per year).
[237] California (South Coast Air Quality Management District), Rule 1420.1 - Emission Standards for Lead from Large Lead Acid Battery Recycling Facilities (Adopted November 5, 2010).
[238] California (South Coast Air Quality Management District), Rule 1420.1 - Emission Standards for Lead from Large Lead Acid Battery Recycling Facilities (Adopted November 5, 2010). Note that

	1997 NESHAP Secondary Lead Smelting for Major Sources[231]	NESHAP Lead Acid Battery Manufacturing Areas Sources [232]& NESHAP Iron and Steel Foundries Area Sources[233]	NESHAP Iron and Steel Foundries Major Sources[234]	California's SCAQMD Rule for Lead Processing Facilities (includes Lead Acid Battery Manufacturing Secondary Lead Smelting, Iron and Steel Foundries), Rule 1420 [235, 236]	California's SCAQMD Rule for Lead from Large Lead Acid Battery Recycling Facilities, Rule 1420.1. [237, 238]
				mopped once per week or chemically suppressed	
Negative pressure total enclosures	Not adopted			Not adopted	Requires total enclosures under negative pressure for several areas.
Vehicle washing at each facility exit	Not adopted			Not adopted	Not adopted
Vehicle washing inside building	Not adopted			Not adopted	Not adopted
Daily ambient monitoring to diagnose activities that lead to NAAQS exceedances for lead	Not adopted			Requires 24 hour monitoring (once very six days) if a facility processes more than 2 tons of lead per year and emits lead equal to or greater than 0.5 lbs/day.[239]	Requires 24 hour monitoring once every three days, and daily monitoring if an exceedance is revealed.
Limit for fugitive dust emissions	Not adopted		Adopted an opacity limit that applies to fugitive dust sources.	Requires an opacity limit where emissions cannot exceed 0.5 or 10 percent opacity for more than three aggregate minutes in any 60-minute period.	Not adopted
Storage , disposal, recovery, or recycling of lead or lead-containing wastes generated from housekeeping activities using practices that do not lead to fugitive lead-dust emissions	Not adopted	Not adopted	Not adopted	Adopted.	Not adopted.

[239]Facilities processing between 2-10 tons of lead per year may be exempted if modeling shows they are below half the standard.

8.4. Implications for RACM Development for Fugitive Dust Control Measures.

Available cost information suggests that process emission control measures (e.g., fabric filters) are generally 2 to 4 times more cost effective than fugitive dust control measures. Moreover, the extent of adoption of fugitive dust control measures by sources and federal/state regulations suggests that the most important consideration in determining whether fugitive dust control measures are reasonably available for a given source in a corresponding source category is the average amount of emissions emitted per source in a given source category. Specifically, as the average amount of emissions per source in a given source category increases, the more likely that fugitive dust control measures might be reasonably available.

Nevertheless, additional considerations may suggest that fugitive dust control measures are reasonably available for sources that have already adopted more cost-effective process emission controls (e.g., fabric filters). For example, EPA has indicated that where essential reductions are difficult to achieve because many sources are already being controlled, the cost per ton of control may necessarily be higher and be considered reasonable.[240] Consequently, if a source has adopted process emission controls, but is still contributing to a lead NAAQS violation, then fugitive dust controls might be the only viable option to eliminate the NAAQS violation and may, therefore, be reasonable despite being less cost effective than the initial cost of process emissions controls.

Also, additional considerations may suggest that fugitive dust control measures are RACM for sources that are area sources or smaller emitting sources. For example, the fact that an area source is in an area with more serious air quality problems may make it more reasonable and appropriate for such areas to impose emission reduction requirements that are less cost effective.[241] Consequently, if an area source is contributing to a lead NAAQS violation, and there are no other viable sources from which emissions can be reduced to get the area within attainment, then imposing less cost effective control measures to smaller area sources might be more reasonable and appropriate. Moreover, EPA has indicated that a large amount of historically deposited lead might increase the reasonableness of fugitive dust control measures.[242]

In addition, EPA encourages the development of innovative measures not previously employed which may also be technically and economically feasible.[243] Therefore, the fact that fugitive dust control measures have not been adopted by many facilities or federal/state regulations does not preclude the

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[240] "In addition, where essential reductions are more difficult to achieve (e.g., because many sources are already controlled), the cost per ton of control may necessarily be higher." National Ambient Air Quality Standards for Lead; Final Rule, 73 FR 66964, 67036 (Published November 12, 2008).

[241] "Areas with more serious air quality problems typically will need to obtain greater levels of emissions reductions from local sources than areas with less serious problems, and it would be expected that their residents could realize greater public health benefits from attaining the standard as expeditiously as practicable. For these reasons, we believe that it will be reasonable and appropriate for areas with more serious air quality problems and higher design values to impose emission reduction requirements with generally higher costs per ton of reduced emissions than the cost of emissions reductions in areas with lower design values." Id. at 67036

[242] "Some emissions that contribute to violations of the Lead NAAQS may also be attributed to smaller area sources. At primary lead smelters, the process of reducing concentrated ore to lead involves a series of steps, some of which are completed outside of buildings, or inside of buildings that are not totally enclosed. Over a period of time, emissions from these sources have been deposited in neighboring communities (e.g., on roadways, parking lots, yards, and off-plant property). This historically deposited lead, when disturbed, may be re-entrained into the ambient air and may contribute to violations of the Lead NAAQS in affected areas. "Id.

[243] "EPA also encourages the development of innovative measures not previously employed which may also be technically and economically feasible." Id.

possibility that such fugitive dust control measures are RACM. For example, many control measures such as bins, hoppers, totes, plastic curtains, moving stockpiles away from doors and traffic lanes, and soil stabilization measures (e.g., landscaping of areas where lead emissions have been historically deposited) are all measures that, on their faces, seem inexpensive and could lessen emissions. Consequently, such measures might constitute RACM, especially when emission reductions are necessary to attain the NAAQS and the availability of other control measures to implement is limited. California's SCAQMD Rule 1420.1 requires a list of many such fugitive dust control measures that facilities might consider. [244] A list of many of the fugitive dust control measures specified by Rule 1420.1 is provided in 4.4.9 of this document and in Table 8.4 of this document.

[244] California (South Coast Air Quality Management District), Rule 1420.1 - Emission Standards for Lead from Large Lead Acid Battery Recycling Facilities (Adopted November 5, 2010).

United States Environmental Protection Agency	Office of Air Quality Planning and Standards Air Quality Policy Division Research Triangle Park, NC	EPA-457/R-12-001 March 2012