



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE OF AIR QUALITY PLANNING AND STANDARDS**

Technical Note – Estimating Lead (Pb) Emissions from Coal Combustion Sources

BACKGROUND

On November 12, 2008 EPA substantially strengthened the national ambient air quality standards (NAAQS) for lead (see 73 FR 66964). EPA revised the level of the primary (health-based) standard from 1.5 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) to $0.15 \mu\text{g}/\text{m}^3$, measured as total suspended particles (TSP) and revised the secondary (welfare-based) standard to be identical in all respects to the primary standard. In conjunction with strengthening the Pb NAAQS, the EPA promulgated new monitoring requirements including new design requirements for the Pb NAAQS surveillance network (40 CFR Part 58, Appendix D, paragraph 4.5). On December 27, 2010, the EPA again revised the Pb monitoring requirements.

Monitoring is now required for Pb sources that may contribute to violations of the Pb NAAQS [“source-oriented monitoring”, paragraph 4.5(a)], and at a minimum of one monitor for any source estimated to emit 0.50 tpy or more of Pb¹. In the 2008 National Emissions Inventory (Version 1), 103 facilities were identified as emitting greater than 0.50 tpy due to combustion of coal. The purpose of this technical note is to provide guidance on approaches that may be used to estimate Pb emissions from coal combustion sources in the absence of site specific lead stack test data.

ESTIMATING LEAD EMISSIONS USING AP-42

AP-42 provides emission factors and process information for more than 200 air pollution source categories. The emission factors have been developed and compiled from source test data, material balance studies, and engineering estimates.² AP-42 provides two approaches for estimating lead emissions from coal combustion. The first is a straight emission factor for controlled coal combustion (4.2×10^{-4} lb/ton fired, Table 1.1-18). According to AP-42, this emission factor is applicable to the combustion of bituminous coal, subbituminous coal, and lignite using a venturi scrubber, spray dryer absorber, wet limestone scrubber with an electrostatic precipitator (ESP) or Fabric Filter (FF), an ESP, or a FF.

A second approach is provided in AP-42 that takes into account site specific information including the concentration of lead in the coal, the ash content of the coal, and PM emission rate. The equation for this approach, provided in Table 1.1-16, is as follows:

$$\text{Lead (lb/10}^{12} \text{ Btu)} = 3.4 * (\text{C/A} * \text{PM})^{0.80}$$

¹ Monitoring agencies may receive a waiver from this requirement where they can “demonstrate the Pb source will not contribute to a maximum Pb concentration in ambient air in excess of 50 percent of the NAAQS (based on historical monitoring data, modeling, or other means).” (40 CFR part 58, Appendix D, paragraph 4.5(a)(ii)).

² <http://www.epa.gov/ttnchie1/ap42/>

Where:

C = concentration of metal in the coal, parts per million by weight (ppmwt).

A = weight fraction of ash in the coal. For example, 10% ash is 0.1 ash fraction.

PM = Site-specific emission factor for total particulate matter, lb/10⁶ Btu.

EMISSION FACTORS DEVELOPED FOR AIR TOXICS RULE

On March 16, 2001, the EPA proposed a rule that would control air toxic emissions from coal and oil fired electrical generating units.³ In developing the proposed rule, the EPA collected air toxic emissions data (including Pb emissions) from over 200 coal fired electrical generating units. These data were used to develop emission factors for a number of different coal type and emission control combinations. Table 1 contains a summary of the Pb emission factors developed as part of this rule making.

Table 1. Emission Factors Developed for the Utility Boilers MACT Standard

Coal Type	Boiler Type	Control Scheme	Lead Emission Factor (lb/MMBtu)
Bituminous	Conventional	Fabric Filter + Wet FGD	3.46E-07
Bituminous	Conventional	Fabric Filter	1.33E-06
Bituminous	Conventional	ESP + Wet FGD	5.26E-06
Bituminous	Conventional	ESP	5.68E-06
Bituminous	Fluidized Bed	Fabric Filter	3.55E-06
Bituminous	Fluidized Bed	ESP	8.68E-07
Coal Refuse	Fluidized Bed	Fabric Filter	3.86E-06
Lignite	Conventional	Fabric Filter + Wet FGD	4.76E-07
Lignite	Conventional	Fabric Filter	3.80E-06
Lignite	Fluidized Bed	Fabric Filter	1.85E-06
Subbituminous	Conventional	Fabric Filter + Wet FGD	5.45E-07
Subbituminous	Conventional	Fabric Filter	1.24E-06
Subbituminous	Conventional	ESP + Wet FGD	3.06E-07
Subbituminous	Conventional	ESP	1.05E-04 ⁴
Subbituminous	Conventional	Wet FGD/PM Scrubber	4.77E-06

³ National Emission Standards for Hazardous Air Pollutants From Coal and Oil-Fired Electric Utility Steam Generating Units and Standards of Performance for Fossil-Fuel-Fired Electric Utility, Industrial-Commercial-Institutional, and Small Industrial-Commercial-Institutional Steam Generating Units. A copy of the proposed rule can be found here - <http://www.epa.gov/ttn/atw/utility/fr03my11.pdf>

⁴ This emission factor appears to be an outlier. The EPA is currently looking into the emissions data that went into this emission factor, but at this time has not determined if there is an error associated with this emission factor. Monitoring agencies are cautioned against the use of this emission factor at this time.

Monitoring agencies may wish to use these emission factors in lieu of the AP-42 approaches discussed above when determining applicability of the monitoring requirements for these facilities.

FOR FURTHER INFORMATION

This document and other documents intended to assist monitoring agencies implement the Pb monitoring requirements can be found at - <http://www.epa.gov/ttn/amtic/pb-monitoring.html>

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