ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 60, 63, 260, 261, 264, 265, 266, 270, and 271

[FRL–5447–2]

RIN 2050–AF01

Revised Standards for Hazardous Waste Combustors

AGENCY: Environmental Protection Agency.

ACTION: Proposed rule.

SUMMARY: The Agency is proposing revised standards for hazardous waste incinerators, hazardous waste-burning cement kilns, and hazardous waste-burning lightweight aggregate kilns. These standards are being proposed under joint authority of the Clean Air Act (CAA) and Resource Conservation and Recovery Act (RCRA). The standards limit emissions of chlorinated dioxins and furans, other toxic organic compounds, toxic metals, hydrochloric acid, chlorine gas, and particulate matter. These standards reflect the performance of Maximum Achievable Control Technologies (MACT) as specified by the Clean Air Act. The MACT standards also should result in increased protection to human health and the environment over existing RCRA standards. The nature of this proposal requires that the following actions also be proposed: proposing the addition of hazardous waste-burning lightweight aggregate kilns to the list of source categories in accordance with 112(c)(5) of the Act; exempting from RCRA emission controls secondary lead facilities subject to MACT; considering an exclusion for certain "comparable fuels"; and revising the small quantity burner exemption under the BIF rule.

DATES: EPA will accept public comments on this proposed rule until June 18, 1996.

ADDRESSES: Commenters must send an original and two copies of their comments referencing docket number F–96–RCSP–FFFFF to: RCRA Docket Information Center, Office of Solid Waste (5305W), U.S. Environmental Protection Agency Headquarters (EPA, HQ), 401 M Street, SW., Washington, DC 20460. Deliveries of comments should be made to the Arlington, VA, address listed below. Comments may also be submitted electronically through the Internet to: RCRA-Docket@epamail.epa.gov. Comments in electronic format should also be identified by the docket number F–96–RCSP–FFFFF. All electronic comments must be submitted as an ASCII file avoiding the use of special characters and any form of encryption.

Commenters should not submit electronically any Confidential Business Information (CBI). An original and two copies of CBI must be submitted under separate cover to: RCRA CBI Document Control Officer, Office of Solid Waste (5305W), U.S. EPA, 401 M Street, SW, Washington, DC 20460.

Public comments and supporting materials are available for viewing in the RCRA Information Center (RIC), located at Crystal Gateway One, 1235 Jefferson Davis Highway, First Floor, Arlington, VA. The RIC is open from 9 a.m. to 4 p.m., Monday through Friday, excluding federal holidays. To review docket materials, the public must make an appointment by calling (703) 603–9230. The public may copy a maximum of 100 pages from any regulatory docket at no charge. Additional copies cost $.15/page. The index and some supporting materials are available electronically. See the "Supplementary Information" section for information on accessing them.

A public hearing will be held, if requested, to discuss the proposed standards for hazardous waste combustors, in accordance with section 307(d)(5) of the Act. Persons wishing to make an oral presentation at a public hearing should contact the EPA at the address given in the **ADDRESSES** section of this preamble. Oral presentations will be limited to 5 minutes each, unless additional time is feasible. Any member of the public may file a written statement before, during, or within 30 days after the hearing. Written statements should be addressed to the RCRA Docket Section address given in the **ADDRESSES** section of this preamble and should refer to Docket No. F–96–RCSP–FFFFF. A verbatim transcript of the hearing and written statements will be available for public inspection and copying during normal working hours at the EPA's RCRA Docket Section in Washington, D.C. (see ADDRESSES section of this preamble).

FOR FURTHER INFORMATION CONTACT: For general information, contact the RCRA Hotline at 1–800–424–9346 or TDD 1–800–553–7672 (hearing impaired). In the Washington metropolitan area, call 703–412–9810 or TDD 703–412–3323.

For more detailed information on specific aspects of this rulemaking, contact Larry Denyer, Office of Solid Waste (5302W), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460, (703) 308–8770, electronic mail: Denyer.Larry@epamail.epa.gov. For more detailed information on implementation of this rulemaking, contact Val de la Fuente, Office of Solid Waste (5303W), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460, (703) 308–7245, electronic mail: DeLaFuente.Val@epamail.epa.gov. For more detailed information on regulatory impact assessment of this rulemaking, contact Gary Ballard, Office of Solid Waste (5305), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460, (202) 260–2429, electronic mail: Ballard.Gary@epamail.epa.gov. For more detailed information on risk analyses of this rulemaking, contact David Layland, Office of Solid Waste (5304), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460, (202) 260–4796, electronic mail: Layland.David@epamail.epa.gov.

SUPPLEMENTARY INFORMATION: The index and the following supporting materials are available on the Internet: (List documents) Follow these instructions to access the information electronically:
Gopher: gopher.epa.gov
WWW: http://www.epa.gov
Dial-up: (919) 558–0335.

This report can be accessed off the main EPA Gopher menu, in the directory: EPA Offices and Regions/Office of Solid Waste and Emergency Response (OSWER)/Office of Solid Waste (RCRA)/(consult with Communication Strategist for precise subject heading)
FTP: ftp.epa.gov
Login: anonymous
Password: Your Internet address

Files are located in /pub/gopher/OSWRCRA

The official record for this action will be kept in paper form. Accordingly, EPA will transfer all comments received electronically into paper form and place them in the official record, which will also include all comments submitted directly in writing. The official record is the paper record maintained at the address in **ADDRESSES** at the beginning of this document.

EPA responses to comments, whether the comments are written or electronic, will be in a notice in the **Federal Register** or in a response to comments document placed in the official record for this rulemaking. EPA will not immediately reply to commenters electronically other than to seek clarification of electronic comments that may be garbled in transmission or during conversion to paper form, as discussed above.

Glossary of Acronyms

APCD—Air Pollution Control Device

PART ONE: BACKGROUND

I. Overview

The U.S. Environmental Protection Agency (EPA) is proposing to revise standards for hazardous waste incinerators and hazardous waste-burning cement kilns and lightweight aggregate kilns (LWAKs) under joint authority of the Clean Air Act, as amended, (CAA) and the Resource Conservation and Recovery Act, as amended (RCRA). The emission standards in today's proposal have been developed under the CAA provisions concerning the maximum level of achievable control over hazardous air pollutants (HAPs), taking into consideration the cost of achieving the emission reduction, any non-air quality health and environmental impacts, and energy requirements. These maximum achievable control technology (MACT) standards, also referred to as National Emission Standards for Hazardous Air Pollutants (NESHAPs), are proposed in today's rule for the following HAPs: dioxins/furans, mercury, two semivolatile metals (lead and cadmium), four low volatility metals (antimony, arsenic, beryllium, and chromium), particulate matter, and hydrochloric acid/chlorine gas. Other toxic organic emissions are addressed by standards for carbon monoxide (CO) and hydrocarbons (HC).

This action is being taken for several reasons. First, this proposal is consistent with the terms of the 1993 settlement agreement between the Agency and a number of groups who challenged EPA's final RCRA rule entitled "Burning of Hazardous Waste in Boilers and Industrial Furnaces" (56 FR 7134, Feb. 21, 1991). These groups include the Natural Resources Defense Council, Sierra Club, Inc., Hazardous Waste Treatment Council (now the Environmental Technology Council), National Solid Waste Management Association, and a number of local citizens' groups. Under this settlement agreement, the Agency is to propose this rulemaking by September-November, 1995, and finalize it by December 1996.

Second, EPA has scheduled rulemakings to develop maximum achievable control technology (MACT) standards for hazardous waste incinerators and cement kilns. To minimize the burden on the Agency and the regulated community, the Agency has combined its efforts under the CAA and RCRA into one rulemaking to establish MACT standards, which also would satisfy the RCRA settlement agreement obligations.

Third, the Agency's Hazardous Waste Minimization and Combustion Strategy, first announced in May 1993, in addition to stressing waste minimization, also made a commitment to upgrade the emission standards for hazardous waste-burning facilities. The three categories of facilities covered in this proposal burn over 80 percent of the total amount of hazardous waste being combusted each year. [The remaining 15–20 percent is burned in industrial boilers and other types of industrial furnaces, which are to be addressed in the next rulemaking for which a proposal is to be issued by December 1998 or sooner.]

Finally, as relates to the development of revised standards under concurrent Clean Air Act and RCRA authority, most of these hazardous waste combustion facilities are major sources of HAP emissions. They therefore must be regulated under section 112(d) of the Clean Air Act. In addition, EPA noted, when promulgating the RCRA rules for boilers and industrial furnaces in 1991 and in a proposal to revise the incinerator rules, that existing standards did not fully consider the possibility of exposure via indirect (non-inhalation) exposure pathways. 56 FR at 7150, 7167, 7169–70 (Feb. 21, 1991); 54 FR at 43720–21, 43723, 43757 (Oct. 26, 1989). The Agency reiterated these concerns in the Combustion Strategy announced in 1993 as one of the major factors leading to its decision to undertake revisions to the standards for hazardous waste combustors. As also noted in the Combustion Strategy and elsewhere, site-specific RCRA omnibus authority, whereby permit writers can impose additional conditions as are necessary to protect human health and the environment, can be used to buttress the existing regulations. See, e.g., 56 FR 7145, at n.8. Nevertheless, this process is expensive, time-consuming, and not always sufficiently certain in result. The Agency thus indicated, in the Combustion Strategy, that technology-based standards could provide a superior means of control by providing certainty of operating performance.

Because of the joint authorities under which this rule is being proposed, the proposal also contains an implementation scheme that is intended to harmonize the RCRA and CAA programs to the maximum extent permissible by law. In pursuing a common-sense approach towards this objective, the proposal seeks to establish a framework that: (1) Provides for combined (or at least coordinated) CAA and RCRA permitting of these facilities; (2) allows maximum flexibility for regional, state, and local agencies to determine which of their resources will be used for permitting, compliance, and enforcement efforts; and (3) integrates the monitoring, compliance testing, and recordkeeping requirements of the CAA and RCRA so that facilities will be able

to avoid two potentially different regulatory compliance schemes.

In addition, this proposal addresses the variety of issues, to the extent appropriate at this time, raised in several petitions filed with the Agency. These petitions are from the Cement Kiln Recycling Coalition (Jan. 18, 1994), the Hazardous Waste Treatment Council (May 18, 1994), and the Chemical Manufacturers Association (Oct. 14, 1994).

II. Relationship of Today's Proposal to EPA's Waste Minimization National Plan

EPA believes that today's proposed rule will create significant incentives for source reduction and recycling by waste generators that would, in turn, help facilities achieve compliance with the MACT standards. RCRA, as well as the Pollution Prevention Act of 1990 (PPA), encourage pollution prevention at the source, and the Clean Air Act mentions pollution prevention as a specific means of achieving MACT. In § 112(d)(2) of the CAA, Congress expressly defined MACT as the "application of measures, processes, methods, systems, or techniques including, but not limited to, measures which reduce the volume of, or eliminate emissions of, such pollutants through process changes, substitution of materials and other modifications."

In addition, in the Hazardous and Solid Waste Amendments of 1984 (HSWA) to RCRA, Congress established a national policy for waste minimization. Section 1003 of RCRA states that, whenever feasible, the generation of hazardous waste is to be reduced or eliminated as expeditiously as possible. Section 8002(r) requires EPA to explore the desirability and feasibility of establishing regulations or other incentives or disincentives for reducing or eliminating the generation of hazardous waste. In 1990, the PPA reinforced these policies by declaring it "to be the national policy of the United States that pollution should be prevented at the source whenever feasible" and, when not feasible, waste should be recycled, treated, or disposed of—in that order of preference.

Although the Agency has devoted significant effort to evaluation and promotion of waste minimization in the past [1], the Hazardous Waste Minimization and Combustion Strategy, first announced in May 1993, recently provided a new impetus to this effort. The Strategy had several components, among which was reducing the amount and toxicity of hazardous waste generated in the United States. Other components of the Strategy included strengthening controls on emissions from hazardous waste combustion units; enhancing public participation in facility permitting; establishing risk assessment policies with respect to facility permitting; and continued emphasis on strong compliance and enforcement.

EPA held a National Roundtable and four Regional Roundtables throughout the nation in 1993–94 to facilitate a broad dialogue on the spectrum of waste minimization and combustion issues. The major messages from these Roundtables became the building blocks for EPA's further efforts to promote source reduction and recycling and specifically for EPA's Waste Minimization National Plan, released in November 1994.

The Waste Minimization National Plan focuses on the goal of reducing persistent, bioaccumulative, and toxic constituents in hazardous waste nationally by 25 percent by the year 2000 and 50 percent by the year 2005. The central themes of the National Plan are: (1) Developing a framework for setting national priorities for the minimization of hazardous waste; (2) promoting multimedia environmental benefits and preventing cross-media transfers; (3) demonstrating a strong preference for source reduction by shifting attention to hazardous waste generators to reduce generation at its source; (4) defining and tracking progress in minimizing the generation of wastes; and (5) involving citizens in waste minimization implementation decisions. The Agency intends to continue its pursuit of hazardous waste minimization under the National Plan and other Agency initiatives in concert with the actions proposed in today's rule.

Of the 3.0 million tons of hazardous waste combusted in 1991, approximately two-thirds of that amount were combusted at on-site facilities (i.e., the same facilities at which the waste was generated). Combustion at an on-site facility therefore presents a situation in which the same facility owners and operators may have some measure of control over generation of wastes at its source and its ultimate disposition. Although close to 400 industries generated wastes destined for combustion in 1991, much of the quantity was concentrated in a few sectors. As a companion to this proposed rule, EPA is focusing its waste minimization efforts on reducing the generation and subsequent release to the environment of the most persistent, bioaccumulative, and toxic constituents in hazardous wastes (i.e., metals, halogenated organics).

Analysis of waste minimization potential suggests that generators currently burning wastes may have a number of options for eliminating or reducing these wastes. We believe that roughly 15 percent of all combusted wastes may be amenable to waste minimization. Three waste generating processes appear to have the most potential in terms of tonnage reduction: (1) Solvent and product recovery/ distillation procedures, primarily in the organic chemicals industry, (2) product processing wastes, and (3) process waste removal and cleaning. In addition, preliminary analyses of Toxics Release Inventory and hazardous waste stream data indicate that over 3 million pounds of hazardous metals are contained in waste streams being combusted. The top 5 ranking metals (with respect to health risk considering persistence, bioaccumulation, and toxicity) are mercury, cadmium, lead, copper, and selenium. Additional analyses are underway to identify the industry sectors and production processes that are chief sources of these and other high priority hazardous constituents.[2]

In today's rule, EPA is soliciting comment on two options to promote the use of pollution prevention/waste minimization measures as methods for helping meet MACT standards. These options (regarding feed stream analysis and permitting requirements) are described in Part Five, Section VI, Subsection D of this preamble. EPA is also seeking comment on a proposal to consider, on a case-by-case basis, extending the compliance deadlines for this rule by one year if a facility can show that extra time is needed to implement pollution prevention/waste minimization measures in order for the facility to meet the MACT standards and that implementation cannot be practically achieved within the allotted three-year period after promulgation of this rule (see Part V, Section 1, Subsection C).

PART TWO: DEVICES THAT WOULD BE SUBJECT TO THE PROPOSED EMISSION STANDARDS

I. Hazardous Waste Incinerators

A. Overview

A hazardous waste incinerator is an enclosed, controlled flame combustion

[1] For example, EPA prepared a report to Congress, "Minimization of Hazardous Wastes" (October 1986), that summarized existing waste minimization activities and evaluated options for promoting waste minimization.

[2] USEPA, Office of Solid Waste, "Setting Priorities for Hazardous Waste Minimization", July 1994.

device, as defined in 40 CFR 260.10, and is used to treat primarily organic and/or aqueous wastes. These devices may be in situ (fixed), or consist of mobile units (such as those used for site remediation and superfund clean-ups) or may consist of units burning spent or unusable ammunition and/or chemical agents that meet the incinerator definition.

B. Summary of Major Incinerator Designs

The following is a brief description of the typical incinerator designs used in the United States.[3]

1. Rotary Kilns

Rotary kiln systems typically contain two incineration chambers: the rotary kiln and an afterburner. The kiln itself is a cylindrical refractory-lined steel shell 10–20 feet in diameter, with a length-to-diameter ratio of 2 to 10. The shell is supported by steel trundles that ride on rollers, allowing the kiln to rotate around its horizontal axis at a rate of 1–2 revolutions per minute. Wastes are fed directly at one end of the kiln and heated by primary fuels. Waste continues to heat and burn as it travels down the inclined kiln. Combustion air is provided through ports on the face of the kiln. The kiln typically operates at 50–200 percent excess air and temperatures of 1600–1800°F. Flue gas from the kiln is routed to an afterburner operating at 2000–2500°F and 100–200 percent excess air where unburnt components of the kiln flue gas are more completely combusted. Auxiliary fuel and/or pumpable liquid wastes are typically used to maintain the afterburner temperature.

Some rotary kiln incinerators, known as slagging kilns, operate at high enough temperatures such that residual materials leave the kiln in a molten slag form. The molten residue is then water-quenched. Another kiln, an ashing kiln, operates at a lower temperature, producing a residual ash, which leaves as a dry material.

2. Liquid Injection Incinerators

A liquid injection incinerator system consists of an incineration chamber, waste burner and auxiliary fuel system. The combustion chamber is a cylindrical steel shell lined with refractory material and mounted horizontally or vertically. Liquid wastes are atomized as they are fed into the combustion chamber through waste burner nozzles. Typical combustion chamber temperatures are 1300–3000°F and residence times are from 0.5 to 3 seconds.

3. Fluidized Bed Incinerators

A fluidized bed system is essentially a vertical cylinder containing a bed of granular material at the bottom. Combustion air is introduced at the bottom of the cylinder and flows up through the bed material, suspending the granular particles. Waste and auxiliary fuels are injected into the bed, where they mix with combustion air and burn at temperatures from 840–1500°F. Further reaction occurs in the volume above the bed at temperatures up to 1800°F.

4. Fixed Hearth Incinerators

Fixed hearth incinerators typically contain two furnace chambers: a primary and a secondary chamber. Some designs have two or three step hearths on which ash and waste are pushed with rams through the system. A controlled flow 'underfire' combustion air is introduced up through the hearths. The primary chamber operates in "starved air" mode and the temperatures are around 1000°F. The unburnt hydrocarbons reach the secondary chamber where 140–200 percent excess air is supplied and temperatures of 1400–2000°F are achieved for more complete combustion.

C. Number of Incinerator Facilities

Currently, 162 permitted or interim status incinerator facilities, having 190 units, are in operation in the U.S. Another 26 facilities are proposed [4] (i.e., new facilities under construction or permitting). Of the above 162 facilities, 21 facilities are commercial facilities that burn about 700,000 tons of hazardous waste annually. The remaining 141 are on-site or captive facilities and burn about 800,000 tons of waste annually.

D. Typical Emission Control Devices for Incinerators

Incinerators are equipped with a wide variety of air pollution control devices (APCDs), which range from no control (for devices burning low ash and low chlorine wastes) to sophisticated state-of-the-art units providing control for several pollutants. Hot flue gases from the incinerators are cooled and cleaned of the air pollutants before they exit the stack. Cooling is mostly done by water quenching, wherein atomized water is sprayed directly into the hot gases. The cooled gases are passed through various pollution control devices to control PM, metals and organic emissions to desired or required levels. Most incinerators use wet APCDs to scrub acid emissions (3 facilities use dry scrubbers). Typical APCDs used include packed towers, spray dryers, or dry scrubbers for acid gas (e.g., HCl, Cl_2) control, and venturi-scrubbers, wet or dry electrostatic precipitators (ESPs) or fabric filters for particulate control.

Activated carbon injection for controlling dioxin and mercury is being used at only one incinerator. Newer APC technologies (such as catalytic oxidizers and dioxin/furan inhibitors) have recently emerged, but have not been used on any full scale facilities in the U.S. For detailed description of APCDs, see Appendix A of "Combustion Emissions Technical Resource Document (CETRED)," US EPA Document #EPA530–R–94–014, May 1994.

II. Hazardous Waste-Burning Cement Kilns

A. Overview of Cement Manufacturing

Cement refers to the commodities that are produced by heating mixtures of limestone and other minerals or additives at high temperature in a rotary kiln, followed by cooling, grinding, and finish mixing. This is the manner in which the vast majority of commercially-important cementitious materials are produced in the United States. Cements are used to chemically bind different materials together. The most commonly produced cement type is "Portland" cement, though other standard cement types are also produced on a limited basis (e.g., sulfate-resisting, high-early-strength, masonry, waterproofed). Portland cement is a hydraulic cement, meaning that it sets and hardens by chemical interaction with water. When combined with sand, gravel, water, and other materials, Portland cement forms concrete, one of the most widely used building and construction materials in the world. Cement produced and sold in the U.S. must meet specifications established by the American Society for Testing and Materials (ASTM). Each type requires specific additives or changes in the proportions of the raw material mix to make products for specific applications.

B. Summary of Major Design and Operating Features of Cement Kilns

Cement kilns are horizontally inclined rotating cylinders, refractory-brick lined, and internally-fired, that calcine a blend of raw materials

[3] For a more detailed description of incineration technology, see "Combustion Emissions Technical Resource Document (CETRED)", USEPA EPA530–R–94–014, May 1994.

[4] USEPA "List of hazardous waste incinerators," November 1994.

containing calcium (typically limestone), silica and alumina (typically clay, shale, slate, and/or sand), and iron (typically steel mill scale or iron ore) to produce Portland cement. Generally, there is a wet process and a dry process for producing cement. In the wet process, the limestone and shale are ground up, wetted and fed into the kiln as a slurry. In the dry process, raw materials are ground dry and fed into the kiln dry. Wet process kilns are typically longer than dry process kilns in order to facilitate water evaporation from the slurried raw material. Wet kilns can be more than 450 feet in length. Dry kilns are more thermally efficient and frequently use preheaters or precalciners to begin the calcining process (i.e., the essential function of driving CO_2 from raw materials) before the raw materials are fed into the kiln.

Combustion gases and raw materials move in a counterflow direction, with respect to each other, inside a cement kiln. The kiln is inclined, and raw materials are fed into the upper end (i.e., the "cold" end) while fuels are normally fired into the lower end (i.e., the "hot" end). Combustion gases move up the kiln counter to the flow of raw materials. The raw materials get progressively hotter as they travel down the length of the kiln. The raw materials eventually begin to soften and fuse at temperatures between 2,250 and 2,700 °F to form the clinker product. Clinker is then cooled, ground, and mixed with other materials, such as gypsum, to form cement.

Combustion gases leaving the kiln typically contain from 6 to 30 percent of the free solids as dust, which are often recycled to the kiln feed system, though the extent of recycling varies greatly among cement kilns.

Dry kilns with a preheater (PH) or precalciner (PC) often use a by-pass duct to remove from 5 to 30 percent of the kiln off-gases from the main duct. The by-pass gas is passed through a separate air pollution control system to remove particulate matter. Collected by-pass dust is not reintroduced into the kiln system to avoid a build-up of metal salts that can affect product quality.

Some cement kilns burn hazardous waste-derived fuels to replace from 25 to 100 percent of normal fossil fuels (e.g., coal). Most kilns burn liquid waste fuels but several also burn bulk solids and small (e.g., six gallon) containers of viscous or solid hazardous waste fuels. Containers are introduced either at the upper, raw material end of the kiln or at the midpoint of the kiln. EPA has also found that hazardous waste-fired precalciners can still be considered part of the cement kiln and, thus, would be part of an industrial furnace (per the definition in 40 CFR 260.10). See 56 FR at 7184–85 (February 21, 1991). This finding is codified at § 266.103(a)(5)(I)(c). This is the only time (and the only rulemaking) in which the Agency found that a device not enumerated in the list of industrial furnaces in § 260.10 can be considered part of the industrial furnace when it burns hazardous wastes separate from those burned in the main combustion device.

C. Number of Facilities

The Agency has emissions data from 26 facilities representing 49 cement kilns in the U.S. It should be noted that some facilities no longer burn or process hazardous waste since they were required to certify compliance with the BIF regulations in August 1992.

Of the hazardous waste-burning kilns for which we have emissions data, 14 facilities use a wet process, 5 facilities use a dry process, and the remaining 7 facilities employ either preheaters or preheater/precalciners in the cement manufacturing process.

D. Emissions Control Devices

All hazardous waste-burning cement kilns either use fabric filters (baghouses) or electrostatic precipitators (ESPs) as air pollution control devices. ESPs have traditionally been employed in the cement industry and are currently used at 17 of the facilities. Nine facilities use fabric filters. A detailed description of these and other air pollution control devices is contained in the technical support document.[5]

III. Hazardous Waste-Burning Lightweight Aggregate Kilns

A. Overview of Lightweight Aggregate Kilns (LWAKs)

The term lightweight aggregate refers to a wide variety of raw materials (such as clay, shale, or slate) which after thermal processing can be combined with cement to form concrete products. Lightweight aggregate concrete is produced either for structural purposes or for thermal insulation purposes. A lightweight aggregate plant is typically composed of a quarry, a raw material preparation area, a kiln, a cooler, and a product storage area. The material is taken from the quarry to the raw material preparation area and from there is fed into the rotary kiln.

B. Major Design and Operating Features

A rotary kiln consists of a long steel cylinder, lined internally with refractory bricks, which is capable of rotating about its axis and is inclined at an angle of about 5 degrees to the horizontal. The length of the kiln depends in part upon the composition of the raw material to be processed but is usually 30 to 60 meters. The prepared raw material is fed into the kiln at the higher end, while firing takes place at the lower end. The dry raw material fed into the kiln is initially preheated by hot combustion gases. Once the material is preheated, it passes into a second furnace zone where it melts to a semiplastic state and begins to generate gases which serve as the bloating or expanding agent. In this zone, specific compounds begin to decompose and form gases such as SO_2, CO_2, SO_3, and O_2 that eventually trigger the desired bloating action within the material. As temperatures reach their maximum (approximately 2100°F), the semiplastic raw material becomes viscous and entraps the expanding gases. This bloating action produces small, unconnected gas cells, which remain in the material after it cools and solidifies. The product exits the kiln and enters a section of the process where it is cooled with cold air and then conveyed to the discharge.

Kiln operating parameters such as flame temperature, excess air, feed size, material flow, and speed of rotation vary from plant to plant and are determined by the characteristics of the raw material. Maximum temperature in the rotary kiln varies from 2050 °F to 2300 °F, depending on the type of raw material being processed and its moisture content. Exit temperatures may range from 300 °F to 1200 °F, again depending on the raw material and on the kiln's internal design. Approximately 80 to 100 percent excess air is forced into the kiln to aid in expanding the raw material.

C. Number of Facilities

EPA has identified 36 lightweight aggregate kiln locations in the United States. Of these, EPA has identified seven facilities that are currently burning hazardous waste in a total of 15 kilns.

D. Air Pollution Control Devices

Lightweight aggregate kilns use one or a combination of air pollution control devices, including fabric filters, venturi scrubbers, spray dryers, cyclones and wet scrubbers. All of the facilities utilize fabric filters as the main type of emissions control, although one facility uses a spray dryer, venturi scrubber and

[5] USEPA, "Draft Technical Support Document for HWC MACT Standards, Volume I: Description of Source Categories", February 1996.

wet scrubber in addition to a fabric filter. For detailed descriptions of these and other air pollution control devices, please see Appendix A of the draft EPA document Combustion Emissions Technical Resource Document (CETRED).[6]

PART THREE: DECISION PROCESS FOR SETTING NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAPs)

I. Source of Authority for NESHAP Development

The 1990 Amendments to the Clean Air Act significantly revised the requirements for controlling emissions of hazardous air pollutants. EPA is now required to develop a list[7] of categories of major and area sources[8] of the hazardous air pollutants (HAPs) enumerated in section 112 and to develop technology-based performance standards for such sources over specified time periods. See Clean Air Act (the Act or CAA) §§ 112(c) and 112(d). Section 112 of the Act replaces the previous system of pollutant-by-pollutant health-based regulation that proved ineffective at controlling the high volumes, concentrations, and threats to human health and the environment posed by HAPs in air emissions. See generally S. Rep. No. 228, 101st Cong. 1st Sess. 128–32 (1990).

Section 112(f) also requires the Agency to report to Congress by the end of 1996 on estimated risk remaining after imposition of technology-based standards and to make recommendations as to legislation to address such risk. CAA § 112(f)(1). If Congress does not act on the recommendation, then EPA must address any significant remaining residual risks posed by sources subject to the section 112(d) technology-based standards within 8 years after promulgation of these standards. See § 112(f)(2). The Agency is required to impose additional controls if such controls are needed to protect public health with an ample margin of safety, or to prevent adverse environmental effects. *Id.* In addition, if the technology-based standards for carcinogens do not reduce the lifetime excess cancer risk for the most exposed individual to less than one in a million (1×10^{-6}), then the Agency must promulgate additional standards. See § 112(f)(2)(A).

II. Procedures and Criteria for Development of NESHAPs

NESHAPs are developed in order to control HAP emissions from both new and existing sources according to the statutory directives set out in § 112. The statute requires a NESHAP to reflect the maximum degree of reduction of HAP emissions that is achievable taking into consideration the cost of achieving the emission reduction, any non-air quality health and environmental impacts, and energy requirements. § 112(d)(2). In regulatory parlance, these are often referred to as maximum achievable control technology (or MACT) standards.

The Clean Air Act establishes minimum levels, usually referred to as MACT floors, for the emission standards. Section 112(d)(3) requires that MACT floors be determined as follows: for existing sources in a category or sub-category with 30 or more sources, the MACT floor cannot be less stringent than the "average emission limitation achieved by the best performing 12 percent of the existing sources * * *"; for existing sources in a category or sub-category with less than 30 sources, then the MACT floor cannot be less stringent than the "average emission limitation achieved by the best performing 5 sources * * *"; for new sources, the MACT floor cannot be "less stringent than the emission control that is achieved by the best controlled similar source * * *". See § 112(d)(3)(A) and (B).

EPA must, of course, consider in all cases whether to develop standards that are more stringent than the floor ("beyond the floor" standards). To do so, however, EPA must consider the enumerated statutory criteria such as cost, energy, and non-air environmental implications.

Emission reductions may be accomplished through application of measures, processes, methods, systems, or techniques, including, but not limited to: (1) Reducing the volume of, or eliminating emissions of, such pollutants through process changes, substitution of materials, or other modifications; (2) enclosing systems or processes to eliminate emissions; (3) collecting, capturing, or treating such pollutants when released from a process, stack, storage, or fugitive emissions point; (4) design, equipment, work practice, or operational standards (including requirements for operator training or certification); or (5) any combination of the above. See § 112(d)(2).

Application of techniques (1) and (2) of the previous paragraph are consistent with the definitions of pollution prevention under the Pollution Prevention Act and the definition of waste minimization under RCRA/HSWA. These terms have particular applicability in the discussion of pollution prevention/waste minimization options presented in the permitting and compliance sections of today's proposal.

To develop a NESHAP, the EPA compiles available information and in some cases collects additional information about the industry, including information on emission source quantities, types and characteristics of HAPs, pollution control technologies, data from HAP emissions tests (e.g., compliance tests, trial burn tests) at controlled and uncontrolled facilities, and information on the costs and other energy and environmental impacts of emission control techniques. EPA uses this information in analyzing and developing possible regulatory approaches. EPA, of course, does not always have or collect the same amount of information per industry, but rather bases the standard on information practically available.

Although NESHAPs are normally structured in terms of numerical emission limits—the preferred means of establishing standards—alternative approaches are sometimes necessary and appropriate. In some cases, for example, physically measuring emissions from a source may be impossible, or at least impractical, because of technological and economic limitations. Section 112(h) authorizes the Administrator to promulgate a design, equipment, work practice, or operational standard, or a combination thereof, in those cases where it is not feasible to prescribe or enforce an emissions standard.

EPA is required to develop emission standards based on performance of maximum achievable control technology for categories or sub-categories of major sources of hazardous air pollutants. § 112(d)(1). As explained more fully in the following section, a major source emits, or has the potential to emit considering controls, either 10 tons per year of any hazardous air pollutant or 25 tons or more of any combination of those pollutants. § 112(a)(1). EPA also can establish lower thresholds where appropriate. *Id.* EPA

[6] USEPA, "Draft Combustion Emission Technical Resource Document (CETRED)", EPA 530–R–94–014, May 1994.

[7] The Agency published an initial list of categories of major and area sources of HAPs on July 16, 1992. See 57 FR 31576.

[8] See Part Three, Section III of today's proposal for a discussion of major and area sources. Generally, a major source is a stationary source that emits, or has the potential to emit considering controls, 10 tons per year of a HAP or 25 tons per year of a combination of HAPs. CAA § 112(a)(1). An area source is generally a stationary source that is not a major source. *Id.* § 112(a)(2).

may in addition require sources emitting particularly dangerous hazardous air pollutants (such as particular chlorinated dioxins and furans) to be regulated under the MACT standards for major sources. § 112(c)(6).

Area sources are any source which is not a major source. Such sources must be regulated by technology-based standards if they are listed, pursuant to § 112(c)(3), based on the Agency's finding that these sources (individually or in the aggregate) present a threat of adverse effects to human health or the environment warranting regulation. After such a determination, the Agency has a further choice as to require technology-based standards based on MACT or on generally achievable control technology (GACT). § 112(d)(5).

In this rulemaking, EPA is proceeding pursuant to § 112(c)(6) (i.e., imposing MACT controls on area sources), because these hazardous waste combustion units emit a number of the HAPs singled out in that provision, including the enumerated dioxins and furans, mercury, and polycyclic organic matter. (See discussion below.)

III. List of Categories of Major and Area Sources

A. Clean Air Act Requirements

As just discussed, Section 112 of the CAA requires that the EPA promulgate regulations requiring the control of hazardous air pollutants emissions associated with categories or subcategories of major and area sources. These source categories and subcategories are to be listed pursuant to § 112(c)(1). EPA published an initial list of 174 categories of such major and area sources in the **Federal Register** on July 16, 1992 (57 FR 31576).

B. Hazardous Waste Incinerators

"Hazardous waste incinerators" is one of the 174 categories of sources listed. The category consists of commercial and on-site (including captive) incinerating facilities. The listing was based on the Administrator's determination that at least one hazardous waste incinerator may reasonably be anticipated to emit several of the 189 listed HAPs in quantities sufficient to designate them as major sources. EPA used two emission rate values to evaluate the available hazardous waste incinerator emissions data: the maximum emission rate measured during the compliance test, and the average emission rate. The data indicate that approximately 30 percent of the facilities meet the major source criteria when using the maximum emissions rate value. When using the average emissions rate value approximately 15 percent of facilities meet the major source criteria.[9] Those facilities meeting the major source criteria do so for HCl and Cl_2 emissions, and one facility is also a major source for antimony emissions.

It should be noted that a major source and boundary for considering whether a source is a major includes all potential emission points of HAPs at that contiguous facility, including storage tanks, equipment leaks, and other hazardous waste handling facilities. The above calculations for incinerators on whether a source is a major source under § 112 do not reflect these potential emission points.

Notwithstanding the fact that most HW incinerators are not likely to meet the HAP emission thresholds for major sources, the Agency is proposing to subject all HWCs to regulation under MACT as major sources, under the authority of § 112(c)(6). See Section IV below.

C. Cement Kilns

Another of the 174 categories of major and area sources of HAPs is Portland Cement Manufacturing (cement kilns). In evaluating the emissions data for the hazardous waste-burning cement kilns, 85 percent of the cement kilns were determined to meet the major source criteria when using the maximum emission rate value. Using the average emission rate value, just over 80 percent of the hazardous waste-burning cement kilns meet the major source criteria.[10] Those facilities meeting the major source criteria do so for HCl and Cl_2 emissions, and one facility is also a major source for organic emissions. It should be noted that the calculation on whether a cement kiln is a major source did not include potential emission points of HAPs at that contiguous facility.

Notwithstanding the fact that some hazardous waste-burning cement kilns may not meet the definition of major source, the Agency is proposing to subject all HWCs to regulation under MACT, as major sources, under the authority of § 112(c)(6). See Section IV below.

D. Lightweight Aggregate Kilns

Section 112(c)(5) authorizes EPA to amend the source category list at any time to add categories or subcategories that meet the listing criteria. EPA is proposing to exercise that authority by adding HW-burning lightweight aggregate kilns to the list of source categories.

In analyzing the emissions data, EPA found that all hazardous waste-burning LWAKs met the major source criteria for two HAPs, HCl and Cl_2, using either the average or maximum emission rate value.[11] It should be noted that the calculation on whether a LWAK is a major source did not include potential emission points of HAPs at that contiguous facility. EPA is therefore proposing today the addition of hazardous waste-burning LWAKs as a source category in accordance with section 112(c)(5) of the Act. In addition, as discussed below, even if a LWAK would otherwise be an area source, EPA is proposing to subject it to the same NESHAPS as major LWAK sources.

IV. Proposal To Subject Area Sources to the NESHAPs Under Authority of Section 112(c)(6)

EPA is today proposing to subject all hazardous waste incinerators, hazardous waste-burning cement kilns, and hazardous waste-burning lightweight aggregate kilns (i.e., both area and major sources) to regulation as major sources pursuant to CAA § 112(c)(6). That provision states that, by November 15, 2000, EPA must list and promulgate § 112 (d)(2) or (d)(4) standards (i.e., standards reflecting MACT) for categories (and subcategories) of sources emitting specific pollutants, including the following HAPs emitted by HWCs: polycyclic organic matter, mercury, 2,3,7,8-tetrachlorodibenzofuran, and 2,3,7,8-tetrachlorodibenzo-p-dioxin. (Although the Agency has not prepared the list, it is the Agency's intention to include hazardous waste combustors.) EPA must assure that sources accounting for not less than 90 percent of the aggregate emissions of each enumerated pollutant are subject to MACT standards.

The chief practical effect of invoking § 112(c)(6) for this rulemaking is to subject area sources that emit 112(c)(6) pollutants to the same MACT standards as major sources, rather than to the potentially less stringent 112(d)(5) or "GACT" ("generally achievable control technology") standards.[12] Today's proposal constitutes one of many EPA actions to assure that sources accounting for at least 90 percent of

[9] For further details see USEPA, "Draft Technical Support Document for HWC MACT Standards, Volume I: Description of Source Categories", February 1996.

[10] Ibid.

[11] Ibid.

[12] EPA also solicits comment on an alternative reading of § 112(c)(6), whereby the provision would require MACT control for the enumerated pollutants but not necessarily for other HAPs emitted by the source, which HAPs are not enumerated in § 112(c)(6).

emissions of § 112(c)(6) pollutants are subject to MACT standards.

Although § 112(c)(6) requires the Agency to regulate source categories that emit not less than 90 percent of the aggregate emissions of the high priority HAPs, the Agency will use its discretion to avoid regulating area source categories with trivial aggregate emissions of specific § 112(c)(6) HAPs. However, as an example of the emissions that are possible from the HWC source categories, it is estimated that HWCs presently emit in aggregate 11.1 tons of mercury per year. Of this quantity, 4.6 tons per year can be attributed to hazardous waste incinerators and 6.5 tons per year to hazardous waste-burning cement and lightweight aggregate kilns. Also, it is estimated that HWCs presently emit in aggregate 122 pounds of dioxins/furans (or 2.15 pounds TEQ) per year. Of this quantity, 9 pounds (or 0.2 pounds TEQ) per year can be attributed to hazardous waste incinerators and 113 pounds (or 1.95 pounds TEQ) per year to hazardous waste-burning cement and lightweight aggregate kilns. To show an example of how today's proposal constitutes an action to assure that sources accounting for at least 90 percent of emissions of § 112(c)(6) pollutants are subject to MACT standards, the document Estimating Exposure to Dioxin-Like Compounds, Vol. II: Properties, Sources, Occurrence and Background Exposures (EPA, 1994) estimates (on p. 29) that national emissions of dioxins and furans (D/F) total 4.18 pounds TEQ per year. Based on this estimation, HWCs account for 51 percent of the annual national emissions of D/F. (Consequently, EPA expects these source categories to be included in the list of sources to be controlled to achieve the requisite 90 percent reduction in aggregate emissions of section 112(c)(6) pollutants.)

Congress singled out the HAPs enumerated in § 112(c)(6) as being of "specific concern" not just because of their toxicity but because of their propensity to cause substantial harm to human health and the environment via indirect exposure pathways (i.e., from the air through other media, such as water, soil, food uptake, etc.). S. Rep. No. 228, 101st Cong. 1st Sess., pp. 155, 166. These pollutants have exhibited special potential to bioaccumulate, causing pervasive environmental harm in biota (and, ultimately, human health risks). *Id.* Indeed, as discussed later, the data appear to show that much of the human health risk from emissions of these HAPs from HWCs comes from these indirect exposure pathways. *Id.* at p. 166. Congress' express intention was to assure that sources emitting significant quantities of § 112(c)(6) pollutants received a stricter level of control. *Id.*

V. Selection of MACT Floor for Existing Sources

The starting point in developing MACT standards is determining floor levels, i.e. the minimum (least stringent) level at which the standard can be set.

All of the hazardous waste combustion units subject to this proposed rule are already subject to RCRA regulation under 40 CFR Parts 264, 265, or 266. As a result, the Agency has a substantial amount of data reflecting performance of these devices. These data consist largely of trial burn data for hazardous waste incinerators and data from certifications of compliance for hazardous waste-burning cement kilns and LWAKs obtained pursuant to 266.103(c). These data consist of at least three runs for any given test condition.

In using these "short term" test data to establish a MACT floor, the Agency has developed an approach that ensures the standards are achievable, i.e. reflect the performance over time of properly designed and operated air pollution control devices (or operating practices) taking into account intrinsic operating variability.

In addition, the Agency notes that the floor calculations were performed on individual HAPs or, in the case of metals, in two groups of HAPs that behave similarly (i.e., separate floor levels for each hazardous air pollutant or group of metal pollutants). However, for HAPs that are controlled by the same type of air pollution control device (APCD), EPA has ensured that all HAP floors are simultaneously achievable by identifying the APCD and APCD treatment train that can be used to meet all floor levels. The ultimate floor levels thus derived can be achieved using the identified technology. This approach is consistent with methods used by EPA in other rules to calculate MACT requirements where the HAP species present must be treated by a treatment train. See, e.g., MACT Rules for Secondary Lead Smelters. 60 FR 32589 (June 23, 1995).

The Agency is not, however, treating hazardous waste-burning incinerators, cement kilns, and LWAKs as a single source category for purposes of developing the MACT floor (or for any other purpose). The Agency's initial view is that there are technical differences in performance for particular HAPs among the three source categories, and therefore that the technology-based floors must reflect these operating differences.

A. Proposed Approach: Combined Technology-Statistical Approach

This analysis first identified the best performing control technology(ies) for each source category (i.e., incinerators, cement kilns, and lightweight aggregate kilns) and each HAP of concern by arraying from lowest to highest all the particular HAP emissions data from existing units within the source category by test condition averages. These technologies comprise MACT floor. In cases where a source had emissions data for a HAP from several different test conditions of a compliance test, the Agency arrayed each test condition separately. The Agency then identified the emission control technology or technologies (and normalized feedrate of metals and chlorine in hazardous waste) used by sources with emissions levels at or below the level emitted by the median of the best performing 12 percent of sources. The sources are termed "the best performing 6 percent" of the sources, or "MACT pool", and the controls they use comprise MACT floor.

The next step was to identify an emissions level that MACT floor control could achieve. Thus, emissions data from *all* sources (in the source category) that use MACT floor control were arrayed in ascending order by average emissions. [This is referred to as the "expanded MACT pool" or "expanded universe".] The Agency evaluated the control technologies used by the additional sources within the "expanded universe" as available data allowed to ensure that they were in fact equivalent in design to MACT floor. The Agency then selected the test condition in the expanded MACT pool with the highest mean emissions to identify the emission level that MACT floor could achieve.

Because the emissions database was comprised of "short-term" test data, the Agency used a statistical approach to identify an emission level that MACT floor could achieve *routinely*. The Agency then identified the test condition in the expanded MACT pool with the highest mean emissions to statistically calculate a "design level" and a floor standard. The design level was calculated as the log mean of the emissions for the test condition. The standard was calculated as a level that a source (that is designed and operated to routinely meet the design level) could meet 99 percent of the time if it has the average within-test-condition emissions variability of the expanded MACT pool. Although the Agency evaluated 90th and 95th percentile limits, the 99th

percentile limit was chosen to: (1) More accurately reflect the variability that could be present in emissions data, and (2) appropriately characterize this variability in light of the consequence of failing to achieve the emissions standards. Additional information on how MACT floor levels were identified is provided in the "Draft Technical Support Document for HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies".

In accounting for operating variability, the Agency solicits comment on whether it may have overcompensated so that the identified floor levels are unduly lenient. The test data on which the proposal is based to some extent reflect worst-case performance conditions because RCRA sources try to obtain maximum operating flexibility by conducting test burns at extreme operating conditions. For example, many sources spike wastes with excess metals and chlorine during compliance testing. In addition, sources operate their emissions control devices under low efficiency conditions (while still meeting emission standards) to ensure lenient operating limits. It thus may be that the Agency's emissions database is so inflated that separate consideration of emissions variability may not be warranted. A floor level could be the highest mean of the test conditions in the expanded MACT pool.

The Agency emphasizes that it would be preferable, for purposes of setting these MACT standards, to have operational and emissions data that better reflect long-term, more routine day-to-day facility operations from all of the source categories. We believe that this type of data would enable the MACT process to articulate a set of HAP standards that would not create some of the issues raised in subsequent sections of this preamble (such as the most appropriate resolution of a variability factor, the optimum approach for considering the contribution of cement and lightweight aggregate kiln raw material feed to HAP emissions, and better identification among sources that are now in an expanded MACT pool but which, with better data, would be determined not to be employing the identified floor controls). As noted in these subsequent sections, the Agency urges commenters to submit these types of data.

B. Another Approach Considered but not Used

Although the Agency believes the proposed approach reflects a reasonable interpretation of the statute, there are other possible interpretations. One of these interpretations, termed the "12 percent approach", was raised and, in fact, evaluated during the process already outlined. This approach is presented here, along with the results of the process in Part Four, Section VIII, for public inspection.

This "12 percent approach" was evaluated in a like manner to the Agency's preferred approach just described. Again, the best performing control technology(ies) for each source category and each HAP were identified by arraying the data by test condition averages. However, the Agency identified the technology or technologies used by the best performing 12 percent of the sources. After arraying emissions data from *all* facilities in the source category that use the identified MACT floor technology(ies) (i.e., the expanded MACT pool), the Agency selected an emissions floor level based on the statistical average of the 12 percent MACT pool, to which was added the average within-test condition variability within the expanded MACT pool. The emissions floor was then calculated at a level that a source with average emissions variability would be expected to achieve 99 percent of the time. The approach was not proposed because it could not be demonstrated that sources within the expanded MACT pool using MACT floor controls could achieve the floor levels. Again, the details of the statistical methods employed are presented in the "Draft Technical Support Document for HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies".

C. Identifying Floors as Proposed in CETRED

The discussion in the Draft Combustion Emissions Technical Resource Document (CETRED) (U.S. EPA, EPA530–R–94–014, May 1994) presented one methodology for establishing particulate matter (PM) and dioxin/furan (D/F) technology-based emission levels for hazardous waste combustors (HWCs). The document presented a procedure for establishing numerical levels which took into account the natural variability that was present in the Agency's PM and D/F emissions data. EPA received numerous comments on the document.

The approaches outlined in CETRED were an initial and preliminary attempt to apply the process by which the NESHAPs are to be established for the existing types of hazardous waste combustors. The approaches in CETRED focused solely on the performance of MACT and how to establish the "floor" emission level under the MACT process.

In CETRED, determination of the MACT floor involved: (1) screening unrepresentative data; (2) ranking all HWC sources based on the data average, considering variability; (3) identifying the top 12 percent of sources as the MACT pool; and (4) statistically evaluating the MACT pool to set the MACT floor. These elements and considerations are described in further detail in CETRED and the "Draft Technical Support Document for HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies". The Agency specifically indicated the preliminary nature of the CETRED approaches and, in light of further deliberations and comments received, has considered and adopted other approaches for this proposal. The comments received are found in the docket.

In considering the use of a purely statistical approach to setting MACT floors, the Agency recognized that whether sources could actually achieve a statistically-derived MACT floor level on a regular basis was significant in determining whether a purely statistical approach could be appropriate or not. The Agency encountered difficulties in identifying an appropriate purely statistical model for the combined source category (HW incinerators, HW-burning cement kilns, and HW-burning lightweight aggregate kilns) emissions database. Consequently, the Agency abandoned a purely statistical approach and examined an approach—referred to here as the "technology approach"—that used demonstrated technological capabilities as a key factor in selecting MACT floor levels.

D. Establishing Floors One HAP or HAP Group at a Time

EPA believes it is permissible to establish MACT floors separately for individual HAPs or group of HAPs that behave the same from a technical standpoint (i.e., based on separate MACT pools and floor controls), provided the various MACT floors are simultaneously achievable. As set out below, Congress has not spoken to this precise issue. An interpretation that allows this approach is consistent with statutory goals and policies, as well as established EPA practice in developing MACT standards.

As described earlier, Congress specified in section 112(d)(3) the minimum level of emission reduction that could satisfy the requirement to adopt MACT. For new sources, this floor level is to be "the emission control that is achieved in practice by the best

controlled similar source". For existing sources, the floor level is to be "the average emission limitation achieved by the best performing 12 percent of the existing sources" for categories and subcategories with 30 or more sources, or "the average emission limitation achieved by the best performing 5 sources" for categories and subcategories with fewer than 30 sources. An "emission limitation" is "a requirement * * * which limits the quantity, rate, or concentration of emissions of air pollutants" (section 302 (k)) (although the extent, if any, the section 302 definitions need to apply to the terms used in section 112 is not clear).

This language does not expressly address whether floor levels can be established HAP-by-HAP. The existing source MACT floor achieved by the average of the best performing 12 percent can reasonably be read as referring to the source as a whole or performance as to a particular HAP. The statutory definition of "emission limitation" (assuming it applies) likewise is ambiguous, since "requirements limiting quantity, rate, or concentration of pollutants" could apply to particular HAPs or all HAPs. The reference in the new source MACT floor to "emission control achieved by the best controlled similar source" can mean emission control as to a particular HAP or achieved by a source as a whole.

Here, Congress has not spoken to the precise question at issue, and the Agency's interpretation effectuates statutory goals and policies in a reasonable manner. See *Chevron* v. *NRDC*, 467 U.S. 837 (1984) (indicating that such interpretations must be upheld). The central purpose of the amended air toxics provisions was to apply strict technology-based emission controls on HAPs. See, e.g., H. Rep. No. 952, 101st Cong. 2d sess. 338. The floor's specific purpose was to assure that consideration of economic and other impacts not be used to "gut the standards". While costs are by no means irrelevant, they should by no means be the determining factors. There needs to be a minimum degree of control in relation to the control technologies that have already been attained by the best existing sources. Legislative History of the Clean Air Act *Vol. II* at 2897 (statement of Rep. Collins).

Furthermore, an alternative interpretation would tend to result in least common denominator floors where multiple HAPs are emitted, whereby floors would no longer be reflecting performance of the best performing sources. For example, if the best performing 12 percent of facilities for HAP metals did not control organics as well as a different 12 percent of facilities, the floor for organics and metals would end up *not* reflecting best performance. Indeed, under this reading, the floor would be no control, because no plant is controlling both types of HAPs.

EPA is convinced that this result is not compelled by the statutory text, and does not effectuate the evident statutory purpose of having floor levels reflect performance of an average of a group of best-performing sources. Conversely, using a HAP-by-HAP approach (or an approach that groups HAPs based on technical factors) to identify separate floors for metals and organics in this example promotes the stated purpose of the floor to provide a minimum level of control reflecting what best performing existing sources have already demonstrated an ability to do.

EPA notes, however, that if optimized performance for different HAPs is not technologically possible due to mutually inconsistent control technologies (for example, metals performance decreases if organics reduction is optimized), then this would have to be taken into account in establishing a floor (or floors). (Optimized controls for both types of HAPS would not be MACT in any case, since the standards would not be mutually achievable.) The Senate Report indicates that in such a circumstance, EPA is to optimize the part of the standard providing the most environmental protection. S. Rep. No. 228, 101st Cong. 1st sess. 168. It should be emphasized, however, that "the fact that no plant has been shown to be able to meet all of the limitations does not demonstrate that all the limitations are not achievable". *Chemical Manufacturers Association* v. *EPA*, 885 F. 2d at 264 (upholding technology-based standards based on best performance for each pollutant by different plants, where at least one plant met each of the limitations but no single plant met all of them).

All available data for HWCs indicate that there is no technical problem achieving the floor levels for each HAP or HAP metal group simultaneously, using the MACT floor technology. In the case of metals and PM, the characteristics of the MACT floor technology associated with the hardest-to-meet floor (e.g., the fabric filter with lowest air-to-cloth ratio) would define the MACT floor technology for purposes of determining achievability of floors and for purposes of costing out the impact of the standards. Existing data show that approximately 9 percent of existing hazardous waste incinerators, approximately 8 percent of hazardous waste-burning cement kilns, and approximately 25 percent of hazardous waste-burning LWAKs are already achieving the proposed floor standards for all HAPs.

Finally, EPA notes that the HAP-by-HAP or HAP group approach to establishing MACT floor levels is not unique to this rule. For example, the Agency has adopted it for the NESHAP for the secondary lead source category (60 FR 32589 (June 23, 1995)) and proposed the same approach for municipal waste combustors (59 FR 48198 (September 20, 1994)).

As discussed above, EPA has the authority to establish MACT floors on a HAP group by HAP group basis and has done so in this case. In doing so, EPA will ensure that such floors, taken as a whole, are reasonably achievable for facilities subject to the MACT standards.

VI. Selection of Beyond-the-Floor Levels for Existing Sources

As discussed in Section V above, the MACT floor defines the minimum level of emission control for existing sources, regardless of cost or other considerations. The process of considering emissions levels more stringent than the MACT floor for existing sources is called a "beyond-the-floor" (BTF) analysis and involves consideration of certain additional factors, including cost, any non-air quality health and environmental impacts and energy requirements, technologies currently in use within these industry sectors, and also other more efficient and appropriate technologies that have been demonstrated and are available on the market (e.g., carbon bed for dioxin/furan control).

Because there are virtually unlimited BTF emissions levels that the Agency could consider, the Agency used several criteria in this proposal to identify when to examine a particular beyond-the-floor emissions level in detail, and also whether to propose a MACT standard based on the beyond-the-floor emissions levels for existing sources.

The primary factor is the cost-effectiveness of setting MACT standards based upon a more efficient technology than the MACT floor technology(ies). If the Agency's economic analysis suggested that BTF levels could be cost-effectively achieved (particularly if significant health benefits would result from a lower emission level), then an applicable BTF emission level control technology was identified to achieve that level. The associated costs were then weighed along with the other criteria. Dioxin/furans is an example

where the Agency considered a BTF level because a beyond-the-floor emission level can be achieved in a cost-effective manner, achieving, in addition, significant non-air quality environmental benefits.

VII. Selection of MACT for New Sources

For new sources, the standards for a source category (or sub-category) cannot be less stringent than the emission control that is achieved in practice by the best-controlled similar source. See § 112(d)(3). The following discussion summarizes the methodology used by the Agency in developing today's proposed emissions standards for new HWC sources.

The approach used to identify MACT for new sources parallels in most ways the approach used to determine the MACT floor for existing sources. For each HAP, the Agency identified the technology associated with the single best performing source (for each source category). The Agency used this best performing technology then looked at all facilities operating the control technology, and determined the achievable emission levels that represent "the emission control that is achieved in practice by the best controlled similar source" by using the maximum value achieved by properly-operated technology (adjusted upwards by a statistically derived variability factor). For further details, see the technical background documents [13] supporting today's proposal.

Since MACT for new sources is to reflect optimized achievable performance and is not necessarily limited to performance levels currently achieved, the Agency also considered several other factors in selecting the MACT new emissions limit. These factors included: (1) Comparisons to other emissions standards which may indicate that a technology is demonstrated and its level of performance (e.g., proposed municipal waste combustors and medical waste incinerators regulations and the European Union waste incineration standards); and (2) test condition emissions variability.

As mentioned earlier, the Agency believes that it is appropriate to compare the proposed emissions standards for new sources to other existing or recently proposed standards applicable to hazardous waste combustors or similar devices as a type of "reality check" that we are developing the most rigorous emissions limits for new sources based upon the best technologies available today.

The extracted data and data plots are presented in the background document [14] located in the docket.

VIII. RCRA Decision Process

It is EPA's intention to eliminate duplicative or potentially duplicative regulation wherever possible. In this section, we discuss: (1) The RCRA mandate to ensure protection of human health and the environment and how that mandate relates to the CAA technology-based MACT standards; (2) how, for RCRA purposes, we evaluated the protectiveness of the proposed MACT standards; (3) how, for RCRA purposes, the Agency intends to continue its policies with respect to site-specific risk assessments and permitting so that, in appropriate situations, additional RCRA permit conditions can be developed as necessary to protect human health and the environment; and (4) how waste minimization opportunities may be considered at individual facilities during the permitting process.

A. RCRA and CAA Mandates To Protect Human Health and the Environment

The Agency is proposing emission standards for HWCs under joint authority of the Clean Air Act Amendments of 1990 and the Resource Conservation and Recovery Act (RCRA). As noted earlier, section 3004(a) of RCRA requires the Agency to promulgate standards for hazardous waste treatment, storage, and disposal facilities as necessary to protect human health and the environment. The standards for incinerators generally rest on this authority. In addition, § 3004(q) requires the Agency to promulgate standards as necessary to protect human health and the environment specifically for facilities that burn hazardous waste fuels (e.g., cement and light-weight aggregate kilns). Using RCRA authority, the Agency has historically established emission (and other) standards for HWCs that are either entirely risk-based (e.g., site-specific standards for metals under the BIF rule), or are technology-based but determined by a generic risk assessment to be protective (e.g., the DRE standard for incinerators and BIFs).

The MACT standards proposed today implement the technology-based regime of CAA § 112. There is, however, a residual risk component to air toxics standards. Section 112(f) of the Clean Air Act requires the Agency to impose, within eight years after promulgation of the technology-based standards promulgated under § 112(d) (i.e., the authority for today's proposed standards), additional controls if needed to protect public health with an ample margin of safety or to prevent adverse environmental effect. (Cost, energy, and other relevant factors must be considered in determining whether regulation is appropriate in the case of environmental effects.)

As noted earlier, EPA's express intent is to avoid regulatory duplication. RCRA § 1006 directs that EPA "integrate all provisions of [RCRA] for purposes of administration and enforcement and * * * avoid duplication, to the maximum extent possible, with the appropriate provisions of the Clean Air Act * * *." The overall thrust of the proposed rule is to have the CAA standards supplant independent RCRA standards wherever possible (i.e., to have the CAA standards, wherever possible, also serve to satisfy the RCRA mandate so that additional RCRA regulation is unnecessary).

Under RCRA, EPA must promulgate standards "as may be necessary to protect human health and the environment." RCRA § 3004(a) and (q). Technology-based standards developed under CAA § 112 do not automatically satisfy this requirement, but may do so in fact. See 59 FR at 29776 (June 6, 1994) and 60 FR at 32593 (June 23, 1995) (RCRA regulation of secondary lead smelter emissions unnecessary at this time given stringency of technology-based standard and pendency of § 112(f) determination). If the MACT standards, as a factual matter, are sufficiently protective to also satisfy the RCRA mandate, then no independent RCRA standards are required. Conversely, if MACT standards are inadequate, the RCRA authorities would have to be used to fill the gap.

It should be noted that this RCRA risk evaluation can inform the MACT decision process as well. For example, the RCRA risk evaluations indicate the potential for significant risk via indirect pathways from dioxins and furans originating in today's baseline air emissions for HWCs. EPA is explicitly authorized to consider non-air environmental impacts (such as exposure to HAPS which, after emission, enter into the food chain and are eventually consumed by humans and other biota) in determining whether to adopt standards more stringent than the MACT floor. Thus, EPA can consider benefits from curbing these

[13] USEPA, "Draft Technical Support Document for HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies", February 1996.

[14] USEPA, "Draft Technical Support Document for HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies", February 1996.

indirect exposures as part of its beyond-the-floor determinations.

As discussed below, the Agency has conducted an evaluation, for the purposes of satisfying the RCRA statutory mandates, of the degree of protection afforded by the MACT standards being proposed today. However, the Agency's current RCRA evaluation is not intended to have any bearing on what we may or may not determine is necessary in several years to satisfy the § 112(f) provisions.

B. Evaluation of Protectiveness

To determine whether the MACT standards are consistent with the Agency's mandate under RCRA to establish standards for hazardous waste management facilities and to issue permits that are protective of human health and the environment, the Agency conducted two types of analyses to assess the extent to which potential risks from current hazardous waste combustion emissions would be reduced through implementation of MACT standards.

The first of these analyses was designed to assess the potential risks to individuals living near hazardous waste combustion facilities and to nearby aquatic ecosystems. The procedures used in this analysis are discussed in detail in the background document contained in the docket for today's proposal.[15] The results are summarized in Part Four of today's notice, "Rationale for Selecting Proposed Standards".

The second analysis of potential risk reduction was a more qualitative evaluation of risks at the national level for those two constituents (dioxins and mercury) which the Agency believes pose significant health risks at the national level and which are found at significant concentrations in hazardous waste combustor emissions. The results of this analysis are presented in Section Seven, "Regulatory and Administrative Requirements", as part of the discussion of potential costs and benefits required under Executive Order 12866.

1. Individual Risk Analysis

The Agency assessed potential risks to individuals from both direct inhalation of emissions (after dispersion in the ambient air) and indirect exposure to emissions through deposition onto soils and vegetation and subsequent uptake through the food chain. The analysis focussed primarily on dioxins and related compounds since these have been of major concern to the Agency from a risk perspective and because there is enough information about the properties of these constituents to allow for a quantitative analysis. The individual risk analysis did also include risks from inhalation of metals, hydrogen chloride, and chlorine (Cl_2).

The Agency conducted an evaluation of risks from metals through indirect exposure routes. With the exception of mercury, most of the metals are not expected to accumulate significantly in the food chain, and the risks from other indirect exposure routes (such as deposition on soil and incidental ingestion of the soil) are not projected to be significant, even with conservative assumptions.

With respect to mercury, the Agency suspects that there may be significant individual risks near hazardous waste combustion facilities, primarily through deposition, erosion to surface waters, and accumulation in fish which are then consumed. However, the current state of knowledge concerning the behavior of mercury in the environment does not allow for a meaningful quantitative risk assessment of emission sources which is precise enough to support regulatory decisions at the national level. Specifically, there is insufficient information with respect to speciation of the mercury into various forms in emissions and with respect to the deposition and cycling of mercury species in the environment to conduct a defensible national quantitative assessment of mercury deposition, erosion to surface waters, and bioaccumulation in fish. The Agency solicits comment and information on the issue of the risks posed by mercury emissions from hazardous waste combustion facilities.

The Agency also considered potential risks from emissions of non-dioxin semi-volatile organics that are products of incomplete combustion (PICs). However, the Agency was not able to conduct an appropriate analysis for several reasons. First, the limited emissions data now available to the Agency on non-dioxin PICs are not sufficiently reliable to conduct an adequate assessment of risk. Second, there is not a universally accepted set of parameter values for some non-dioxin PICs with which to assess potential exposures (e.g., the use of octanol-water partition coefficients (Kow) to predict bioaccumulation versus the use of empirical data and the extent to which bioaccumulation of compounds such as phthalates and polycyclic aromatic hydrocarbons (PAHs) occurs in domestic animals). The Agency solicits comment on these issues and, in particular, requests data on bioaccumulation of PAHs, phthalates, and other non-dioxin PICs in farm animals used for food production and in other mammals and birds. The Agency also intends to obtain a better set of data relating to the non-dioxin PIC emissions from hazardous waste combustion facilities.

2. Individual Risks From Dioxins

In order to evaluate potential risks from dioxins to individuals living near hazardous waste combustion facilities, the Agency selected eleven example facility locations, consisting of areas in which five actual cement kilns, four incinerators, and two lightweight aggregate kilns are located. The example facility locations represent a variety of environmental settings and facility characteristics. The purpose of using example facilities was to incorporate as much realism as possible into the Agency's risk assessment and to reduce the reliance on hypothetical, conservative assumptions about either location or source type characteristics. Site-specific characteristics considered in the analysis include meteorological conditions, topography, and land use as well as stack height and gas flow rates. However, the stack gas concentrations used in the modeling of the example facilities were derived from national emissions data. Therefore, while the example facility analyses are useful for providing information to evaluate national standards on a generic basis, they are not site-specific assessments of any individual facility and cannot be regarded as such.

The Agency has identified a number of indirect exposure pathways which are most likely to present significant risks. These include: consumption of locally-produced meat, eggs, and dairy products and consumption of fish from local waterways. Contamination of food occurs from deposition of toxic emissions onto plants and soil with subsequent ingestion by farm animals or, in the case of fish contamination, from deposition directly into water bodies or onto soil and runoff into surface waters with subsequent uptake in fish.

In assessing risks to the more highly exposed individuals, the Agency assumed that certain segments of the population subsisted in part on home-produced foods or fish obtained from nearby lakes or streams. In addition, the Agency assumed that these individuals were exposed in the farming and fishing areas most affected by the example facilities' emissions. In its analysis of the eleven example facilities, the

[15] "Risk Assessment Support to the Development of Technical Standards for Emissions from Combustion Units Burning Hazardous Wastes: Background Information Document," February 20, 1996.

Agency attempted to identify the actual location of farms and water bodies where subsistence activities might be expected to occur. For dioxins, the highest exposures are expected to occur for individuals whose diets include significant amounts of home-produced meat and eggs or locally caught fish. Individuals likely to have high exposures include subsistence farmers that raise beef cattle, dairy cows, or chickens along with their families as well as subsistence fishers and recreational anglers and their families.

In evaluating individual risks, the Agency projected both "high end" and "central tendency" estimates of risks to the individuals of concern in the analysis. The central tendency estimates were derived by setting all emission rates, fate and transport parameters, and exposure assumptions at central tendency values, as described in the risk assessment background document. To derive high end risk estimates, the Agency set the emission levels at the 90th percentile of the distribution of available dioxin concentrations and, for most exposure scenarios, set one exposure parameter to a high end value while keeping all other parameters at central tendency values. For purposes of evaluating the protectiveness of the standards, the Agency used a target risk level of 10–5 for the high end individual risk, which is consistent with the approach taken in the 1991 BIF rule.

3. Uncertainties in the Individual Dioxin Risk Estimates

Much of the information used to derive the individual risk estimates for dioxins was taken from the Agency's draft Dioxin Reassessment documents [16] [17] [18]. Those documents discuss in considerable detail a number of the uncertainties associated with both the cancer slope factor (the dose-response descriptor) and the many parameters used in the exposure assessment. Some of these uncertainties are also discussed in the risk assessment background document for today's proposal.

In addition, there have been a large number of public comments on the Dioxin Reassessment, which the Agency is now considering. If the Agency decides to revise its assessment of either the toxicity or exposure associated with dioxins prior to the final promulgation of this rule, those revisions will be considered in the development of the final rule.

The Agency is also conducting an external peer review of its risk analysis supporting today's proposal. The results of this peer review, which are expected during the comment period, will be available in the public record for this rule and will be considered in developing the final rule.

4. Qualitative Assessments of National Risks

While the individual risk assessment discussed above provides a quantitative measure of the protectiveness of the proposed MACT standard, there are other ways of evaluating potential impacts of reducing emissions of hazardous constituents. One approach taken by the Agency is to describe to the extent practicable what is known about the national extent of risks from constituents such as dioxins and mercury. To put that information in context with respect to this rule, the relative contribution of hazardous waste combustion to other known air releases of these constituents to the environment is then presented. The Agency recognizes that it is not appropriate to quantitatively correlate emissions with risk on a national scale; nevertheless, this type of information is useful for qualitatively evaluating the potential impact of the proposed MACT rule.

C. Use of Site-Specific Risk Assessments Under RCRA

As part of the Agency's Hazardous Waste Minimization and Combustion Strategy, EPA currently has a national RCRA policy of strongly recommending to all federal and state RCRA permit writers that, under the omnibus permit provisions of RCRA § 3005(c)(3), site-specific risk assessments be performed as part of the RCRA permitting process if necessary to protect human health and the environment. Regions and authorized states have been implementing this national policy since mid-1993 under the aegis of the omnibus and other applicable authorities.

The Combustion Strategy announced this policy encouraging site-specific risk assessments as part of the overall effort to ensure that, under appropriate legal authorities, all RCRA combustion permits being issued are sufficiently protective. Specifically, these site-specific risk assessments were intended to address potential concerns about a suite of hazardous air pollutants, among them dioxins, furans, metals, and non-dioxin PICs, during the time it took for the Agency to upgrade the technical standards for hazardous waste incinerators, boilers, and industrial furnaces. This proposal is the first rulemaking that the Agency has issued in the upgrading effort.

The question has arisen as to the status of the Agency's current policy with respect to site-specific risk assessments, particularly with respect to the HAPs for which standards are being proposed today as well as for other non-dioxin PICs. As noted above, the Agency has conducted a risk evaluation under RCRA of the degree of protection afforded by the proposed MACT standards for the HAPs addressed in today's rule. However, with respect to mercury and non-dioxin PICs, the Agency does not at this time have sufficient reliable data to be able to assess, on a national basis, the magnitude of the risks that can routinely be expected from burning hazardous waste in HWCs. Although the Agency has plans to obtain extensive and detailed PIC emissions data from hazardous waste combustors in the coming months, it may be some time before the Agency is in a proper position to make any type of regulatory and policy judgment about the need, if any, for additional national standards for these toxic organics. Indeed, at several sites, the levels of some non-dioxin PICs have not previously been shown to be of concern, at least to the extent that site-specific testing revealed their presence and to the extent evaluated in site-specific risk assessments.

The Agency is continuing its policy of recommending that, if necessary to protect human health and the environment, site-specific risk assessments be conducted as part of RCRA permitting for all hazardous waste combustors (incinerators, boilers, and industrial furnaces alike) until national standards for HAPs of concern are in place. We expect that, in most situations prior to actual implementation of facility measures to appropriately control the HAPs addressed in this rule, the EPA regional and authorized state permitting officials will find there is a necessity to conduct site-specific risk assessments prior to final permit determinations. We also note that the remaining uncertainties about the risks from non-dioxin PICs and mercury would likely bear upon implementation of the national policy. However, small on-site facilities are not likely to present the same level of potential risk as other facilities. This industry segment may not warrant site specific risk assessments with the same frequency as the large on-site or

[16] "Health Assessment Document for 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds Volume I and II", Office of Research and Development, June 1994.

[17] "Health Assessment Document for 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds Volume III", Office of Research and Development, August 1994.

[18] "Estimating Exposure to Dioxin-Like Compounds Volume I, II, and III", Office of Research and Development, June 1994.

commercial facilities. Among the factors that the regions and states should consider in their evaluation of the necessity for a site-specific risk assessment are: (1) The current level of HAPs being emitted by a facility, particularly in comparison to the MACT standards being proposed and in comparison to the emissions assumptions and exposure scenarios used in the RCRA risk evaluation of the proposed MACT standards (detailed in the Background Document); (2) whether the facility is exceeding the proposed HAP standards, particularly for dioxins/furans and mercury, what immediate measures could be instituted to reduce those emissions; (3) the scope of waste minimization efforts at the facility with respect to the HAPs of concern and the status of implementation of any facility waste minimization plan; (4) particular site-specific considerations such as proximity to receptors, unique dispersion patterns, etc.; (5) the PICs most likely to be found and those most likely to pose significant risk; (6) the presence or absence of other sources of HAPs in sufficient proximity as to exert a significant influence on interpretation of a facility-specific risk assessment; (7) the presence or absence of significant ecological considerations, including for example high background levels of a particular contaminant or proximity of a particularly sensitive ecological area; and (8) the volume and types of wastes being burned. This list is by no means exhaustive, but is meant only to suggest significant factors that have thus far been identified. Others may be equally or more important.

Continuation of the site-specific risk assessment policy rests primarily on the RCRA requirement to ensure that all permits are protective of human health and the environment. Until the Agency is in a position to determine, on a national basis, whether additional standards are needed to address toxic emissions, we anticipate this policy will remain in effect. EPA's intention is to make that determination, if sufficient data is in hand, by the time of the final rule, now scheduled for issuance in December 1996. In that respect, we emphasize the importance of the submission of detailed data on non-dioxin PICs from commenters.

In the meantime, the omnibus provision in § 3005(c)(3) provides the regions and authorized states with the proper site-by-site authority to ensure that these risk assessments are completed as part of the permitting process. Other RCRA statutory and regulatory provisions may apply as well. Furthermore, we encourage individual facilities to work with their local communities in designing these risk assessments and in carrying out the testing and analysis, so that the confidence of local communities is maximized.

In addition, EPA strongly urges companies to explore waste minimization opportunities as a means to reduce risks from combustion emissions, particularly with respect to the HAPs of concern. Nearly every state provides free pollution prevention/waste minimization technical assistance. Further information on how to obtain this assistance can be furnished by state permitting agencies or by contacting the National Pollution Prevention Roundtable at (202) 466–7272. Other sources of information include Enviro$ense, an electronic library on pollution prevention, technical assistance, and environmental compliance. Access is via a system operator (703) 908–2007, via modem at (703) 908–2092, or via Internet at http://wastenot.inel.gov/enviro-sense.

PART FOUR: RATIONALE FOR SELECTING THE PROPOSED STANDARDS

This part describes the Agency's rationale for today's proposed standards and other options under consideration.

I. Selection of Source Categories and Pollutants

A. Selection of Sources and Source Categories

The Agency is proposing emissions standards for three source categories: hazardous waste incinerators, hazardous waste-burning cement kilns, and hazardous waste-burning lightweight aggregate kilns. The Agency is not proposing to regulate emissions from CKs (in this notice) or LWAKs that do not burn hazardous waste.

In this section, we discuss the Agency's analysis of subdividing incinerators by size (i.e., small and large sources) and subdividing cement kilns by process type (i.e., wet and dry). We also discuss the scope of the MACT standards for cement kilns, and the existing RCRA standards that control emissions of HAPs from equipment leaks and tanks which are used to manage hazardous waste.

1. Consideration of Subdividing Incinerators by Size

Section 112(d) allows the Administrator to distinguish among classes, types, and sizes of sources within a source category in establishing MACT floor levels. Given that the size of incinerators, as measured by gas flow rate in actual cubic feet per minute (acfm), varies substantially (i.e., from 1,000 acfm to 180,000 acfm), the Agency considered subdividing incinerators by size.

The basis for distinguishing between small and large incinerators as well as the preliminary estimates of the resultant floor levels for each category are presented in the docket and summarized below. The Agency is not proposing separate standards (at the floor)[19] for incinerators because: (1) the types and concentrations of uncontrolled HAP emissions are similar for large and small incinerators; (2) the same types of emission control devices are applicable to both small and large incinerators; and (3) the floor levels would be generally unchanged[20] (several floor levels would decrease somewhat), with the exception that the LVM standard for large incinerators would increase by more than a factor of four. We believe that the higher LVM floor level for large incinerators would not be appropriate given that approximately 80 percent of incinerators already are meeting the LVM floor without subdividing.

The Agency invites comment on its determination that subdividing incinerators by size would not be warranted. We also invite comment on whether subdividing incinerators by other classifications (e.g., commercial versus on-site units) would be appropriate for establishing MACT floor levels. Commenters should provide data and information on, in particular: (1) how the types and concentrations of uncontrolled HAP emissions are different for the suggested categorization of sources; (2) whether and why MACT emission control technology would not be applicable to a category of sources; and (3) other appropriate factors.

To investigate the effect on MACT floor levels of subdividing incinerators by size, the Agency identified a gas flow rate of 23,127 acfm as a reasonable and appropriate demarcation between small and large incinerators. This value was determined using a slope analysis approach whereby gas flow rates for each source (for which the Agency had data) were plotted in ascending order. The Agency chose the point at which the slope markedly changed as the point of demarcation between small and large incinerators. Approximately 57 percent of incinerators for which we have gas flow rate data would be classified as small using this approach.

[19] Note that we discuss in Part Four, Section III in the text whether beyond-the-floor standards for D/F, Hg, and PM (as currently proposed for all incinerators) are appropriate for small incinerators.

[20] And therefore, a level of complexity would be added to the rule without substantial benefit.

Projected MACT floor levels for small and large incinerators are compared to floor levels for combined incinerators (i.e., without subdividing) in the table below:

	Small incinerators	Large incinerators	Floor levels for all incinerators combined
	Floor level	Floor level	
D/F (ng/dscm)	0.2 TEQ or <400 °F	0.2 TEQ or <400 °F	0.2 TEQ or <400 °F.
PM (mg/dscm)	180	180	180
Hg (μg/dscm)	110	130	130
SVM (μg/dscm)	230	270	270
LVM (μg/dscm)	160	880	210
HCl + Cl_2 (ppmv)	280	260	280
CO (ppmv)	100	100	100
HC (ppmv)	12	12	12

2. Consideration of Subdividing Cement Kilns by Manufacturing Process

The Agency also considered whether to subdivide the cement kiln source category into wet and dry process kilns given that these types of kilns are designed and operated differently. (See discussion in Part Two, Section II.) MACT floor levels for wet and dry kilns are compared to floor levels for combined cement kilns (i.e., without subdividing) in the table below:

Pollutant	Wet process kilns	Dry process kilns	Floor levels for all kilns combined
	Floor level	Floor level	
D/F (ng/dscm)	0.2 TEQ or 418 °F	0.2 TEQ or 547 °F	0.2 TEQ or 418 °F.
PM (mg/dscm)	69	69	69
Hg (μg/dscm)	83	150	130
SVM (μg/dscm)	870	57	57
LVM (μg/dscm)	220	49	130
HCl + Cl_2 (ppmv)	460	340	640

Subdividing cement kilns by process type would result in a mix of impacts with varying degrees of significance. For wet kilns, the main impact would be an increase in the SVM floor from 57 to 870 μg/dscm. The mercury floor, on the other hand, would drop from 130 to 83 μg/dscm. The remainder of the floors would remain roughly the same. For dry cement kilns, the main impact would be that the LVM floor drops from 130 to 49 μg/dscm. The dioxin/furan floor would change by allowing a higher APCD temperature—547 °F rather than 418 °F.

The Agency is not proposing separate standards for wet and dry process kilns because: (1) The types and concentrations of uncontrolled HAP emissions are similar for both types of kilns; (2) the same types of emission control devices are applicable to both types of kilns; (3) for dry process kilns, the LVM floor level would drop to an extremely low level that may be difficult for many kilns to achieve because of the presence of these metals in raw materials; and (4) for wet kilns, the SVM floor would increase to 870 μg/dscm, a level much higher than the industry can achieve.[21] There may also be other factors that should be considered, and the Agency invites comment on those in addition to the factors noted above.

We note that the cement industry has asserted that it is not feasible to use a FF on wet kilns in cold climates because the "high moisture content of the gas will clog the fabric with cement-like dust and ice."[22] This is not consistent with the Agency's understanding. Although wet kilns located in cold climates that operate at low flue gas temperatures (e.g., 350–400 °F) in order to minimize formation of D/F and improve performance of activated carbon injection systems may be required to improve insulation or take other measures to minimize cold spots in the baghouse to limit corrosion, we believe that appropriate measures can be readily taken. The Agency is aware of two wet kilns that currently operate fabric filters in cold climates (Thomaston, Maine, and Dundee, Michigan) at flue gas temperatures below 400 °F.[23] In addition, a wet kiln burning hazardous waste in Paulding, Ohio, is currently upgrading its PM control system to replace an ESP with a FF.

The Agency invites comment on the appropriate criteria to be used and upon its determination that subdividing cement kilns by process type is not warranted. Commenters should provide data and information on, in particular: (1) Whether the types and concentrations of uncontrolled HAP emissions are different for wet and dry kilns; (2) whether and why MACT emission control technology(ies) would not be applicable to a wet or dry kiln; and (3) other appropriate factors.

3. Scope of the MACT Standards for Cement Kilns

The proposed NESHAP for cement kilns addresses only exhaust combustion gas emissions from main stack(s), bypass stack(s), and fugitive combustion emissions (e.g., leaks from kiln seals). The cement kiln standards would not apply to process or fugitive emissions that are not affected

[21] See letter from Craig Campbell, CKRC, to James Berlow, USEPA, undated but received February 20, 1996. We note that, although the Agency is proposing a SVM standard of 57 μg/dscm, we invite comment on an alternative (and potentially preferable) approach to identify MACT floor technology which would result in a floor-based standard of 160 μg/dscm. See Part Four, Section IV in the text. Because we identified the alternative approach late in the rule development process, we are inviting comment on the higher standard rather than proposing it.

[22] See letter from Micheal O'Bannon, EOP Group, to Elliot Laws, USEPA, dated February 14, 1996, p. 3 of Attachment.

[23] See USEPA, "Draft Technical Support Document For HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies", February, 1996, for further information.

by burning hazardous waste (such as emissions from raw material processing or clinker cooler emissions).[24]

4. Current RCRA Controls on Equipment Leaks and Tanks

We note that the Agency has promulgated air emission standards regulating fugitive emissions from equipment leaks (e.g., pumps, compressors, valves) and tanks which are used to manage hazardous waste. Accordingly, these devices are not addressed by today's proposal. (Tanks and equipment leaks from HW management activities at HWCs are regulated under RCRA standards. See, e.g., 40 CFR Parts 264 and 265, Subparts AA, BB, and CC. These controls are expected to be consistent with MACT and are not being reevaluated here.)

B. Selection of Pollutants

As noted earlier, section 112(b) of the Clean Air Act contains a list of 189 hazardous air pollutants for which the Administrator must promulgate regulations establishing emissions standards for designated major and area sources. The list of 189 HAPs is comprised of metallic, organic, and inorganic compounds.

Hazardous waste incinerators and hazardous waste-burning cement kilns and LWAKs emit many of the listed HAPs. Data available to the Agency indicate that metal HAP emissions include antimony, arsenic, beryllium, cadmium, chromium, lead, mercury, nickel, and selenium compounds. Organic HAPs emitted include chlorinated dioxin and furan, benzene, carbon disulfide, chloroform, chloromethane, hexachlorobenzene, methylene chloride, naphthalene, phenol, toluene, and xylene. Hydrochloric acid and chlorine gas are prevalent inorganic compounds found in stack emissions because of high chlorine content of many hazardous wastes.

Today, the Agency is proposing eight emissions standards for individual HAPs, group of HAPs, or HAP surrogates. These emission standards cover dioxin/furan, mercury, particulate matter, semivolatile HAP metals (lead and cadmium), low-volatile HAP metals (antimony, arsenic, beryllium, and chromium), carbon monoxide, hydrocarbons, and total chlorides. The following discussion presents the Agency's rationale for proposing NESHAPs for these individual HAPs, group of HAPs, or HAP surrogates.

1. Toxic Metals

In developing today's proposed rule, the Agency considered 14 toxic metals that may pose a hazard to human health and the environment when they are components of emissions from hazardous waste combustion sources. Section 112(b) of the Act contains a list of 11 metal HAPs: antimony, arsenic, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, and selenium. The list of hazardous constituents under RCRA[25] specifies three additional metals: barium, silver, and thallium. Five of these metals (or their compounds) are known or suspected carcinogens: arsenic, beryllium, cadmium, hexavalent chromium, and nickel.

To develop an implementable approach for controlling the metal HAP emission levels, the Agency grouped metal HAPs by their relative volatility and is proposing an emissions limit for the each volatility group (i.e., the sum of emissions from the metals in the group cannot exceed the limit). We selected the following three groups: (1) A high-volatile group comprised of only mercury, (2) a semivolatile group comprised of lead and cadmium, and (3) a low-volatile group consisting of antimony, arsenic, beryllium, and chromium. The Agency's proposal not to include the remaining seven toxic metals in these volatility groupings is discussed later in this section.

Our data indicate that mercury is generally in the vapor form in and downstream of the combustion chamber, including at the air pollution control device (APCD). Thus, the level of emissions is a function of the feedrate of mercury and the use of APCDs that can control Hg in the vapor form (e.g., carbon injection, wet scrubbers for some control of soluble HgCl). The semivolatile group metals typically vaporize at combustion temperatures, then condense onto fine particulate before entering the APCD. Thus, emissions of semivolatile metals are a function not only of the feedrate of the metal, but also of the efficiency of the particulate matter (PM) control device. Low-volatile metals are less apt to vaporize at combustion temperatures and therefore partition primarily to the bottom ash, residue, or clinker (in the case of cement kilns) or adsorb onto large, easy-to-control particles in the combustion gas. Thus, low-volatile metal emissions are more strongly related to the operation of the PM APCD than to the feedrate.[26]

We note that the dynamics associated with the fate of metals in a combustion device are much more complex than presented here. Numerous factors impact metals' behavior such as the presence of chlorine (higher metal volatility associated with metal chlorides than metal oxides), combustion conditions within the device (e.g., temperature profile), inter-metal relationships, physical and chemical form the metal exhibits when introduced to the device (e.g., valence state and solid versus liquid), type and efficiency of the particulate control device, and differences in the design and operation of sources (e.g., cement kiln dust recycling rate). See the technical background document supporting today's proposal for more details.[27]

Setting an emission level for a number of grouped metals has several advantages and disadvantages. One advantage is that fewer individual standards are involved, which helps implementability. Moreover, grouping allows a facility more flexibility in complying with an emissions standard based on facility-specific characteristics (e.g., special characteristic waste streams) and operation requirements (e.g., reduced spiking of numerous metals). On the other hand, a disadvantage of a group emission limit is that it potentially allows higher emissions of the more toxic metals within a group (than if an individual metal limit were established).[28]

The Agency is proposing not to regulate directly emissions of the remaining four metal HAPs (i.e., cobalt, manganese, nickel, and selenium).[29] The

[24] Today's proposal applies only to those kilns that burn or process hazardous waste irrespective of the purpose of burning or processing. The term "burn" means burning for energy recovery or destruction, or processing as an ingredient. The Agency is developing a NESHAP for cement kilns that do not process hazardous waste in a separate rulemaking. That NESHAP will also regulate those hazardous waste-burning cement kiln process and fugitive emissions that would not be subject to today's rule (i.e., emission sources other than the main or by-pass stack).

[25] The list of hazardous constituents is contained in appendix VIII of Part 261. Cobalt and manganese are not hazardous constituents.

[26] Although, at a given PM emission rate at a source, emissions of LMV will be affected by LVM feedrate.

[27] USEPA, "Draft Technical Support Document for HWC MACT Standards, Volume VII: Miscellaneous Technical Issues", February 1996.

[28] We note that, for the risk assessment used to determine if RCRA concerns would be adequately addressed by the proposed MACT standards, we assumed that each metal in a volatility was emitted in turn at the emission limit for that volatility group.

[29] The Agency acknowledges that three metals (barium, silver and thallium), currently regulated by the BIF rule, would not be regulated under this MACT proposal. EPA notes that these three metals are not HAPs. The Agency believes that the combination of the proposed particulate and metals standards would adequately control emissions of these three metals.

Agency's rationale is based upon a combination of factors: (1) Inadequate emissions data for Co, Mg, Ni, and Se; and (2) relatively low toxicity of Co and Mn. The Agency specifically requests comment on whether these four metals would be adequately controlled under the MACT standards that would be provided by today's proposal.

The Agency is aware of two other approaches to group toxic metals. First, the European Union has established three groupings to control metal emissions from hazardous waste incineration units. One "group" includes only mercury, a second group consists of cadmium and thallium, and the third group includes antimony, arsenic, chromium, cobalt, copper, lead, manganese, nickel, tin, and vanadium. Section VII of this Part summarizes the European Union emission standards.

A rulemaking petition [30] submitted to the Agency by the Cement Kiln Recycling Coalition (CKRC) contained a report [31] (appendix D of the petition) prepared by a technical advisory board to the CKRC. Their analysis of stack emissions and cement kiln dust data suggests three volatility groupings based on metal volatility demonstrated in cement kilns. The groupings are: (1) Volatile metals including mercury and thallium; (2) semivolatile metals consisting of antimony, cadmium, lead, and selenium; and (3) low-volatile metals comprising barium, beryllium, chromium, arsenic, nickel, manganese, and silver. See the technical background document for further discussion on grouping metals by volatility.[32] The Agency requests comments on the appropriateness of grouping metals by volatility and requests supporting information and data on the appropriate composition of metal volatility groups (i.e., for the metals discussed above).

2. Toxic Organic Compounds

Burning hazardous waste that contains toxic organic compounds under poor combustion conditions can result in substantial emissions of HAPs originally present in the waste as well as other compounds, due to the partial but incomplete combustion of the constituents in the waste (known as products of incomplete combustion, or PICs). PICs can be unburned organic compounds that were present in the waste, thermal decomposition products resulting from organic constituents in the waste, or compounds synthesized during or immediately after combustion. The quantity of toxic organic compounds emitted depends on such factors as the combustion conditions under which the waste is burned (including time, temperature, and turbulence), the concentrations of the toxic compounds in the waste, and the waste firing rate.

Since the majority of the 189 enumerated HAPs are organics, the Agency has concluded (for today's proposal) that establishing individual emission limits for each of the organic HAP compounds emitted from these combustion sources would be impractical and not implementable. Measuring each compound would be very costly and would pose unreasonable compliance and monitoring burden on the regulated community while achieving little, if any, emission reduction from the approach presented in today's proposal. In addition, EPA and state compliance oversight and enforcement efforts would also be unreasonably costly without concurrent benefits. Also, the Agency does not have adequate emissions data to support development of individual organic emission limits [33] at this time. Therefore, the Agency is proposing a multi-faceted approach to control the toxic organic HAPs to be addressed under § 112: (1) Emissions limits for dioxin and furan on a toxicity equivalents (TEQ) basis; (2) limits on flue gas concentrations of hydrocarbons (HC) as a HAP surrogate; (3) limits on flue gas concentrations of carbon monoxide (CO) also as a HAP surrogate; and (4) emission limits for particulate matter (PM) to control adsorbed semivolatile organic HAPs (see separate discussion on PM below).

First, given the high toxicity of some dioxin and furan congeners and the fact that standards ensuring good operating conditions alone (i.e., temperature at the inlet of the APCD) will not always control emissions of dioxin/furans (D/F), the Agency has determined that proposing an emission standard specifically for D/F is a necessary component to the multi-faceted approach for toxic organics emissions control. The D/F standard proposed today is based on TEQ (Toxicity Equivalents).[34] TEQ is a method for assessing the risks associated with exposures to complex mixtures of chlorinated dibenzo-p-dioxin and dibenzofurans (CDDs and CDFs). The method relates the toxicity of the 209 structurally related chemical pollutants to the toxicity of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD).

Second, the Agency is proposing to use carbon monoxide (CO) and hydrocarbons (HC) as surrogates to control emissions of non-D/F organic HAPs. We note that limiting CO and HC emissions to levels ensuring good combustion conditions would also help minimize D/F precursors. CO and HC emissions are both recognized indicators of combustion intensity and completeness. Low CO flue gas levels are indicative of a combustion device operating at high combustion efficiency (56 FR at 7149–54). Operating at high combustion efficiency helps ensure minimum emissions of unburned (or incompletely burned) organics. However, limiting CO may not by itself absolutely minimize PIC emissions. This is because PICs can result from small pockets within the combustion zone where adequate time, temperature, turbulence, and oxygen have not been provided to completely oxidize these organics.[35] As combustion becomes less efficient or less complete, at some point, the emissions of total organics (measured as HC) will increase. A

[30] CKRC's rulemaking petition proposes to establish new technology-based combustion emissions standards and was submitted to EPA on January 18, 1994. CKRC's petition consists of four basic components. First, the stringency of current BIF Rule toxic metal limits should be increased by factors of 5 to 10 and applied to all combustion devices (i.e., both BIFs and incinerators). Second, new regulatory efforts for dioxin/furan standards should focus on a toxic equivalency approach (TEQ) rather than on a total congener approach. Third, the implementation of the new metals and dioxin/furan standards should be applied uniformly to all types of hazardous waste combustors (HWCs) and imposed at the same time. Finally, EPA should conduct a rulemaking on indirect exposure risk assessments before requiring their use. CKRC's petition has been placed in the docket supporting today's proposal.

[31] "Scientific Advisory Board on Cement Kiln Recycling (Process Technology Workgroup), Evaluation of the Origin, Emissions and Control of Organic and Metal Compounds From Cement Kilns Co-Fired With Hazardous Wastes," June 8, 1993.

[32] USEPA, "Draft Technical Support Document for HWC MACT Standards, Volume VII: Miscellaneous Technical Issues," February 1996.

[33] The number of organic HAPs measured at each facility varies widely with some facilities reporting measurements for a large number of HAPs while other facilities measuring only a few HAPs.

[34] The TEQ approach used for today's proposal is the I–TEQ/89 approach defined in USEPA, "Interim Procedure for Estimating Risks Associated With Exposures to Mixtures of Chlorinated Dibenzo-p-Dioxin and -Dibenzofurans (CDDs and CDFs) and 1989 Update," March 1989. For a discussion of establishing D/F limits based on TEQ versus total congeners, see USEPA, "Combustion Emissions Technical Resource Document (CETRED)," May 1994, pp. 4–21.

[35] We note that there are emissions data indicating that even though CO levels are below 100 ppmv, HC emissions can exceed 5 ppmv (measured as propane with a heated sampling system), the upper HC level that is generally representative of operating under good combustion conditions. See 56 FR 7154, note 26 (February 21, 1991), and Energy and Environmental Research Corporation, "Surrogate Evaluation of Thermal Treatment Systems," Draft Report dated October 17, 1994, Figure 2–1.

portion of the HC emission is comprised of organic HAPs. Thus, CO levels provide an indication of the potential for organic HAP emissions and CO limits are therefore proposed as a measure to help prevent these emissions. HC limits are proposed to document actual emissions of organic HAPs.[36]

Notwithstanding today's proposal to establish MACT standards for both CO and HC emissions for HWIs and LWAKs (CKs would be required to comply with either a CO or HC standard for technical reasons discussed in Section IV below), the Agency invites comment on whether standards for both CO and HC (coupled with the D/F and PM standards to also control organic HAPs) are unnecessarily redundant. Commenters should provide data and information on how either CO or HC alone (but in conjunction with D/F and PM standards) would ensure proper control of organic HAPs. In particular, commenters should address the fact that the Agency's database indicates that HC levels can exceed good combustion condition levels when CO levels are below 100 ppmv (thus suggesting that controls on both CO and HC are needed). In addition, commenters should address how the MACT standards proposed today for HC would or could ensure that sources operate under good combustion conditions and thus minimize emissions of organic HAPs.

If based on review of comments and further analysis the Agency determines that standards for both CO and HC are not warranted, we would consider, among other potential options, the following alternative regulatory approaches: (1) Give each source the option of complying with either the CO or HC standard (as proposed today for technical reasons for by-pass duct gas for cement kilns); or (2) establish a national standard for either CO or HC, but not both (the Agency would determine which parameter is more appropriate and establish a standard for that parameter). The Agency invites comment on these alternative regulatory approaches or others that would ensure proper control of organic HAP emissions.

3. Hydrochloric Acid (HCl) and Chlorine (Cl_2)

Both hydrochloric acid and chlorine are designated HAPs that are present in HWC emissions. However, the test method used to determine HCl and Cl_2 emissions (BIF methods 0050, 0051, and 9057, commonly referred to as "Method 26A")[37] may not be able to distinguish between HCl and Cl_2 in all situations.[38] Therefore, EPA proposes combining the two HAPs into a single HCl and Cl_2 standard. We believe this is appropriate because emissions of both of these HAPs can be controlled by limiting feedrate of chlorine in hazardous waste and wet scrubbing.[39]

4. Particulate Matter (PM)

EPA is proposing to use particulate matter (PM) as a surrogate for non-D/F organic HAPs (that are adsorbed onto the PM) and for the metal HAPs which are not specified in the metals standards (i.e., Co, Mn, Ni, and Se).[40] More than 40 semivolatile organic HAPs can be adsorbed onto PM and can, thus, be controlled by a MACT standard for PM.[41] The metal HAPs that are not directly controlled by the MACT standards for metals can also be controlled (at least partially) by a PM standard. The low volatility metals are likely to be entrained in larger particulates and the semivolatile metals are likely to be condensed onto small particulates.

The Agency notes that we are proposing to use PM also as a compliance parameter to ensure compliance with the SVM, LVM, and D/F standards. As discussed in Part V, Section II, of the preamble, a site-specific PM operating limit would be established as a surrogate for the PM control device collection efficiency. Given that we are also proposing a PM MACT emission standard, the site-specific operating limit for PM could not exceed the PM standard.

C. Applicability of the Standards Under Special Circumstances

In this section, we discuss the applicability of the proposed MACT standards under the following circumstances: (1) When a regulated metal or chlorine is not present in the hazardous waste at detectable levels; (2) when the source temporarily ceases hazardous waste burning; and (3) when the source terminates hazardous waste burning.

1. Nondetect Levels of Metals or Chlorine in All Feedstreams

If no feedstreams to a HWC (e.g., on-site incinerator) contain detectable levels of Hg, SVM, LVM, or chlorine, the source would not be subject to the emission standard associated with the metal or chlorine (e.g., if no feedstreams contain detectable levels of chlorine, the HCl/Cl_2 standard would be waived). In addition, performance testing, monitoring, notification, and recordkeeping requirements ancillary to the waived standard would also be waived. We believe that this waiver is appropriate because the source would be incompliance with the emission standard by default if it was not feeding the metal or chlorine.

To be eligible for the waiver, the source must develop and implement a feedstream sampling and analysis plan to document that no feedstream contains detectable levels of the metal or chlorine (for which a waiver is claimed).

The Agency invites comment on whether it is necessary to specify minimum detection levels (or to take other measures) to ensure that appropriate analytical procedures are used to document levels of metal or chlorine in feedstreams.

2. Nondetect Levels of Metals or Chlorine in the Hazardous Waste Feed

The proposed MACT standards for mercury, SVM, LVM, or chlorine would apply even if these constituents are not present at detectable levels in the

[36] We note that virtually all HWCs are already equipped with a CO monitor because of RCRA requirements. In addition, several incinerators, cement kilns and lightweight aggregate kilns are also equipped with a HC monitor because of RCRA or state requirements or voluntary initiative.

[37] We note that owners and operators of cement kilns have argued that this method provides measurements that are biased high because metallic salts penetrate the filter and the chloride is incorrectly reported as HCl. EPA has considered this concern and continues to believe that metallic salts do not significantly bias the results. Nonetheless, we invite comment on this issue. If, in fact, metallic salts can bias the results, we invite comment particularly on how or whether the proposed MACT standards could be adjusted given the inflated emissions database, and how compliance with an adjusted standard could be demonstrated.

[38] In the presence of other halogens (e.g., fluorine and bromine) that are often constituents of hazardous waste, fossil fuels or kiln raw materials, EPA is concerned that reactions can occur in the impinger solutions used by the stack sampling method that cause a portion of the Cl_2 to be reported as HCl. Thus, the HCl levels could be biased high, and the Cl_2 levels could be biased low. Nonetheless, the method does continue to give an accurate determination of combined HCl and Cl_2 levels in the presence of other halogens.

[39] We also note that, for purposes of determining whether the proposed MACT standard would satisfy RCRA concerns, we evaluated the level of protection that would be provided assuming (conservatively) that 10 percent of the HCl/Cl_2 standard would be emitted as the more toxic Cl_2.

[40] We note that PM 10 is a criteria pollutant under the Clean Air Act. PM can also have adverse effects on human health even if toxics are not adsorbed on the PM. Although EPA cannot control PM in and by itself under § 112(d) (it must be a surrogate for HAP control), EPA may consider reductions in criteria pollutants in assessing cost-effectiveness of MACT controls. See S. Rep. No. 228, 101st Congress, 1st Session, p. 172.

[41] See memo from Larry Gonzalez, EPA, to the docket for this rule (F–96–RCSP–FFFFF), entitled "Semi-volatile Organic HAPs that Can Be Adsorbed onto PM", dated February 22, 1996.

hazardous waste. This issue is relevant for cement kilns and light-weight kilns because, if these sources were not burning hazardous waste, the proposed MACT standards would not apply. Cement kilns (CKs) that do not burn hazardous waste would be subject to separate MACT standards that the Agency is developing for those sources, and light-weight aggregate kilns (LWAKs) that do not burn hazardous waste would not be subject to any MACT standards.

It could be argued that a CK or LWAK that burns hazardous waste with nondetect levels of Hg, SVM, LVM, or chlorine is not burning hazardous waste with respect to that metal or the HCl/Cl_2 standard. Accordingly, regulation should revert to any applicable MACT standard for the source when not burning hazardous waste. The Agency rejects this argument, however. A source cannot be subject to regulation under two MACT source categories. Further, such an approach would be extremely difficult to implement and enforce for CKs given that compliance procedures would be different for the two source categories.

3. Sources That Temporarily Cease Burning Hazardous Waste

Sources that temporarily cease burning hazardous waste would remain subject to today's proposed standards. Similar to the discussion above, such sources could argue that in the interim when hazardous waste is not burned, MACT regulation should revert to the MACT standards applicable to CKs or LWAKs that do not burn hazardous waste.

The Agency rejects this argument as well and for the same reasons discussed above: a source cannot be intermittently subject to MACT regulation under two source categories, and implementation and enforcement would be extremely complicated. See the discussion below regarding how to define temporary interruptions in waste burning versus termination of waste burning.

4. Sources That Terminate Hazardous Waste Burning

A source that terminates hazardous waste burning would no longer be subject to today's proposed rules. A source has terminated hazardous waste burning when it: (1) ceases burning hazardous waste (i.e., hazardous waste is not fed and hazardous waste does not remain in the combustion chamber); and (2) stops complying with the proposed standards and begins complying with other applicable MACT standards (i.e., cement kilns must comply with the MACT standards, when promulgated, for kilns that do not burn hazardous waste). In addition, today's rule would require sources that terminate hazardous waste burning to notify the Administrator in writing within 5 days of the termination.

Such sources could begin burning hazardous waste again under the following conditions: (1) The source must comply with the MACT standards applicable to new sources; (2) the source must submit a notification of compliance with the standards (based on a comprehensive performance test); and (3) prior to submitting the notification of compliance, the source cannot burn hazardous waste for more than a total of 720 hours, and hazardous waste may be burned only for purposes of emissions pretesting (i.e., in preparation for the comprehensive performance test) or comprehensive performance testing.

We are taking this position regarding termination of waste burning to avoid the implementation and enforcement complications that could result if a source could claim that it was not subject to the proposed regulations during those periods of time that it was not burning hazardous waste. Without these requirements, a source could vacillate at will between being regulated and unregulated (or for CKs, between being subject to regulation as a hazardous waste-burning kiln versus a non-hazardous waste-burning kiln). We invite comment on whether these requirements are reasonable and appropriate to address the Agency's implementation and enforcement concerns.

II. Selection of Format for the Proposed Standards

A. Format of the Standard

When EPA regulates a source, it must determine on a case-by-case basis what format the standards are. This section explains the reasons why EPA chose the format it did for this specific source category. Due to differing situations in other cases, other formats may be chosen for other source categories.

1. Units

EPA investigated four formats for use in expressing today's proposed standards: mass-based emissions; calculated mass-based emissions; percent reduction; and concentration-based. The Agency ultimately selected concentration-based standards for the reasons discussed below.

The mass-based approach would set a limit of mass emissions per unit time, i.e., kg/hr, lb/hr, etc. This approach was rejected because it is inherently incompatible with technology based standards for several reasons. First, a mass-based standard does not assure good control at small facilities. Small facilities have lower flow rates, would be allowed higher concentration of emissions, and thus could meet a standard with no or minimal technological control. Also, it produces an undue burden on larger facilities in that they would have to install controls and small facilities would not. One potential consequence is that it would cause an incentive for more small facilities, causing an increase in emissions nationally. For these reasons, this option was not chosen.

An alternate to the mass-based approach is the calculated mass-based approach. This would involve EPA determining some appropriately low level of metals and chlorine feed, multiplying that by a system removal efficiency factor, and issuing the result as a mass-based limit. One concern with this approach is EPA does not know what feedrate would be appropriate. Any feedrate could be construed as arbitrary. Also, the approach would result in a mass-based limit which does not address concerns described in the preceding paragraph. It also does not address how to set the other standards: CO, HC, PM, and dioxin/furans. For these reasons, this option was not chosen.

A third approach is to set the standards based on a specified percent reduction. This comports well with a technology-based approach because it deals directly with determining what technology performs most efficiently. However, there are problems with this approach. First, it is difficult to determine where the percent reduction should be applied: feed to stack, across the APCD train, or across a specific control device. Use of feed to stack percent reductions present a difficulty due to the measurement variability of feed samples and stack emissions. APCD train or device specific percent reductions would be difficult to implement. Facilities are not configured to sample inlet emissions to the APCD train or to a specific APCD. Thus, facilities would have to be reconfigured to allow inlet sampling. Stack sampling would be required at both the outlet and, possibly, multiple inlet points. This would significantly increase the testing burden. In addition, implementation of any approach based on percent reduction would involve substantial and expensive monitoring of operating parameters to ensure that the specified percent reduction occurs during operation. For these reasons, this approach was not chosen.

The approach that was chosen for these source categories is to set concentration-based standards. This approach is consistent with how EPA has historically based air emission standards. It favorably addresses the problems of the other options. However, it does allow larger facilities to emit higher mass emissions of HAPs. But mass-based levels would result in higher emissions nationally by encouraging more smaller facilities (see previous paragraph). This tradeoff, having higher mass emissions at larger facilities but lower emissions nationally, was considered acceptable for this proposal. Concentration based approaches are also easier to implement and do not necessarily rely on the setting of operating limits. For this reason, concentration-based standards are regarded as preferable to the other options, and was chosen on that basis.

It is possible that other units could be chosen for other source categories. As explained in the introductory paragraph this is consistent because other units might be more appropriate for other source categories.

2. Correction to 7 Percent Oxygen and 20° C

All standards are corrected to 7 percent oxygen and 20° C. This is because the data EPA used to derive the standards were corrected in this manner. This is also consistent with the correction used for BIFs, hazardous waste incinerators, MWCs, and MWIs.

3. Significant Figures and Rounding

All standards proposed here are expressed to two significant figures.

For the purposes of rounding, we propose to require the use of ASTM procedure E–29–90 or its successor. This procedure is the American standard for rounding. Rounding shall be avoided prior to rounding for the reported result.

B. Averaging Periods

Averaging periods are the time periods over which emissions or feedstream and operating parameters are set. These periods require consideration because of the inherent variability associated with the operation of complying (i.e., properly designed and operated) MACT devices. As noted above, facilities normally operate within certain limits but do have emissions above and below these normal levels due to the natural variability associated with the operation of a facility. EPA must account for this variability when promulgating technology-based standards. See, *e.g., FMC Corp.* v. *Train,* 538 F.2d 973, 986 (4th Cir. 1976). If EPA were to establish a "not-to-be-exceeded" limit, that limit would invariably be higher than if the limit were expressed as an average emission level. That would tend to encourage higher emitting, but low variability devices since they could meet the not-to-exceed standard.

For instance, say EPA is considering establishing a standard on: an instantaneous basis; a one hour average; and a 12-hour average. Also, assume that the complying MACT facility has average emissions of 5 and short-term perturbations as high as 300. In this case equally stringent emissions levels could be: 300 on an instantaneous basis; on the order of 10 for an hourly average; or closer to 5 for the 12-hour average. If the limit were established at 300 on an instantaneous basis, this could significantly favor a facility that has high perturbations less than 300, but average emissions of 250 (assuming the facility with average emissions of 250 could meet the instantaneous limit, 300, with fewer controls.) This facility would emit 50 times more of that HAP than a facility operating at an emission average of 5, but would still comply with the standard. To address the problem of setting limits on an instantaneous basis, emissions and feedstream and operating limits are established on the average with specified averaging periods.

1. Manual Methods

The MACT standards for HWCs (except those for HC and CO) were based on the average of data from three test runs during which emissions were measured by manual methods. EPA thus proposes that compliance be based on the average of three manual methods test runs to be consistent with data used to establish the standards. *Chemical Waste Management* v. *EPA*, 976 F.2d 2, 34 (D.C. Cir. 1992) (Noting that this is an inherently reasonable approach and is consistent with the standard approach for compliance under the Part 63 MACT standards.)

The standard could be set in such a way as to require all three runs to be less than the standard. Such a standard would be derived by choosing the highest data point from three manual test runs and would result in an emission level higher than those proposed. The "not-to-be-exceeded" approach was considered problematic for reasons just described, so averaging was chosen.

Manual methods sample facility exhaust emissions for a period of time. The minimum length of time required to sample is specified indirectly by the manual method in the form of collection or gas flow specifications. The results of the manual method test are reported as an average over the sampling period. Therefore for manual method test runs, the averaging period is the sampling period over which the sample was collected.

EPA proposes no specific averaging period here for manual method test runs, with one caveat discussed below. Instead EPA proposes to rely on the minimum sampling volumes or collected sample (whichever the method requires) specified by the manual methods. EPA invites comment on whether minimum sampling periods for manual methods should be specified directly.

EPA is proposing a three hour minimum sampling time for method 0023A. Three hours is also the minimum sampling period stated in method 23 to Part 60, appendix A. EPA is proposing a minimum sampling time in order to ensure that each D/F run samples long enough to obtain adequate samples of the various congeners to determine compliance with the TEQ standard. This issue is important here because there is an inconsistency between air rules and RCRA rules regarding how to treat nondetected congeners when calculating the TEQ.

The document which defines the TEQ calculation, "Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-Dioxins (CDDs and CDFs) and 1989 Update" (EPA/625/3–89/016, March 1989), uses in its examples the assumption that all non-detects are zero. Also, Method 23 of Part 60 Appendix A, the method used by air programs for determining total D/F congeners, similarly states in Section 9, titled Calculations:

> Any PCDD's or PCDF's that are reported as nondetected (below the MDL) shall be counted as zero for the purpose of calculating the total concentration of PCDD's and PCDF's in the sample.

Therefore, many assume that nondetects are zero for the purposes of calculating site specific TEQs.

Unfortunately, RCRA programs in most instances use the nondetect value, not zero, in the calculation of the TEQ. (See BIF method 23 found in Part 266, Appendix IX, section 3.4.) Since this rule would be promulgated under both RCRA and CAA authority, this issue needs to be resolved.

The Agency believes a facility will have to measure for 20 minutes per run using SW–846 method 0023a to obtain enough sample to be useful for the TEQ calculation. This leads EPA to believe that enough sample will be collected during a three hour run to assure that

nondetected congeners are indeed not present. If a source complies with the minimum sampling period and still has non-detects, then EPA proposes allowing non-detects to be assumed to be zero.

This would also apply to other methods which have passed the Method 301 validation procedures and EPA has agreed are acceptable. In the case of other methods, the facility would assume that non-detects are zero if the method accumulates the same amount or more sample than Method 0023A would in a three hour run. If a source chooses not to comply with the three hour minimum, EPA would mandate that non-detected congeners be assumed to be present at the detection level for the purposes of the TEQ calculation.

EPA specifically invites comments on the selection of the proposed minimum sampling time for the D/F method and the assumed concentration of nondetected congeners in the calculation of the TEQ.

2. Continuous Emissions Monitoring Systems (CEMS)

EPA is proposing to require the use of five CEMS—CO, HC, O_2, Hg, and PM—and to allow the use of CEMS for SVM, LVM, HCl, and Cl_2. Presently, for cement kilns and LWAKs, continuous emission monitoring of O_2 and CO (or HC) is required under the BIF rule (40 CFR 266.103(c)(1)(v)). Emission limits and their associated averaging period must be established for all of these pollutants (except for O_2) in keeping with the nature of compliance with a CEMS. (The O_2 CEMS is used to continuously correct the CEMS readings for the other pollutants to 7 percent O_2. There is no emission limit specific to O_2.) Hourly rolling average emissions data are available to establish emission limits for CO and HC on an hourly-rolling average.

Only manual method stack emissions data, however, are available to establish appropriate emission limits and averaging periods for the other standards: Hg, PM,[42] SVM, LVM, and HCl and Cl_2. This presents a unique issue for the Agency to resolve since, in most cases, EPA promulgates CEMS standards by collecting CEMS emissions data from facilities run under "normal" conditions. The Agency would use this CEMS data to calculate a statistically based CEMS emission standard, assuming some confidence interval and number of annual exceedances. Since no "normal" CEMS data exists, but worst-case manual test data from trial burns and compliance tests does, an alternate approach must be developed to derive a CEMS emission standard an its associated averaging period.

a. Approach to Establishing Averaging Periods for Hg, PM,[43] SVM, LVM, HCl and Cl_2 CEMS. One important issue concerning the data is that it was obtained from trials burn and compliance test results (similar to the comprehensive performance test, described in section III of Part Five). These are generally worst-case tests facilities used to establish operating limits under the BIF and Incinerator rules. Facilities must be in compliance with all standards at all times they are burning hazardous waste. Therefore, the emissions represented by this data are the highest emissions the facility could experience and be in compliance with the current BIF and incinerator rules. In other words, the emissions data represents a not-to-be-exceeded emission level for the given facility.

Now, let us examine how a facility would comply with today's proposed emission standards if they were *not* to use a CEMS, but by performing a comprehensive performance test and complying with the standards using operating parameter limits. As a result of today's proposed rule and as was the case in the BIF and incinerator rules, EPA believes facilities will conduct a comprehensive performance test in the same way current trial burns and compliance tests are conducted. That is they will attempt to get the widest operating envelope possible by intentionally running the facility under conditions which will maximize emissions (by practices such as maximizing feed-rates, running control devices less effectively, etc.) and yet not exceed any applicable emission standards. Facilities will use the operating data from the comprehensive test to establish and continuously monitor operating limits for feedrate and device parameters. This defines the facility's operating envelope. During normal operation, owner/operators will operate in such a way that the facility is performing better than the operating limits established during the comprehensive performance test. Since exceedances of operating limits established during the comprehensive performance test are a *de facto* violation of the corresponding standard, this means that the emissions during normal operation will at all times be lower than those during the comprehensive test.

When complying with today's proposed standards using a CEMS, it is important that facilities using a CEMS not be at a disadvantage relative to facilities using operating parameter limits. There are two ways a disadvantage could occur: when the emission standard is numerically less and/or the averaging period is shorter. In the case of manual stack tests, the averaging period is the stack sampling time. Therefore, the CEMS emission limit would be equal in stringency to the manual stack test limit if they both had the same numerical value and the CEMS averaging period were equal to the sampling period for the manual method.

Also, EPA believes facilities have a number of advantages using CEMS. First, the assumptions to assure compliance are fewer and less conservative (direct measure of the standard is the top of the monitoring hierarchy; see section II.A. of Part Five.) CEMS are less intrusive on the facility than operating parameter limits. Most importantly, CEMS mean facilities need to monitor only one emissions parameter to assure compliance rather than multiple operating limits, often relevant to more than one standard.[44]

In summary, regardless of whether CEMS or operating limits are used, both continually assure that the facility is meeting the standard(s) at all times. CEMS are an alternate, more direct, method of confirming a state of performance than are continuously monitored operating parameter limits established through a comprehensive test. A facility which complies with the standards in today's proposed rule would experience its highest emissions during a comprehensive performance test, when the facility establishes its operating envelope to ensure it is in compliance with the standards at all times. Therefore, a CEMS limit is equally stringent to a standard for a comprehensive performance test if it is numerically equal and has the same averaging period. For comprehensive performance tests, the averaging period is the sampling time for the manual method. Therefore, it is proposed that the CEMS standards be the same numerical limits established for manual method comprehensive performance tests with the averaging period equal to

[42] Note that the PM CEM is also used as an operating parameter for PM APCD efficiency and that additional averaging periods apply during normal operation. See Part Five, Section II.C.7. titled "Particulate Matter" for more information.

[43] Note that the PM CEM is also used as an operating parameter for PM APCD efficiency and that additional averaging periods apply during normal operation. See Part Five, Section II.C.7. titled "Particulate Matter" for more information.

[44] For example, an exceedance of an operating parameter limit used to ensure compliance with the dioxin, mercury, SVM, LVM, and HCl and Cl_2 standards would be a violation of all those standards. If a CEM were used for one or more of these standards, a violation would only occur if the CEM limit were exceeded.

the sampling period for three manual method test runs.

b. Averaging Periods for CO and HC CEMS. As stated previously, the data used to derive today's proposed CO and HC standards proposed are not manual methods data, but continuous emissions data based on a one-hour rolling average. To be consistent with the data used to derive the standards, it is proposed that the averaging periods for CO and HC CEMS standards remain one-hour.

c. Averaging Periods for Other CEMS. Based on the discussion of subsection I above, EPA proposes the following CEMS averaging periods for CEMS. The numerical standard is the same as those proposed in sections III through V of this part.

Three main assumptions were used in determining how long a facility would have to sample to achieve the minimum levels specified in the manual methods. They are assumptions for: sample flow rate; flue gas oxygen content; and the detection limit or specified sample collection specified in the method. For sample flow rate, EPA assumed a flow rate of 0.5 scfm because this is either what is directly stated as the flow rate in the methods or it is used by convention.

The Agency also assumed that the oxygen concentration in the flue gas was 7 percent, the basis of today's standards. Oxygen concentrations in the flue gas can change greatly, but EPA believes that the derived sampling time is elastic relative to the assumed oxygen concentration. In other words, the sampling times would change roughly five to ten per cent over the range of oxygen concentrations experienced by HWCs. This is not significant relative to other assumptions made here, so a 7 percent oxygen concentration was assumed.

Finally, each method specifies a minimum analytical detection limit or sample collection. We assumed that a test operator would collect three times what is prescribed in the method to account for facility variability, unknowns at a given site, etc. This is a conventional approach used by testing contractors. This will be referred to below as the "collected sample."

There are other issues which need to be addressed as well. One CEMS can be used to comply with more than one standard and standards can vary from subcategory to subcategory. Therefore, EPA proposes that the sampling time used to derive the averaging period be the longest sampling time which relates to the CEM averaging period. For an example, see the discussion on the Hg and multi-metals CEM standards, below.

Manual methods tests do not run on-the-hour, so an averaging periods with some fraction of an hour would result if rounding were not used. EPA believes it is reasonable and simpler to have integer value hourly averages. Since the direct measure of a standard at the stack is at the top of the monitoring hierarchy, a less conservative approach is warranted in this case, so EPA proposes that averaging periods for CEMS be rounded up to the nearest hour. (See section II.A. of Part Five for more information on the monitoring hierarchy.)

Also, a resulting averaging period may be inappropriately short, i.e., less than one hour. In this case EPA would establish an averaging period of one-hour. This is reasonable since the averages for operating parameters to control average emissions are one-hour. (See section II.B.1. of Part Five for a discussion of averages for operating parameters.) Monitoring of a standard continuously at the stack is at the top of the monitoring hierarchy, while establishing operating parameter limits is at the bottom. It would be inconsistent if an averaging period for CEMS were less than those for operating parameter limits, so a one-hour average will be proposed in this case.

For mercury (Hg) and multi-metal CEMS, it is proposed that the averaging period be ten hours. SW–846 method 0060 would be the manual method used to comply with these standards if a CEM were not used. Emission standards for these HAP categories vary greatly from HAP-to-HAP and within a HAP, from subcategory-to-subcategory. But the proposed SVM standard for LWAKs results in the longest sample collection time. EPA believes that an LWAK will have to sample for approximately 200 minutes per run to collect 15 μg of sample to be in compliance with the LWAK SVM standard. Three runs of 200 minute duration is 600 minutes, or ten hours.

For the HCl and Cl_2 standard, it is proposed that the CEMS averaging period be one hour. In this case, EPA has determined that a facility would have to sample less than ten minutes per run to collect the minimum amount, 300 μg, of sample specified by the method. If three times this sampling time were used to establish the averaging time, it would result in one of roughly 30 minutes. This is unreasonable for a CEMS averaging period, so EPA is proposing that the averaging period be one hour.

Finally, it is proposed that the PM CEMS averaging period be two hours. This is because a facility would have to sample for roughly 30 minutes per run to collect the minimum amount, 30 mg, of particulate specified by the method. Three times this sampling time is 1.5 hours, so after rounding an averaging period of two hours is proposed.

Table IV.2.1 summarizes the CEMS averaging period for the various CEMS emission standards.

TABLE IV.2.1.—AVERAGING PERIODS FOR CEMS STANDARDS

HAP or standard	CEMS averaging period
PM	2 hours.
Mercury (Hg)	10 hours.
SVM	10 hours.
LVM	10 hours.
HCl and Cl_2	1 hour.
CO	1 hour.
HC	1 hour.

d. All Averages are Rolling Averages. All CEMS averaging periods are on a rolling-basis. In other words, each time a sample is recorded, a new rolling average is calculated using the new sample and all previous samples obtained during the specified averaging period. If sample results are recorded every minute and the averaging period is one hour, then the most recent sample is averaged together with the results of the previous 59 samples to obtain the hourly rolling average. When there are not enough data to obtain a rolling average, one of two approaches would be used. We propose that for short-term interruptions of the rolling average that the rolling average "pick-up" where it left off, i.e., consider the one-minute average immediately prior to the interruption to be the one minute average that occurred prior to the current one-minute average. For longer term interruptions, all available one minute averages would be averaged together until the time period since the start of the rolling average equals the averaging period for that parameter. Then there is enough data to perform the rolling average as usual, and the rolling average would continue as normal. For more information on the use of CEMS and the rolling average, see Part Five, Section II.C. "Compliance Monitoring Requirements" and the proposed regulations, Appendix J to Part 60.

3. Feedstream and Operating Limits

Today, EPA is proposing specific monitoring requirements to ensure facilities are in compliance with the standards during normal operation. Some of these monitoring requirements require setting limits on feedstream or operating parameters. These limits will

be set on an average. Other limits would be instantaneous limits, such as those for fugitive process emissions.

It is proposed that four averaging periods be used for feedstream and operating limits: twelve hour, one hour, ten minutes, and instantaneous. All averages would be calculated on a rolling-average basis with measurements taken every 15 seconds to obtain a one minute average. The one minute averages are used to obtain the twelve hour, one hour or ten minute rolling average. The use of one-minute averages, i.e., the average of the previous 15 second averages within that minute, is the current practice for HWCs. "Instantaneous" limits are just that, values not to be exceeded at any time. Averaging does not occur for "instantaneous" values. These definitions supersede requirements in the Part 63 general provisions, which are less stringent. Consult chapter 5, volume IV of the Technical Background Document for more information regarding EPA's choice of the time duration for averaging periods.

For discussion on what operating limits EPA is proposing and what the averaging period will be for particular operating limits, see section II of Part Five of this preamble.

III. Incinerators: Basis and Level for the Proposed NESHAP Standards for New and Existing Sources

Today's proposal would establish maximum achievable control technology (MACT) emission standards for dioxins/furans, mercury, semivolatile metals (cadmium and lead), low volatile metals (arsenic, beryllium, chromium and antimony), hydrochloric acid and chlorine (combined), particulate matter, carbon monoxide, and hydrocarbons from existing and new hazardous waste incinerators (HWIs). See proposed § 63.1203. The following discussion addresses how MACT floor and beyond-the-floor (BTF) levels were established for each HAP, and EPA's rationale for the proposed standards. The Agency's overall procedural approach for MACT determinations has been discussed in Part Three, Sections V and VI for existing sources and in Section VII for new sources.

To conduct the MACT floor analyses presented today, the Agency compiled available data from hazardous waste-burning incinerators: both commercial as well as on-site facilities. As discussed earlier, the vast majority of these data were generated during trial burns to demonstrate compliance with existing RCRA standards at 40 CFR Part 264, Subpart O. Therefore, the data were obtained under proper QA/QC procedures. These emissions data, however, represent worse-case emissions that cannot be exceeded (because limits on operating parameters are based on operations during the trial burn). As noted earlier, the Agency invites commenters to submit data that reflect more normal, day-to-day operations and emissions. This will enable the Agency, among other things, to be better able to distinguish among facilities that are now included in the expanded MACT floor pool but which, upon closer inspection and with better data, may not be actually employing the identified floor controls.

A. Summary of MACT Standards for Existing Incinerators

This section summarizes EPA's proposed emission levels for existing incinerators for each HAP, HAP group, or HAP surrogate. The proposed emission standards for HWIs are presented in the table below:

TABLE IV.3.A.1.—PROPOSED MACT STANDARDS FOR EXISTING INCINERATORS

HAP or HAP surrogate	Proposed standards [1]
Dioxin/furans	0.20 ng/dscm TEQ.
Particulate Matter	0.030 gr/dscf. (69 mg/dscm).
Mercury	50 μg/dscm.
SVM [Cd, Pb]	270 μg/dscm.
LVM [As, Be, Cr, Sb]	210 μg/dscm.
HCl + Cl_2	280 ppmv.
CO	100 ppmv.
HC	12 ppmv.

[1] All emission levels are corrected to 7 percent O_2.

1. Dioxins and Furans (D/Fs)

a. MACT Floor. The Agency's analysis of dioxin/furan (D/F) emissions from HWCs and other combustion devices (e.g., municipal waste combustors and medical waste incinerators) indicates that temperature of combustion gas at the inlet to the particulate matter (PM) control device can have a major effect on D/F emissions.[45] D/F emissions generally decrease as the gas temperature of the PM control device decreases, and emissions are lowest when the gas temperature of the PM control device is below the optimum temperature window for D/F formation—450 to 650 °F.[46] Given that incinerators are equipped with both wet and dry PM control devices that operate under a range of temperatures, the Agency is identifying a MACT floor for D/F based on temperature control at the inlet to the PM control device.

Incinerators emitting D/F at or below levels emitted by the median of the best performing 12 percent of incinerators have combustion gas temperatures below 400° F. These best performing sources were equipped with venturi scrubbers to control PM. The gas temperature of the wet air pollution control system for one source was 163° F; gas temperature data for the other best performing sources were not available. Although gas temperatures at a wet PM control device would normally be less than 200° F, temperatures could be higher in the presence of acid gases such as HCl and SO_2. Consequently, the Agency believes that it would be reasonable and appropriate to generalize that gas temperatures of wet PM control devices are less than 400° F.

The Agency evaluated D/F emissions from all incinerators that are equipped with wet PM control systems. Average D/F emissions for test conditions ranged from 0.01 ng/dscm (TEQ) to 39 ng/dscm (TEQ). D/F emissions were as high as 3.5 ng/dscm (TEQ) for incinerators that were not burning substantial levels of known D/F precursors or were not equipped with a waste heat boiler (WHB). (It is hypothesized that WHB-equipped incinerators may have high (uncontrolled) D/F emissions because D/F may be formed on particulate attached to boiler tubes as combustion gases pass through the optimum temperature window (450–650° F) for D/F formation.) WHB-equipped incinerators using wet PM control devices had D/F emissions ranging from 0.4 to 8 ng/dscm (TEQ), and an incinerator equipped with a wet PM control device burning waste comprised of approximately 30 percent PCBs had D/F emissions of 39 ng/dscm (TEQ).

The Agency is consequently identifying temperature control to below 400° F at the PM control device as the MACT floor. Given that approximately 45 percent of test conditions in our database have average D/F emissions below 0.20 ng/dscm (TEQ), we believe that it is appropriate to express the floor as "0.20 ng/dscm (TEQ), or temperature at the PM control device not to exceed 400° F". This would allow sources that operate at temperatures above 400° F but that achieve the same D/F emissions as 45 percent of sources that operate below 400° F to meet the standard without incurring the expense of

[45] USEPA, "Draft Technical Support Document For HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies", February 1996.

[46] For example, during compliance testing of a cement kiln, D/F emissions exceeded 1.7 ng/dscm (TEQ) at a ESP temperature of 435° F.

lowering the PM control device gas temperature.

EPA estimates that 75 percent of incinerators are currently meeting the floor level. The annualized cost for the remaining incinerators to reduce D/F emissions to 0.20 ng/dscm (TEQ) or control gas temperature at the PM control device to below 400° F would be $3.0 million. Achievement of the floor levels would reduce D/F TEQ emissions nationally by 35 g/yr.

b. Beyond-the-Floor (BTF) Considerations. The Agency has identified activated carbon injection (CI) operated at gas temperatures less than 400° F as BTF control for D/F for incinerators.[47] CI is currently used by a commercial hazardous waste incinerators to achieve emission levels routinely (based on quarterly stack testing) of less than 0.20 ng/dscm (TEQ). CI is also used to reduce D/F emissions from several municipal and medical waste incinerators (MWIs) in a similar manner.

CI has been demonstrated to be routinely effective at removing greater than 95 percent of D/F and some tests have demonstrated a removal efficiency exceeding 99 percent at gas temperatures of 400° F or below.[48] To determine a BTF emission level, the Agency considered the emission levels that could result from gas temperature control to less than 400° F combined with CI.

To estimate D/F emissions with temperature control combined with CI, the Agency considered the range of emissions from sources in the MACT floor database, as discussed above. Incinerators that are not equipped with a WHB and not burning high levels of D/F precursors (the vast majority of incinerators) could be expected to achieve D/F emissions of less than 3.5 ng/dscm (TEQ) with temperature control only. These sources could be expected to achieve D/F emissions of below 0.18 ng/dscm (TEQ) when using CI assuming a fairly conservative removal efficiency of 95 percent.

There are three sources in our database equipped with WHBs. One currently uses CI to achieve D/F emissions below 0.20 ng/dscm (TEQ) when controlling PM with an ESP operating below 400° F. Another source had D/F emissions of 0.56 ng/dscm (TEQ) when controlling PM with a wet system. This source could be expected to achieve D/F emissions below 0.03 ng/dscm (TEQ) using CI at a removal efficiency of 95 percent. The third WHB-equipped incinerator in our database had D/F emissions of 8.0 ng/dscm (TEQ) when controlling PM with a wet system. This source could be expected to achieve D/F emissions below 0.40 ng/dscm using CI at a removal efficiency of 95 percent. We note, however, that the feed to this source during testing comprised approximately 10 percent hexachlorophenol, a D/F precursor.

Finally, one incinerator in the database that controlled PM with a wet system had D/F emissions of 39 ng/dscm (TEQ). This source could be expected to achieve D/F emissions below 2 ng/dscm (TEQ) when using CI at 95 percent efficiency. We note, however, that the feed to this source during testing comprised approximately 30 percent PCBs, known D/F precursors.

The Agency has considered this information and determined that it would be reasonable and appropriate to establish 0.20 ng/dscm (TEQ) as an emission level that is achievable with BTF control. Although two sources in our database that fed (during testing) high levels of D/F precursors may not have been able to achieve that level if they had been equipped with CI, we believe that those sources could achieve a level of 0.20 ng by reducing the feedrate of D/F precursors.

We note that, because we have assumed a fairly conservative CI removal efficiency of 95 percent to identify the 0.20 ng/dscm BTF level, we believe that this adequately accounts for emissions variability that would be experienced at a given source attempting to operate under constant conditions (e.g., as during a performance test). That is, because CI removal efficiency is likely to be up to or greater than 99 percent, we believe that it is not necessary to add a statistically-derived variability factor to the 0.20 ng/dscm BTF level to account for emissions variability. Accordingly, the 0.20 ng/dscm (TEQ) BTF level is proposed as the emission standard.

We invite comment on this issue, and note that if a statistically-derived variability factor were deemed appropriate, the BTF level of 0.20 ng/dscm would be expressed as a standard of 0.31 ng/dscm (TEQ). We note, however, that under this approach, it may be appropriate to use a less conservative CI removal efficiency (i.e., because emissions variability would be accounted for using statistics rather than in the engineering decision to use a conservative CI removal efficiency), thus lowering the 0.20 ng/dscm level to approximately 0.1 ng/dscm (TEQ). If so, the BTF standard would be approximately 0.21 ng/dscm (TEQ) (i.e., virtually identical to the proposed standard) after considering a statistically-derived variability factor.

EPA estimates that 50 percent of incinerators are currently meeting a BTF level of 0.20 ng/dscm (TEQ). The incremental annualized cost for the remaining incinerators to meet this BTF level rather than comply with the floor controls would be $26.2 million, and would provide an incremental national reduction of 38 g/yr in D/F TEQ emissions over the floor level. This represents an overall reduction of about 95 percent compared to baseline D/F emissions of 77 g/year.

EPA has determined that proposing a BTF MACT standard is warranted and a number of factors support the proposed BTF level of 0.20 ng/dscm (TEQ). D/F are some of the most toxic compounds known due to their bioaccumulation potential and wide range of health effects at exceedingly low doses, including carcinogenesis. Exposure via indirect pathways was in fact a chief reason Congress singled out D/F for priority MACT control in section 112(c)(6). See S. Rep. No. 228, 101st Cong. 1st Sess. at 154–155 (1990). As discussed elsewhere in today's preamble (and as qualified by the discussion below regarding small incinerators), EPA's risk analysis developed for purposes of RCRA in fact shows that D/F emissions from hazardous waste incinerators could pose significant risks by indirect exposure pathways and that these risks would be reduced by BTF controls. EPA is expressly authorized to consider this non-air environmental benefit in determining whether to adopt a BTF level. CAA section 112(d)(2).

As discussed in Part Seven of the preamble, the cost-effectiveness of the BTF level for small on-site incinerators may be high. This is because on-site incinerators are generally smaller than commercial incinerators, have lower gas flow rates, and therefore have lower mass emission rates of D/F. Thus, the cost per gram of D/F TEQ removed for small incinerators is greater than for large (on-site and commercial) incinerators. Accordingly, the Agency invites data and comment on: (1) whether the BTF level is cost-effective for small incinerators; and (2) whether the final rule should establish MACT standards at the floor level (i.e., 0.20 ng/dscm (TEQ), or 400° F) for these small

[47] We note that incinerators using wet PM control systems would need to reheat the combustion gas before injecting the carbon. This is because CI is not efficient at D/F (or Hg) removal at gas temperatures below the dew point. Gas reheating in these situations was considered in estimating the cost of compliance with the proposed standards.

[48] USEPA, "Draft Technical Support Document For HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies", February 1996.

incinerators.[49] [50] Under this approach, the Agency would use the same definition of small incinerator used to identify incinerators subject to less frequent performance testing—incinerators with gas flow rates less than 23,127 acfm.[51]

EPA notes further that the control technology on which the proposed BTF standard is based, carbon injection, also controls mercury. The ability and efficiencies of controlling two such high toxicity HAPs with the same highly-efficient control technology is an important factor in the Agency's decision to propose a BTF standard. The Agency notes further that the absolute cost of achieving the proposed standard is relatively low, particularly considering the toxicity of D/F (as well as mercury, which, as just noted, would also be controlled). For example, the proposed BTF levels would result in annualized costs of $27 million to all HWIs or $15 per ton of hazardous waste burned.

Finally, EPA's initial view is that it may be necessary to adopt further controls under RCRA to control D/F if it did not adopt the BTF level. This would defeat one of the purposes of this proposal—to avoid imposing emission standards under both statutes for these sources wherever possible. These risks would, however, be reduced to acceptable levels if emission levels are reduced to the proposed BTF level of 0.20 ng/dscm (TEQ).

2. Particulate Matter

a. MACT Floor. The Agency has a database for PM emissions from 74 HWIs that indicates a range (by test condition average) from 0.0003 gr/dscf to 1.9 gr/dscf. For MACT determination, the median of the best performing 12 percent of the HWIs in the MACT pool were analyzed and found to be using the following APCDs to control PM: (1) A fabric filter (with an air to cloth ratio of less than 10.0 acfm/ft^2); and (2) an ionizing wet scrubber (IWS) in combination with a venturi-scrubber. Accordingly, these APCDs were tentatively designated as the MACT floor technologies. To identify an emission level that these technologies could be expected to achieve routinely, the Agency examined the emissions from all incinerators (in the database) that were equipped with these PM control devices. A MACT floor level of 240 mg/dscm (0.107 grains/dscf) resulted from the analysis based on considerations discussed in Part Three, Section V, above.

This level, however, is higher than the current federal standard of 180 mg/dscm (0.08 grains/dscf).[52] Thus, the Agency is not proposing to use the statistically-derived approach to identify the MACT floor emission level. The Agency has regulated PM emissions from hazardous waste incinerators under RCRA (40 CFR 264.343(c)) since 1981 and all RCRA-permitted incinerators have been required to meet the federal standard of 0.08 gr/dscf (180 mg/dscm). The Agency, therefore, is identifying the MACT floor at the regulated level of 180 mg/dscm.

The APCDs commonly used at HWIs to control PM to the current RCRA standard are fabric filters, ESPs, IWSs, and venturi-scrubbers. Accordingly, we have designated these technologies as MACT floor for PM control. Approximately 95 percent of all test conditions in our database have lower average levels (average over all runs of the test condition) than the MACT floor level of 180 mg/dscm.[53] This MACT floor level will not impose any incremental burden on HWIs (except compliance and related permitting costs) since it is the currently enforceable level.

b. Beyond-the-Floor Considerations. The Agency considered two levels of more stringent BTF PM standards, 69 and 34 mg/dscm (0.03 and 0.015 gr/dscf), since well designed and well operated ESPs, IWSs, and fabric filters can routinely achieve PM control at the 69 mg/dscm level,[54] while state-of-the-art ESPs, IWSs and FFs can achieve 34 mg/dscm level. The Agency is proposing a BTF standard of 69 mg/dscm (0.03 grains/dscf) based on engineering evaluation of the emissions data from HWIs. (We note that, as discussed in Sections IV and V below, it also is consistent with the proposed standards for cement kilns and LWAKs). Most of the HWIs having PM emissions between 69 to 180 mg/dscm (0.03 to 0.08 gr/dscf) range are likely to be using older APCDs that can be upgraded to provide better PM control. Only 30 percent of all test conditions[55] in our database were found to have PM emissions greater than the proposed BTF level of 69 mg/dscm (0.03 gr/dscf). Analysis of the test data appeared to indicate that some sources operated under poor, non-normal conditions during one test condition resulting in high PM levels, while much lower PM emissions were achieved during other test conditions. As noted elsewhere, the Agency is specifically concerned that the nature of these test data (and the absence of more detailed, routine operations and emissions data) has interfered with our ability to derive MACT standards that appropriately reflect the lower, day-to-day emissions achievements of the best performing facilities. The Agency will continue to refine its analysis in this regard, and we specifically invite data and comments on this issue.

The Agency estimates that 9 percent of existing incinerators can achieve the proposed BTF levels using design, operation and maintenance upgrades of their APCDs, while 11 percent facilities would require installation of new fabric filters or other equivalent APCD (e.g., ESP or IWS). The national annualized cost to HWIs to comply with the proposed BTF level would be $2.7 million and would provide an incremental reduction of PM emissions of 839 tons/year (52 percent) from the baseline emissions level of 1606 tons/year. Accordingly, the Agency believes that a BTF level of 69 mg/dscm (0.03 gr/dscf) is appropriate.

The performance of many APCDs can be improved to achieve a more stringent PM BTF level of 34 mg/dscm by adopting good D/O/M practices; in other cases, the APCD may have to be upgraded or replaced. Upgrades include techniques for ESPs such as humidification or increasing the plate area or power input, and for FFs, increasing cloth to air ratio and pressure drop across bags, or retrofits to modern fabrics like heavy woven fiberglass. The Agency is concerned, however, that the cost of such retrofitting to achieve PM levels of 34 mg/dscm (0.015 gr/dscf)

[49] See also discussion in Part Four, Section I (Selection of Source Categories and Pollutants), regarding whether the Agency should subdivide incinerators by size and promulgate separate floor standards (and BTF standards, if warranted).

[50] If after review of comments and further analysis the Agency determines that subdividing incinerators is not appropriate but, because of cost-effectiveness considerations, BTF levels are not warranted for all types of incinerators, the Agency invites comment on whether such cost-effectiveness and BTF decisions should be based on incinerator size or whether the incinerator is a commercial or on-site unit.

[51] We also use this definition to request (elsewhere in the text) comment on whether the requirement to use Hg and PM CEMS for compliance monitoring should be relaxed or waived for small incinerators.

[52] This anomalous result is apparently attributable to: (1) inability to consider emissions from only those HWIs truly using MACT floor control (because of inadequate data to properly characterize the design, operation, and maintenance of the control device); and (2) use of a variability factor that is based on emissions variability (during trial burn testing) that may be much higher than many sources actually experience.

[53] We presume that those few test conditions that exceeded the 180 mg/dscm standard occurred during failed trial burn tests.

[54] We note also that, as discussed in the next section, cement kilns with much higher inlet particulate loadings are currently required to meet a 69 mg/dscm standard.

[55] Representing 20 percent of the sources.

could be substantial. We also note that PM is not a HAP, but rather a surrogate for non-dioxin/furan HAPs adsorbed on to PM and for metal HAPs not directly controlled by a MACT standard. These HAPS would be controlled to some extent by other proposed standards (e.g., metal-specific standards; CO and HC limits to control organic HAPs). For these reasons, we believe that controlling PM to the proposed BTF level of 69 mg/dscm (0.03 gr/dscf) is appropriate. In addition, we also note that the Agency has no information that a lower PM standard would be needed to satisfy RCRA requirements.

3. Mercury

a. MACT floor for mercury. Mercury (Hg) emissions from incinerators are currently controlled by controlling the feedrate of Hg and by using wet scrubbers (although such scrubbers are used primarily for acid gas control). Wet scrubbers can remove soluble forms of mercury species (e.g., HgCl).

The Agency's Hg emissions database from 29 HWIs indicates that baseline Hg emissions range from 0.05 μg/dscm to a high of 1,360 μg/dscm. To identify MACT floor control, EPA determined that sources with Hg emissions at or below the level emitted by the median of the best performing 12 percent of sources were controlling Hg using either: (1) Hg feedrate control expressed as a maximum theoretical emission concentration (MTEC)[56] of 19 μg/dscm; or (2) wet scrubbers coupled with an MTEC of 51 μg/dscm. Analysis of emissions from all incinerators in the database using these or better controls (i.e., lower Hg feedrates expressed as lower MTECs) resulted in a MACT floor level of 130 μg/dscm.[57] To meet this floor level 99 percent of the time, EPA estimates that a source with average emissions variability must be designed and operated to routinely meet an emission level of 57 μg/dscm.

EPA estimates that approximately 70 percent of incinerators currently meet the floor level. The annualized cost for the remaining incinerators to meet the floor level is estimated to be $29.5 million, and would reduce Hg emissions nationally by 7,166 lbs per year from the baseline emissions level of 9,193 lbs per year.

b. Beyond-the-Floor Considerations. The Agency has considered two alternative beyond-the-floor (BTF) controls for improved Hg control: flue gas temperature reduction to 400° F or less followed by either activated carbon injection (CI) or carbon bed (CB). (As discussed in the D/F section, we note that incinerators with PM control devices operating below the dew point (e.g., venturi-scrubbers, ionizing wet scrubbers) would have to reheat the combustion gas before using CI, and would need to add a FF or other PM control device to remove the injected carbon.) EPA believes that CI-controlled systems can routinely achieve Hg emission reductions of 90 percent or better and that CB-controlled systems can routinely achieve Hg emissions of 99 percent or better.[58]

For CI-controlled systems, EPA has identified a BTF emission standard of 50 μg/dscm, assuming first that a source has controlled its Hg emissions to only 300 μg/dscm using a wet scrubber and/or feed control, and second, a CI removal efficiency of 90 percent. (The BTF emission standard corresponds to a design level of 30 μg/dscm, i.e., a level that the device is designed and operated to achieve routinely.)[59] For CB systems, the BTF standard would be 5.0 μg/dscm (assuming 99 percent removal efficiency).

We note that another option for identifying BTF levels would be to consider the CI or CB system as an add on to the floor controls identified above. Under this option, emission levels prior to CI would be assumed to be the floor level, 130 μg/dscm. Thus, a CI system at 90 percent removal could be expected to achieve a standard of approximately 13 μg/dscm. A CB system at 99 percent removal could be expected to achieve a standard of approximately 1.3 μg/dscm. We specifically request comment on whether this approach of applying BTF reductions to the floor levels is appropriate.

We also note that an alternative approach to using a statistically-derived variability factor to account for emissions variability would be to assume a conservative control efficiency for the CI or CB BTF technology. We believe that using a conservative removal efficiency could adequately account for emissions variability. Under this approach, we would conservatively assume that CI-controlled systems could achieve a removal efficiency of 80 percent and that CB-controlled systems could achieve an efficiency of 90 percent. When these removal efficiencies are applied to the floor level of 130 μg/dscm (corresponding to a design level of 57 μg/dscm), this would result in emission standards of 11 μg/dscm for CI-controlled systems, and 5.7 μg/dscm for CB-controlled systems.[60] We invite comment on this alternative approach to account for emissions variability among runs within a test condition.

For the reasons discussed below, EPA believes that a BTF level based on use of CI is warranted and is proposing a MACT standard of 50 μg/dscm. The proposed standard would result in nationwide Hg emissions reductions of 757 lbs per year above the floor level and 7,922 lbs per year from baseline levels, and the incremental annualized cost to achieve the BTF level over the floor level would be $7.7 million.

EPA has considered costs in relation to emissions reductions and the special bioaccumulation potential that Hg poses and determined that proposing a BTF limit is warranted. Hg is one of the more toxic metals known due to its bioaccumulation potential and the adverse neurological health effects at low concentrations especially to the most sensitive populations at risk (i.e., unborn children, infants and young children). Congress has singled out mercury in CAA section 112(c)(6) for prioritized control. A more detailed discussion of human health benefits for mercury can be found in Part Seven of today's proposal. The chief means of control, activated carbon injection, also controls D/F so that there are distinct efficiencies in control.[61]

The Agency evaluated a more stringent standard of 8 μg/dscm for Hg emissions based on CB technology. This standard would result in additional national Hg reductions of 960 lbs per year over the proposed standard of 50

[56] MTEC is the Hg feedrate divided by the gas flow rate, and is an approach to normalize Hg feedrate across sources.

[57] As discussed above in the text, we added a within-test condition emissions variability factor to the log-mean of the runs for the test condition in the expanded MACT pool with the highest average emission.

[58] USEPA, "Draft Technical Support Document For HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies", February 1996. See also memo from Shiva Garg, EPA, to the Docket (No. F–96–RCSP–FFFFF), dated February 22, 1996, entitled "Performance of Activated Carbon Injection On Dioxin/Furan and Mercury Emissions."

[59] To achieve a standard of 50 μg/dscm 99 percent of the time, a source with average emissions variability must be designed and operated to achieve an emission level of 30 μg/dscm.

[60] The same approach could be applied to the previously discussed approach of applying the BTF control to an assumed emission level of 300 μg/dscm. When assuming the conservative removal efficiencies of 80 percent for CI and 90 percent for CB, this would result in BTF standards of 60 μg/dscm for CI-controlled systems and 30 μg/dscm for CB-controlled systems. A statistically-derived variability factor would not be added because emissions variability is accounted for by assuming conservative (i.e., lower-than-expected) removal efficiencies for CI and CB systems.

[61] As discussed for D/F, we invite comment on whether the final rule should establish floor levels, rather than BTF levels, for Hg for small incinerators. This is because the Agency is concerned about the cost-effectiveness of the BTF levels for small incinerators.

μg/dscm at an incremental annualized national cost of $20 million. The Agency does not believe that a CB-based emission level of 8 μg/dscm would be appropriate.

4. Semivolatile Metals (SVM) (Cadmium and Lead)

a. MACT Floor. Emissions of SVMs from HWIs are currently controlled by PM control devices. In addition, some incinerators have specific emission limits for these metals established under RCRA omnibus permit authority. The Agency has a database for SVM emissions from 42 HWIs, which indicates a range (by test condition average) from a low of 1.46 to a high of 29,800 μg/dscm. For the MACT analysis, the median of the best performing 12 percent of HWIs were found to be using: (1) a venturi-scrubber (VS)[62] with a MTEC level of 170 μg/dscm; (2) a combination of ESP and WS with a MTEC level of 5,800 μg/dscm; and (3) a combination of VS and IWS with a MTEC of 49,000 μg/dscm.[63] Accordingly, we identified these technologies as MACT floor.

To identify an emission level that these technologies could routinely achieve, we evaluated the emission levels from all HWIs equipped with these controls.[64] We identified the test condition in this expanded MACT pool with the highest average emission and used procedures discussed above in Part Three, Section V, (i.e., addition of a within-test condition emissions variability factor to the log mean of the runs for this test condition) to identify a MACT floor level 270 μg/dscm.

We estimate that approximately 65 percent of all incinerators currently meet this MACT floor level. Sources not already meeting the floor level can readily achieve it by making design, operation, or maintenance improvements to their existing PM control system or by retrofitting with a new PM control device.

The national annualized cost to HWIs to comply with the proposed floor level is estimated to be $9.9 million, and would provide a reduction in Cd and Pb emissions of 50 tons/year, a 94 percent reduction in emissions.

b. Beyond-the-Floor Considerations. The Agency is not proposing a more stringent BTF standard for SVM. We note that the floor level alone would provide for a 94 percent reduction in emissions, and emissions at the floor are not likely to trigger the need for additional control for these sources under RCRA.

5. Low Volatile Metals (Arsenic, Beryllium, Chromium and Antimony)

a. MACT floor. The Agency has a database for LVM emissions from 41 HWIs, which indicates a range (by test condition average) from a low of 3.5 to a high of 133,000 μg/dscm. For MACT analysis, the median of the best performing 12 percent of HWIs achieved the LVM emission levels using: (1) a venturi-scrubber (VS) for MTECs up to 1,000 μg/dscm; and (2) an ionizing wet scrubber (IWS) for MTECs up to 6,200 μg/dscm. Accordingly, we identified these technologies as MACT floor.

In addition, we consider any PM control device to provide equivalent LVM control to a VS. We therefore identified an ESP, IWS, or FF with a MTEC up to 1,000 μg/dscm as MACT floor control. Similarly, we consider a FF or ESP as equivalent technology to a IWS. Thus, a FF or ESP coupled with a MTEC up to 6,200 μg/dscm is also considered MACT floor control.

To identify an emission level that these technologies could routinely achieve, we considered the emissions from all HWIs in our database equipped with MACT floor control. We identified the test condition in this expanded MACT pool with the highest average emissions and added a within-test condition emissions variability factor to the log-mean of the test condition runs. See Part Three, Section V, above. Accordingly, we have identified a MACT floor level of 210 μg/dscm.

Approximately 80 percent of all test conditions in our database achieved the MACT floor level even though many HWIs were equipped with different APCDs or had higher MTECs. EPA believes that most HWIs would be able to achieve the proposed MACT floor without installing an add-on control system. The control technologies necessary to achieve the MACT floor level are already being used by many HWIs for PM and acid gas control.

The national annualized cost to HWIs to comply with the floor level would be $7.7 million and would provide an incremental reduction in LVM emissions of 25 tons/year (91 percent) from the baseline emissions level of 27.3 tons/year.

b. Beyond-the-Floor Considerations. The Agency is not proposing a more stringent LVM standard using BTF controls (i.e., better performing PM control equipment). We note that the floor level alone would provide for a 91 percent reduction in emissions, and emissions at the floor are not likely to trigger the need for additional control for these sources under RCRA.

6. Hydrochloric Acid and Chlorine

a. MACT floor for HCl/Cl_2. The Agency's database for HCl/Cl_2 emissions from 59 HWIs indicates a range (by test condition average) from a low of 0.1 to a high of 1068 ppmv (expressed as HCl equivalents). For MACT analysis, the median of the best performing 12 percent of HWIs achieving the lowest HCl/Cl_2 emission levels were found to be using some kind of scrubbing using combinations of absorber, ionizing wet scrubber, VS, packed bed scrubber (PBS), or generic wet scrubber. In addition, the best performing sources had a chlorine feedrate of up to 2.1E7 μg/dscm, expressed as a MTEC. Accordingly, we identified MACT floor control as wet scrubbing coupled with a chlorine MTEC up to 2.1E7 μg/dscm.

To identify an emission level that wet scrubbing with an MTEC up to 2.1E7 μg/dscm could routinely achieve, we considered the emissions from all HWIs in our database equipped with these controls. We identified the test condition in this expanded MACT pool with the highest average emissions and added a within-test condition emissions variability factor to the log-mean of the test condition runs. See Part Three, Section V, above. Accordingly, we have identified a MACT floor level of 280 ppmv.

Over 90 percent of all test conditions in our database achieve this MACT floor level. At current baseline levels, HWIs emit 1712 tons/year of HCl/Cl_2, and at today's proposed MACT standard, these emissions would be reduced by 592 tons/year, a reduction of 35 percent. The estimated annualized national cost to the industry to meet the proposed MACT standard would be $4.5 million.

b. Beyond the-Floor Considerations. The Agency considered whether to propose a BTF level and determined that it would not be warranted. We note that emissions at the floor are not likely to trigger the need for additional control for these sources under RCRA.

7. Carbon Monoxide and Hydrocarbons

As discussed in Section I above, the Agency believes that establishing emission limits and continuous

[62] Because virtually all other PM control devices (e.g., ESP, FF, IWS) would be expected to have a SVM collection efficiency equivalent to or better than a VS, a source equipped with any PM control device and having a MTEC less than 170 μg/dscm was considered to be using MACT floor control.

[63] We considered a FF to have equivalent (or better) SVM removal efficiency compared to an IWS. Thus, we considered a source equipped with a FF and any wet scrubber (ahead of the FF) and having a MTEC less than 49,000 μg/dscm to be using MACT floor control. A FF alone may not provide equivalent control of SVM because SVM can be volatile in stack emissions.

[64] Sources with better controls (MACT technology and lower feedrate expressed as MTEC) were also included in the expanded MACT pool.

monitoring of two surrogate compounds (hydrocarbons (HC) and carbon monoxide (CO)) will help control emissions of non-dioxin organic HAPs (in combination with PM control to control absorbed organic HAPs).

a. MACT Floor for HC. The Agency's database for HC emissions from 31 HWIs indicates a range (by test condition average) from a low of 0.2 to a high of 35.8 ppmv. Unlike certain cement kilns and LWAKs, incinerators are not required to monitor HC under RCRA regulations. Facilities generally obtained HC emissions data for their own information and often used an unheated FID detector, in which soluble volatiles and semivolatiles are condensed out before entering the detector. Also much of the data were based on run averages (as opposed to the maximum hourly rolling average format proposed today).[65] Notwithstanding these shortcomings, the Agency used these data to identify a MACT floor level.

The Agency identified MACT control for HC as operating under good combustion practices (GCPs). GCPs include techniques such as thorough air, fuel, and waste mixing, provision of adequate excess oxygen, maintenance of high temperatures to destroy organics, design of the facility to provide high enough residence times for destruction of organics, operation of the facility by qualified and certified operators, and periodic equipment maintenance to manufacturer-recommended standards.

To identify the MACT floor level, the Agency conducted a quantitative evaluation of the data combined with engineering judgment to identify test conditions that appear to be conducted under good combustion conditions. Since it is not possible to say with certainty which test conditions were conducted using GCPs absent a detailed examination of all test conditions, we conducted the analysis by arraying the entire HC database from the lowest to the highest emission levels. We then assumed that test conditions beyond a clear break-point were not operated under GCPs. Based on the above analysis and a statistical evaluation of the level that the average source can achieve 99 percent of the time, the Agency identified a MACT floor level of 12 ppmv.

We estimate that the annualized burden on HWIs to meet this floor level would be $8.5 million. An annual reduction of 49 tons of HC emissions (20 percent) is expected from the baseline levels of 239 tons/year.

EPA specifically invites comment on the approach used to identify the MACT floor level and requests HC data on a hourly rolling average basis, using heated FID monitors.

b. MACT floor for CO. RCRA regulations for HWIs were promulgated in 1981 and limit CO emissions to levels achieved during the trial burn. (As noted elsewhere, facilities typically design trial burns to maximize CO in order to provide operational flexibility.) Most of our database for CO (from 59 facilities) is based on run-averages during trial burns (rather than an hourly rolling average-basis; see discussion below). The CO levels in our database that are on a run-average basis range from 0.3 to 10,400 ppmv.

We are proposing today a maximum hourly rolling average (MHRA) format for CO (and HC), which is the same format in which a standard of 100 ppmv (Tier 1) was proposed in 1990 for HWIs (see 55 FR 17862 (April 7, 1990)) and promulgated for CKs and LWAKs in 1991 (see 56 FR 7134 (February 21, 1991)).

Although the Agency did not promulgate a final rule for CO emissions from HWIs (because of Agency resource constraints), the Agency published a guidance document[66] wherein a Tier 1 CO limit of 100 ppmv HRA was recommended for control of PIC emissions if warranted on a site-specific basis. Accordingly, subsequent trial burns for HWIs have been conducted using a HRA format for CO. Our CO database in the HRA format is comprised of 17 test conditions and has a range of 10 to 1,500 ppmv.

For MACT determination, the Agency conducted an analysis similar to that described above for HC and a CO MACT floor level of 120 ppmv resulted (e.g., MACT floor control is GCPs, and a break-point analysis was used to identify sources likely to be truly using GCPs). Nonetheless, since the Agency has previously proposed a CO limit of 100 ppmv and since this level is readily achievable by well-designed and well-operated HWIs, the Agency is proposing 100 ppmv HRA as the MACT floor.

We note that this floor level compares favorably with CO standards for other types of incinerators such as medical waste incinerators for which the proposed standard is 50 ppmv (60 FR 10654, February 27, 1995), and mass burn and fluidized bed municipal waste incinerators for which the promulgated CO standard is 100 ppmv (60 FR 65382, December 19,1995).

The Agency estimates that at a 100 ppmv standard, national CO emission reductions of 13,200 tons/year could be achieved from the baseline level of 14,080 tons/year at an annualized national cost of $17.4 million.

c. Beyond-the-Floor Considerations. The Agency considered more stringent BTF limits for CO and HC. Although state-of-the-art HWIs operating under GCPs should be able to routinely achieve levels below 100 ppmv HRA for CO and 12 ppmv HRA for HC, the Agency is concerned that the incremental compliance cost may not warrant more stringent standards.

EPA invites comments specifically on: (1) the use of CO and HC as surrogates for non-dioxin organic emissions; and (2) data and information and suggestions on an approach to identify a lower floor level for HC that more accurately reflects the levels that are being routinely achieved by HWIs operating under GCPs.

8. MACT Floor and BTF Cost Impacts

The annualized national cost to achieve the proposed standards is estimated at $486,000 for each on-site incinerator unit and $731,000 for each commercial unit. The total (pre-tax) national annualized cost is estimated to be $90 million for on-site and $25 million for commercial incinerators. These costs include a CEMS cost of $130,000 per source annually. The most expensive HAPs would be dioxins and mercury, for which BTF levels have been proposed, and would cost $3.0 million and $30 million respectively nationally at MACT floor levels, and $29.2 million and $37.2 million respectively at BTF levels. These costs include maintenance and operation of the equipment and CEMS. CEMS account for 18 percent of the total compliance cost. Details of these cost estimates have been provided in "Second Addendum to the Regulatory Impact Assessment for Proposed Hazardous Waste Combustion Standards" and are based on no market exit by any HWI and assuming that the facilities have only a limited ability to pass through the costs of the rule to generators.

The Agency, however, estimates that perhaps 4 of the 34 commercial facility units and up to 51 of the 184 on-site facility units would elect to cease

[65] The average of emissions over a run is lower than the maximum hourly rolling average for the run. In addition, unheated FIDs report lower HC levels than a heated FID that would be required under today's proposal. Both of these factors would lead the Agency to underestimate the cost of compliance. On the other hand, the HC levels in the database were measured during worst-case, trial burn conditions. Thus, these emissions are likely to be much higher than during normal operations. This factor has lead the Agency to overestimate compliance costs.

[66] USEPA, "Guidance on PIC Controls For Hazardous Waste Incinerators", April 1990, EPA/530–SW–90–040.

burning hazardous wastes as a result of today's proposals. Most of these facilities burn small quantities of hazardous wastes. These facilities would likely find it more economical to transport the hazardous wastes to other facilities, while perhaps continuing to burn other non-hazardous and industrial wastes, in lieu of incurring expenditures to upgrade their units to continue to burn that small quantity of HW under MACT standards. As such, the total quantity of wastes burned would not be affected since those wastes would be burned by other HWCs, for which there appears to be sufficient capacity available.

B. Summary of MACT Standards For New Incinerators

1. Basis for MACT New

According to Section 112 of CAA, the degree of reduction in emissions deemed achievable for new facilities may not be less stringent than the emissions control achieved in practice by the best controlled similar unit. This section summarizes EPA's rationale for establishing MACT standards for new HWIs. The methodology for determining the standards for new incinerators is similar to that for existing sources, except that MACT floor control is based on the single best performing technology, and the MACT pool is expanded to consider emissions from any source using that technology. For more details see "Draft Technical Support Document for HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies".

The Agency is proposing the following standards for new HWIs:

TABLE IV.3.B.1—PROPOSED MACT STANDARDS FOR NEW INCINERATORS

HAP or HAP surrogate	Proposed standard[a]
Dioxins/furans	0.2 ng/dscm TEQ.
Particulate matter	69 mg/dscm (0.030 gr/dscf).
Mercury	50 μg/dscm.
SVM [Cd, Pb]	62 μg/dscm.
LVM [As, Be, Cr, Sb]	60 μg/dscm.
HCl + Cl_2	67 ppmv.
CO	100 ppmv.
HC	12 ppmv.

[a] All emission levels are corrected to 7 percent O_2.

2. MACT New for Dioxin/Furans

a. MACT New Floor. EPA examined its emissions database and identified the single best performing existing source, and found that the test condition with the lowest PCDD/F TEQ emissions had a test-condition average of 0.005 ng/dscm. This facility employs a water quench and wet scrubbing air pollution control systems (APCSs). The D/F emission control by this source is being achieved by inhibiting the formation of D/F in the APCD by rapid quench of the hot gases from the combustion chamber. Therefore, the Agency selected wet scrubbing and low APCD inlet temperature (400° F) as the MACT floor control.

To determine an emission level that this the floor control could be expected to achieve, the Agency considered data from all HWIs using the MACT floor control. Using the same methodology as used for identifying the floor level for existing sources, the Agency identified a MACT floor level of 0.20 ng/dscm TEQ or an APCD inlet temperature of 400° F.

b. Beyond-the-Floor (BTF) Considerations. As discussed above for existing sources, the Agency selected activated carbon injection (ACI) as the BTF technology. ACI is routinely effective in removing greater than 95 percent of D/F from flue gases. The Agency had identified a BTF level of 0.2 ng/dscm TEQ for the same reasons discussed above for the BTF standard for existing sources.

The Agency also consider a carbon bed as a BTF technology to achieve lower emission levels. As discussed for existing sources, however, the Agency is concerned that the cost of carbon beds may not be warranted given the incremental emissions reduction over a ACI-based BTF standard.

3. PM Standard for New HWIs

The single best performing source in our database for PM emissions was a source equipped with a FF having an air to cloth ratio of 3.8 acfm/ft^2. Thus, this technology represents MACT new floor control. When we considered emissions data from all sources equipped with this level of control (or better), we identified a floor level of 0.039 gr/dscf.

The Agency considered more efficient PM control (e.g., lower air-to-cloth ratio, better bags) as BTF control that could achieve alternative BTF levels of 0.03 or 0.015 gr/dscf. These are the same controls investigated for BTF considerations for existing sources.

The Agency is proposing the same BTF standard for new sources as it is proposing for existing sources—(69 mg/dscm or 0.03 gr/dscf). This standard is readily achievable. The Agency is not proposing a 0.015 gr/dscf standard because, as discussed for existing sources, it is not clear that the additional cost is warranted considering the incremental reduction in PM.

4. Mercury Standard for New HWIs

a. MACT New Floor. The single best performing source in our database for Hg emissions was a source equipped with a wet scrubber (WS) and having a MTEC of 51 μg/dscm. The Agency considered any wet scrubbing device an equivalent control technology (when coupled with a MTEC up to 51 μg/dscm) because of the ability to scrub soluble forms of mercury species. Thus, the Agency identified MACT new floor control as any wet scrubber coupled with a MTEC up to 51 μg/dscm. When we considered emissions data from all sources equipped with this level of control, we identified a floor level of 115 μg/dscm.

b. Beyond-the-Floor Considerations. As for existing sources, the Agency considered the use of both activated carbon injection (ACI) and carbon bed (CB) as alternative BTF technologies. We are proposing a BTF standard of 50 μg/dscm for new sources based on use of ACI for the same reasons we are proposing this standard for existing sources.

5. Semivolatile Metals Standard for New HWIs

a. MACT New Floor. The single best performing source in our database for SVM emissions was a source equipped with a VS in combination with a IWS, and having a MTEC of 49,000 μg/dscm. The Agency considered a wet scrubber in combination with a FF (coupled with a MTEC up to 49,000 μg/dscm) to provide equivalent or better control of SVM. Thus, these technologies represent MACT new floor control. When we considered emissions data from all sources equipped with this level of control, we identified a floor level of 240 μg/dscm.

b. Beyond-the-Floor Considerations. The Agency believes that state-of-the-art FFs can achieve much lower emissions of SVM. For example, the Agency has determined that MWCs equipped with a FF can achieve more than a 99 percent reduction in SVM. See 59 FR 48198 (September 20, 1994). Given that we have identified a MACT new floor (design) level for cement kilns of 35 μg/dscm (see discussion in Section IV below), we believe that a design level of 35 μg/dscm for HWIs is achievable, reasonable, and appropriate. To ensure that a source that is designed to meet a SVM level of 35 μg/dscm can meet the standard 99 percent of the time (assuming the source has average within-test condition emissions variability for sources equipped with

ESPs and FFs), the Agency has established a standard of 62 μg/dscm.

We note that SVM emissions at this level are not likely to result in additional regulation of these sources to satisfy RCRA health risk concerns.

6. Low Volatile Metals Standard for New HWIs

a. MACT New Floor. The single best performing source in our database for LVM emissions was a source equipped with a VS with an MTEC of 1,000 μg/dscm. Given the LVM collection efficiency of a VS, the Agency considered any PM control device (e.g., ESP, IWS, FF) to provide equivalent or better collection efficiency. Thus, these technologies represent MACT new floor control. When we considered emissions data from all sources equipped with this level of control, we identified a floor level of 260 μg/dscm. (We note that this floor level for new sources is higher than the floor level proposed for existing sources. Although the statistically-derived emissions variability factor was added to the same test condition for both MACT existing floor and MACT new floor, the variability factor was greater for test conditions in the MACT new expanded pool.)

b. Beyond-the-Floor Considerations. The Agency believes that state-of-the-art PM control devices (e.g., ESPs, IWS, FFs) can achieve LVM emission levels well below the floor level. Given that we have identified a floor (design) level[67] for new CKs and new LWAKs of 35 μg/dscm and 26 μg/dscm, respectively (see discussion in Sections IV and V below), we believe that a BTF design level of 35 μg/dscm is achievable, reasonable, and appropriate for new HWIs. To ensure that a source that is designed to meet a LVM level of 35 μg/dscm can meet the standard 99 percent of the time (assuming the source has average within-test condition emissions variability for sources equipped with ESPs and FFs), the Agency has established a standard of 60 μg/dscm.

We note that LVM emissions at this level are not likely to result in additional regulation of these sources to satisfy RCRA health risk concerns.

As discussed elsewhere in today's proposal, we are encouraging but not requiring sources to document compliance with the metals standard using a multi-metal continuous monitoring system (CEMS). Given that available information indicates that a multi-metal CEMS could not effectively detect LVM emissions below 80 μg/dscm, we are proposing an alternative standard of 80 μg/dscm for sources that elect to document compliance with a CEMS.

7. HCl and Cl_2 Standards for New HWIs

a. MACT New Floor. The single best performing source in our database for HCl and Cl_2 emissions was a source equipped with a wet scrubber with a MTEC of 1.7E7 μg/dscm. The Agency considered any wet scrubber to be equivalent technology. Thus, MACT new floor control is defined as wet scrubbing with a MTEC up to 1.7E7 μg/dscm. When we considered emissions data from all sources equipped with this level of control, we identified a floor level of 280 ppmv.

b. Beyond-the-Floor Considerations. The Agency believes that state-of-the-art wet scrubbers can readily achieve better than 99 percent removal of HCl and Cl_2. Applying this removal efficiency to the test condition in our database with the highest average emission (i.e., 1,100 ppmv; no emission control device) results in an emission of 11 ppmv. We do not believe, however, that it is necessary to establish a BTF (design) level[68] this low for HCl and Cl_2. Accordingly, we believe that it is reasonable and appropriate to establish a design level of 25 ppmv which corresponds to a statistically-derived standard of 67 ppmv.[69]

We note that this level is consistent with the levels we are proposing for new CKs (67 ppmv BTF level) and new LWAKs (62 ppmv floor level). Further, we note that HCl and Cl_2 emissions at this level are not likely to result in additional regulation of these sources to satisfy RCRA health risk concerns.

8. Carbon Monoxide and Hydrocarbon Standards for New HWIs

As with existing sources, CO and HC in conjunction with PM remain the parameters of choice to monitor continuously for controlling non-dioxin organics. Current regulations require continuous monitoring of CO, but not of HC, and so the database of CO from incinerators is quite extensive. However, the format of our CO data is mostly on a run average basis as explained above. The CO levels of the best performing facility in this database are less than 10 ppmv hourly rolling average (HRA). The technology to achieve low level of non-dioxin organics is "Good Combustion Practices", which is the same as for existing sources.

As such, we are proposing the same MACT standards for CO and HC as for existing sources, but request comments on whether more stringent standards would be more appropriate for new sources. The promulgated standard for new large MWCs ranges from 50 to 150 ppmv based on type of the device and the Agency would like to consider more stringent levels for CO and HC that are representative of good combustion practices in new HWIs in the final rule.

9. MACT New Cost Impacts

The annualized incremental costs (capital, operation and maintenance) for a small, medium and large HWI based on today's proposed control levels are estimated at $336K, $514K and $772K, respectively. Major increases are due to installing FF, activated carbon injection (for D/F and Hg control) and scrubbing devices (for acid gas control). For this analysis, it was assumed that baseline facilities can comply with existing regulations using a wet scrubber and venturi-scrubber. Since the number of new facilities starting construction every year is uncertain, total annualized incremental cost for all the new HWIs in the U.S. due to today's proposal cannot be estimated. The above costs include increased costs of APCS' needed above baseline levels, and do not include costs of the main incinerator system or the ancillary systems like fans, stack etc. Details of these costs have been provided in the "Regulatory Impact Assessment for the Proposed Hazardous Waste Combustion MACT Standards".

C. Evaluation of Protectiveness

In order to satisfy the Agency's mandate under the Resource Conservation and Recovery Act to establish standards for facilities that manage hazardous wastes and issue permits that are protective of human health and the environment, the Agency conducted an analysis to determine if the proposed MACT standards satisfy RCRA requirements, or whether independent RCRA standards would be needed. These analyses were designed to assess both the potential risks to individuals living near hazardous waste combustion facilities who are highly exposed and risks to other less exposed individuals living near such facilities. The Agency evaluated potential risks both from direct inhalation exposures and from indirect exposures through deposition onto soils and vegetation and

[67] That is, the log mean of runs for the test condition in the expanded MACT pool with the highest average emission. A within-test condition emissions variability factor (based on test conditions in the expanded MACT pool) is added to the log-mean for this test condition to derive the standard.

[68] An emissions variability factor would be added to the log-mean of the runs of this test condition to derive a standard.

[69] The variability factor is based on within-test condition emissions variability for incinerators equipped with wet scrubbers.

subsequent uptake through the food chain. The Agency evaluated a variety of exposure scenarios representing various populations of interest, including subsistence farmers, subsistence fishers, recreational anglers, and home gardeners.[70] In characterizing the risks within these populations of interest, both high-end and central tendency exposures were considered.

The primary exposure parameter considered in the high-end characterization was exposure duration. For the baseline, 90th percentile stack gas concentrations were also included in the high-end characterization to reflect the variability in current emissions. For dioxins at the floor, the high-end characterization also included 90th percentile stack gas concentrations to reflect the large variation in dioxin emissions using the floor technology (i.e., temperature control). For the MACT standards, the Agency used the design value which is the value the Agency expects a source would have to design in order to be assured of meeting the standard on a daily basis and hence is always a lower value than the actual standard for all HAPs controlled by a variable control technology.[71] The procedures used in the Agency's risk analyses are discussed in detail in the background document for today's proposal.[72]

The risk results for hazardous waste incinerators are summarized in Table III.C.1 for cancer effects and Table III.C.2 for non-cancer effects for the populations of greatest interest, namely subsistence farmers, subsistence fishers, recreational anglers, and home gardeners. The results are expressed as a range where the range represents the variation in exposures across the example facilities (and example water bodies for surface water pathways) for the high-end and central tendency exposure characterizations across the exposure scenarios of concern. For example, because dioxins bioaccumulate in both meat and fish, the subsistence farmer and subsistence fisher scenarios are used to determine the range.[73]

TABLE III.C.1.—INDIVIDUAL CANCER RISK ESTIMATES FOR INCINERATORS [1]

	Dioxins	Semi-volatile metals [2]	Low volatile metals [3]
Existing Sources			
Baseline	2E–9 to 9E–5	4E–9 to 7E–7	2E–10 to 4E–6
Floor	3E–9 to 5E–5 [4]	5E–8 to 5E–7	5E–8 to 8E–6
BTF	3E–9 to 2E–6 [5].		
New Sources			
Floor	3E–9 to 5E–5 [4]	5E–8 to 5E–7	5E–8 to 8E–6
BTF	3E–9 to 2E–6 [5].		
CEM Option [6]		2E–8 to 2E–7	4E–8 to 6E–6

[1] Lifetime excess cancer risk.
[2] Carcinogenic metal: cadmium.
[3] Carcinogenic metal: arsenic, beryllium, and chromium (VI).
[4] Based on 20 ng/dscm TEQ, the highest level known to be emitted at the floor.
[5] Based on 0.20 ng/dscm TEQ.
[6] Based on SVM standard of 60 μg/dscm and LVM standard of 80 μg/dscm (applicable only if the source elects to document compliance using a multi-metals CEM).

TABLE III.C.2.—INDIVIDUAL NON-CANCER RISK ESTIMATES FOR INCINERATORS [1]

	Semi-volatile metals [2]	Low volatile metals [3]	Hydrogen chloride	Chlorine
Existing Sources				
Baseline	<0.001 to 0.02	<0.001 to 0.2	0.001 to 0.05	0.008 to 0.7
Floor	<0.001 to 0.01	<0.001 to 0.09	0.02 to 0.05 [4]	0.07 to 0.3 [5]
New Sources				
Floor	<0.001 to 0.01	<0.001 to 0.09	0.02 to 0.05 [4]	0.07 to 0.3 [5]
BTF	<0.001 to 0.003	<0.001 to 0.03	0.004 to 0.01 [4]	0.02 to 0.07 [5]
CEM Option [6]	<0.001 to 0.004	<0.001 to 0.06.		

[1] Hazard quotient.
[2] Cadmium and lead.
[3] Antimony, arsenic, beryllium, and chromium.
[4] HCl+Cl_2 assuming 100 percent HCl.
[5] HCl+Cl_2 assuming 10 percent Cl_2.
[6] Based on SVM standard of 60 μg/dscm and LVM standard of 80 μg/dscm (applicable only if the source elects to document compliance using a multi-metals CEM).

[70] In addition, the Agency evaluated a "most exposed individual" for the purpose of assessing inhalation risks. A most exposed individual (MEI) is operationally defined as an individual who resides at the location of maximum predicted ambient air concentration.

[71] For the semi-volatile and low volatility metals categories, the Agency assumed the source could emit up to the design value for each metal in the category for the purpose of assessing protectiveness.

[72] "Risk Assessment Support to the Development of Technical Standards for Emissions from Combustion Units Burning Hazardous Wastes: Background Information Document," February 20, 1996.

[73] For the semi-volatile and low volatility metals categories, the inhalation MEI scenarios are also used. For hydrogen chloride and chlorine (Cl_2) only the inhalation MEI scenarios are used.

The risk analysis indicates that for the semi-volatile and low volatility metals category, the MACT standards for incinerators are protective at the floor for both existing and new sources. The analysis indicates that the CEM compliance option for new sources is also protective. For hydrogen chloride and chlorine (Cl_2), the MACT standards for incinerators are also protective at the floor for both existing and new sources. However, the analysis indicates that for dioxins the proposed beyond the floor standards, rather than the floor levels, are protective.

IV. Cement Kilns: Basis and Level for the Proposed NESHAP Standards for New and Existing Sources

Today's proposal would establish new emission standards for dioxins/furans, mercury, semivolatile metals (cadmium and lead), low volatile metals (arsenic, beryllium, chromium and antimony), particulate matter, acid gas emissions (hydrochloric acid and chlorine), particulate matter (PM), hydrocarbons, and carbon monoxide (for the by-pass duct) from existing and new hazardous waste-burning cement kilns. See proposed § 63.1204. The following discussion addresses how MACT floor and beyond-the-floor (BTF) levels were established for each HAP, and EPA's rationale for the proposed standards. The Agency's overall methodology for MACT determinations has been discussed in Part Three, Sections V and VI for existing sources and in Section VII for new sources.

To conduct the MACT floor analyses presented today, the Agency compiled all available emissions data from hazardous waste-burning cement kilns. As noted earlier, the vast majority of this database is comprised of compliance test emissions data generated as a result of Boiler and Industrial Furnace (BIF) rule requirements.[74] The Agency is also aware that additional emissions data will become available. Sources of new data include test reports generated from compliance recertification testing (required every three years under the BIF rule for interim status facilities; see § 266.103(d)), results from voluntary industry initiatives and testing programs, supplemental emissions testing conducted by individual companies, and data from pilot-scale research by EPA's Office of Research and Development. As timely and appropriate, notice of these additional data, if used as a basis for standards in this rulemaking, will be published to allow for review. However, we emphasize again that, for purposes of setting MACT standards, it is preferable to have data that reflect the normal, day-to-day operations and emissions. In addition, the Agency believes that this type of data will substantially assist in the appropriate resolution of some of the issues (e.g., variability, proper identification of sources in MACT floor pools, raw material feed contributions to emissions) that are raised in the following sections. We invite commenters to submit this type of data and to discuss these issues in their comments.

In addition, the Agency requests comments on whether we should use emissions data from cement kilns that no longer burn hazardous waste for MACT floor determinations.[75] Even though these cement kilns subsequently decided to stop burning waste, we believe that their emissions data represent the level of emission control achieved at a kiln burning hazardous waste and are therefore appropriate for use in a MACT analysis. Moreover, the air pollution control equipment employed by these facilities is similar in type, design and operation to equipment employed by the waste-burning industry as a whole.

The Agency conducted a preliminary analysis of the effect on MACT floor levels of removing these emissions data from consideration, and found no significant impacts (see discussion later in this section on MACT floor levels) other than for semivolatile metals and hydrocarbons in the by-pass duct. The SVM floor would rise from 57 µg/dscm (today's proposed floor level) to approximately 1200 µg/dscm.[76] This level is much higher than the cement industry can achieve.[77] Also, the Agency notes that a SVM floor of 1200 µg/dscm may necessitate the need to consider adopting further controls under RCRA to address potential risks that SVMs (especially cadmium) may pose.[78]

In addition, the by-pass duct HC floor would be affected because two-thirds of the HC data available to the Agency were generated by these cement plants and would no longer be considered in the analysis. This may make calculation of the HC MACT floor problematic using the current MACT approach due to the limited remaining emissions data. The remainder of the HAP floors would remain roughly at today's proposed levels.

If EPA were to decide to exclude data from cement kilns that no longer burn hazardous waste, the Agency then believes that emission data from cement kilns that have made significant modifications or retrofits to their manufacturing process (e.g., replacing a raw material with one with different characteristics, installing new control equipment) since the earlier emissions data were generated must also be considered for exclusion from MACT analysis. The Agency requests comment on whether we should use these emissions data (i.e., the data generated prior to significant process changes) in MACT analysis. The commenter should also address how the Agency could identify cement kilns that have made significant process changes and the scope of modifications or retrofits that would significantly impact emissions. Finally, since changes can affect some HAP emissions and not others, the commenter should address whether this issue should be decided on an individual HAP basis.

A. Summary of Standards for Existing Cement Kilns

This section summarizes EPA's rationale for identifying MACT for existing cement kilns that burn hazardous waste and the proposed emission limits. The discussion of MACT includes discussions of "floor" controls and considerations of "beyond-the-floor" controls. Table IV.4.A.1 summarizes the proposed emission limits.

[74] By August 21, 1992, or by the applicable date allowed by an extension by the Regional Administrator, owners and operators of BIF facilities burning hazardous waste were required to conduct compliance testing and submit a certification of compliance with the emissions standards for individual toxic metals, HCl, Cl_2, particulate matter, and CO, and where applicable, HC and dioxin/furans. See 40 CFR § 266.103(c).

[75] Cement kilns no longer burning hazardous waste include three Southdown plants (Fairborn, OH, Knoxville, TN, and Kosmosdale, KY) and North Texas Cement (Midlothian, TX).

[76] The Agency notes that we are also taking comment on a SVM floor level of 160 µg/dscm (using an alternative approach discussed later in this section). A SVM floor level of 1200 µg/dscm appears unnecessarily high considering our proposed floor analysis and that of others (e.g., see Part Four, section 9).

[77] See letter from Craig Campbell, CKRC, to James Berlow, EPA, undated but received February 20, 1996. We note that, although the Agency is proposing a SVM standard of 57 µg/dscm, we invite comment on an alternative (and potentially preferable) approach to identify MACT floor technology which would result in a floor-based standard of 160 µg/dscm. See discussion on SVM floor later in this section. Because we identified the alternative approach late in the rule development process, we are inviting comment on the higher standard rather than proposing it.

[78] The Agency doubts that a MACT beyond-the-floor level would be warranted.

TABLE IV.4.A.1.—PROPOSED EMISSION STANDARDS FOR EXISTING CEMENT KILNS

HAP or HAP surrogate	Proposed standard [a]
Dioxin/furans (TEQ)	0.20 ng/dscm (TEQ).
Particulate Matter	69 mg/dscm (0.030 gr/dscf).
Mercury	50 µg/dscm.
SVM (Cd, Pb)	57 µg/dscm.
LVM (As, Be, Cr, Sb)	130 µg/dscm.
HCl+Cl_2 (total chlorides).	630 ppmv.
Hydro-carbons:	
Main Stack [b]	20 ppmv.
By-pass Stack [c]	6.7 ppmv.
Carbon Monoxide:	
Main Stack	N/A.
By-pass Stack [c]	100 ppmv.

[a] All emission levels are corrected to 7 percent O_2.

[b] Applicable only to long wet and dry process cement kilns (i.e., not applicable to preheater and/or precalciner kilns).

[c] Emissions standard applicable only for cement kilns configured with a by-pass duct (typically preheater and/or precalciner kilns). Source must comply with either the HC or CO standard in the by-pass duct. A long wet or long dry process cement kiln that has a by-pass duct has the option of meeting either the HC level in the main stack or the HC or CO limit in the by-pass duct.

1. Dioxin/Furans

a. MACT Floor. The Agency's analysis of dioxin/furan (D/F) emissions from HWCs and other combustion devices (e.g., municipal waste combustors and medical waste incinerators) indicates that temperature of flue gas at the inlet of the PM control device can have a major effect on D/F emissions.[79] D/F emissions generally decrease as the gas temperature of the PM control device decreases, and emissions are lowest when the gas temperature of the PM control device are below the optimum temperature window for D/F formation—450 °F to 650 °F.[80] Given that CKs operate their ESPs and FFs under a range of temperatures (i.e., from 350 °F to nearly 750 °F), the Agency is identifying MACT floor for D/F based on temperature control at the inlet to the ESP or FF.[81]

The emissions data for CKs includes results from 58 test conditions collected from 19 cement plants, with a total of 28 kilns being tested. The Agency's database shows that the average test condition D/F emissions ranged from 0.004 to nearly 50 ng/dscm (TEQ).

Kilns emitting D/F at or below levels emitted by the median of the best performing 12 percent of kilns had flue gas temperatures at or below 418°F at the inlet to the ESP or FF, while inlet temperatures for other kilns ranged to nearly 750°F. The Agency then evaluated D/F emissions from all kilns that operated the ESP or FF at 418°F or less and determined that 75 percent had D/F emissions less than 0.2 ng/dscm (TEQ). The other 25 percent of kilns generally had TEQs less than 0.8 ng/dscm (TEQ), although one kiln emitted 4.7 ng/dscm (TEQ).

The Agency is, therefore, identifying temperature control at the inlet to the ESP or FF at 418 °F as the MACT floor control. Given that 75 percent of sources achieve D/F emissions of 0.20 ng/dscm (TEQ) at that temperature, the Agency believes that it is appropriate to express the floor as "0.20 ng/dscm (TEQ), or (temperature at the inlet to the ESP or FF not to exceed) 418 °F". This would allow sources that operate at temperatures above 418 °F but that achieve the same D/F emissions as the majority of sources that operate below 418 °F (i.e., 0.20 ng/dscm (TEQ)) to meet the standard without incurring the expense of lowering the temperature at the ESP or FF.

EPA estimates that over 50 percent of CKs currently are meeting the floor level. The national annualized compliance cost [82] for CKs to reduce D/F emissions to 0.20 ng/dscm (TEQ) or control ESP or FF inlet temperature to below 418 °F would be $7.3 million for the entire hazardous waste-burning cement industry, and would reduce D/F TEQ emissions nationally by 830 grams/year (TEQ) or 96 percent from current baseline emissions.

b. Beyond-the-Floor (BTF) Considerations. The Agency has identified activated carbon injection (CI) at less than 400 °F as a BTF control for D/F for cement kilns because CI is currently used in similar applications such as hazardous waste incinerators, municipal waste combustors, and medical waste incinerators. The Agency is not aware of any CK flue gas conditions that would preclude the applicability of CI or inhibit the performance of CI that has been demonstrated for other waste combustion applications.

Carbon injection has been demonstrated to be routinely effective at removing greater than 95 percent of D/F for MWCs and MWIs and some tests have demonstrated a removal efficiency exceeding 99 percent at gas temperatures of 400 °F or less.[83] To determine a BTF emission level, the Agency considered the emission levels that would be expected to result from gas temperature control to less than 400 °F combined with CI.

To estimate emissions with temperature control only, the Agency considered the MACT floor database that indicates, as noted above, 25 percent of CKs operating the ESP or FF at temperatures above 418°F could be expected to emit D/F at levels above 0.2 ng/dscm (TEQ). Although the majority could be expected to emit levels of 0.8 ng/dscm (TEQ) or below, some could be expected to emit levels as high as 4.7 ng TEQ.

When CI is used in conjunction with temperature control, an additional 95 percent reduction in emissions could be expected. Accordingly, emissions with these BTF controls could be expected to be less than a range of 0.04 to 0.24 ng/dscm (TEQ) (i.e., 95 percent reduction from 0.8 ng and 4.7 ng, respectively). Given that CI reductions greater than 95 percent are readily feasible, the Agency believes that it is appropriate to identify 0.20 ng/dscm (TEQ) as a reasonable BTF level that could be routinely achieved.

The Agency notes that, because we have assumed a fairly conservative carbon injection removal efficiency of 95 percent to identify the 0.20 ng/dscm (TEQ) level, we believe that this approach adequately accounts for emissions variability at an individual kiln because CI removal efficiency is likely to be up to or greater than 99 percent. EPA thus believes that it is not necessary to add a statistically-derived variability factor to the 0.20 ng/dscm (TEQ) level to account for emissions variability at an individual kiln. Thus,

[79] USEPA, "Draft Technical Support Document For HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies", February 1996.

[80] For example, consider kiln #1 at the Ash Grove Cement Company in Chanute, Kansas. During BIF certification of compliance testing in 1992, Ash Grove dioxins/furans emissions exceeded 1.7 ng/dscm (TEQ) at a control device temperature of 435 °F. Testing in 1994 at a temperature of approximately 375 °F resulted in emissions less than 0.05 ng/dscm (TEQ).

[81] The Agency notes, however, that other factors can affect D/F emissions including presence of precursors in the feed or as a result of incomplete combustion and presence of compounds thought to inhibit surface-catalyzed formation of D/F such as sulfur. Thus, D/F emissions may be low (e.g., 0.2 ng TEQ per dcsm) even though the temperature of stack gas at the inlet to the ESP or FF may exceed 400–450 °F, and D/F emissions may be relatively high (e.g., 0.3–0.5 ng TEQ per dscm) even though the temperature may be below that range.

[82] Total annual compliance costs are before consolidation and do not incorporate market exit resulting from the proposed rule. Also, CEM costs assume that no facilities currently have a HC analyzer in place. Thus, these compliance costs may result in overstated annual compliance costs. See the "Second Addendum to the Regulatory Impact Assessment for Proposed Hazardous Waste Combustion MACT Standards", February 1996, for details.

[83] USEPA, "Draft Technical Support Document for HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies", February 1996.

the 0.20 ng/dscm (TEQ) BTF level represents the proposed emission standard.

EPA solicits comment on this approach, and notes that if a statistically-derived variability factor were deemed appropriate with the assumed conservative CI removal efficiency, the BTF level of 0.20 ng/dscm (TEQ) would be expressed as a standard of 0.31 ng/dscm (TEQ). We note, however, that under this approach, it may be more appropriate to use a less conservative, higher CI removal efficiency of 99 percent (i.e., because emissions variability would be accounted for using statistics rather than in the engineering decision to use a conservative CI removal efficiency). Doing so would lower the 0.20 ng/dscm (TEQ) level to approximately 0.04 ng/dscm (TEQ) (i.e., 99 percent reduction from 0.8 ng and 4.7 ng results in levels of 0.008 ng to 0.047 ng/dscm (TEQ), respectively, and 0.04 ng is a reasonable value within this range). If so, the D/F standard would be about 0.15 ng/dscm (TEQ) (i.e., 0.04 ng/dscm TEQ plus the variability factor of 0.11 ng/dscm TEQ).

We note that although CI is normally a relatively inexpensive control technology to add to sources (with flue gas above the dew point) that already have PM controls at the 69 mg/dscm level, CKs present a special situation. This is because: (1) CI will remove Hg as well as D/F (see discussion below regarding BTF control for Hg); (2) CKs recycle as much collected PM as possible because it is useful raw material and doing so reduces cement kiln dust (CKD) management cost; (3) some CKs recycle the CKD by injecting it at the raw material feed end of the kiln where the D/F may not be destroyed; and (4) to remove Hg from the recycling system to ensure compliance with the Hg standard, a portion of the CKD would have to be wasted.[84]

Accordingly, EPA has assumed that CKs that have to use CI to meet the BTF standard (i.e., those that cannot achieve the standard with temperature control alone) would install the CI system after the existing ESP or FF and add a FF to remove the injected carbon with the adsorbed D/F (and Hg). Although adding a new FF in series is an expensive approach, it would enable CKs to meet both the proposed D/F and Hg standards (as well as the PM, SVM, and LVM standards). Thus, the cost of the CI and FF systems have been apportioned among these proposed standards.

EPA estimates that 40 percent of CKs are currently meeting this BTF level. The national incremental annualized compliance cost for the remaining CKs to meet this BTF level[85] rather than comply with the floor controls would be $6.6 million for the entire hazardous waste-burning cement industry, and would provide an incremental reduction in D/F (TEQ) emissions nationally beyond the MACT floor controls of 20 grams/year (TEQ).

EPA has considered costs in relation to emissions reductions and the special bioaccumulation potential that D/F pose and determined that proposing a BTF limit is warranted.[86] D/F are some of the most toxic compounds known due to their bioaccumulation potential and wide range of health effects at exceedingly low doses, including carcinogenesis. Further, as discussed elsewhere in today's preamble, EPA's risk analysis developed for purposes of RCRA shows that emissions of these compounds from hazardous waste-burning cement kilns could pose significant risks by indirect exposure pathways, and that these risks would be reduced by BTF controls. Finally, EPA is authorized to consider this non-air environmental benefit in determining whether to adopt a BTF level. As noted earlier, exposure via these types of indirect pathways was in fact a chief reason Congress singled out D/F for priority MACT control in section 112(c)(6).

Finally, EPA's initial view is that it may need to adopt further controls under RCRA to control D/F if it did not adopt the BTF MACT standard. This would defeat one of the purposes of this proposal, to avoid regulation of emissions under both statutes for these sources wherever possible. These risks would, however, be reduced to acceptable levels if emissions levels are reduced to 0.20 ng/dscm (TEQ).

For these reasons, the Agency is proposing a BTF level of 0.20 ng/dscm (TEQ) for D/F emitted from hazardous waste-burning cement kilns.

2. Particulate Matter

a. MACT Floor. Cement kilns have high particulate inlet loadings to the control device due to the nature of the cement manufacturing process; that is, a significant portion of the finely pulverized raw material fed to the kiln is entrained in the flue gas entering the control device. CKs use ESPs or FFs to control PM to a 0.08 gr/dscf standard under the BIF rule, unless the kiln is subject to the more stringent New Source Performance Standard (NSPS) (see 40 CFR 60.60 (Subpart F)) of 0.3 lb/ton of raw material feed (dry basis) to the kiln,[87] which is generally equivalent to 69 mg/dscm or 0.03 gr/dscf.

The PM emissions data for CKs includes results from 54 test conditions collected from 26 facilities, with a total of 34 units being tested. The Agency analyzed all available PM emissions data and determined that sources with emission levels at or below the level emitted by the median of the best performing 12 percent of sources used fabric filters with air-to-cloth (A/C) ratios of 2.3 acfm/ft^2 or less. Analysis of emissions data from all CKs using FFs with the 2.3 acfm/ft^2 A/C ratio or less resulted in a level of 0.065 gr/dscf.

Because the NSPS is a federally enforceable limit that many cement kilns are currently subject to, the Agency has chosen the existing NSPS standard, not the statistically-derived limit discussed above, as MACT for existing hazardous waste-burning CKs. Thus, the Agency is identifying a MACT floor for PM and is identifying the floor level as the NSPS limit of 69 mg/dscm (0.03 gr/dscf). Given that the NSPS standard was promulgated in 1971, the Agency believes that it is reasonable to consider it as the MACT floor level. We note further that 30 percent of cement kiln test conditions currently meet the 69 mg/dscm floor level.

As mentioned above, the NSPS standard for PM is expressed as 0.3 lb/ton of raw material (dry basis) feed to the kiln. Although we are proposing to establish the floor level as the MACT standard (see BTF discussion below) expressed as 69 mg/dscm (0.03 gr/dscf), we specifically invite comment on whether the standard should be expressed in terms of raw material feed. We are proposing a "mg/dscm" basis for the standard because a PM concentration in stack gas is commonly used for waste combustors-hazardous waste incinerators, municipal waste

[84] We note that most CKs currently dispose of a portion of CKD to control clinker quality (i.e., to control alkali salts). Nonetheless, the economics of CKD management are uncertain at this time given impending Agency action to ensure proper management. Thus, we believe that CKs will increase efforts in the future to minimize the amount of CKD that is disposed.

[85] We note that not every source with D/F emissions currently exceeding 0.20 ng TEQ per dscm would need to install CI to meet the standard. As noted previously in the text, 75 percent of sources could be expected to meet the standard with temperature control only. In estimating the cost of compliance with the standard, EPA considered the magnitude of current emissions and current operating temperatures to project whether the source could comply with the standard with temperature control only.

[86] We note that the D/F BTF control technology, CI, would also be used to control mercury emissions beyond the floor.

[87] See § 60.62 Standard for particulate matter for further details.

combustors, and medical waste incinerators. We note, however, that using a "mg/dscm" basis for the CK standard would penalize the more thermally efficient dry kilns (generally preheater and precalciner kilns). This is because these kilns have lower stack gas flow rates per ton of raw material feed because they do not need to provide additional heat (by burning hazardous waste and/or fossil fuel) to evaporate the water in the raw material slurry. Thus, wet kilns have higher gas flow rates per ton of raw material than dry kilns because of increased combustion gas and water vapor. This higher stack gas flow rate dilutes the PM emissions and effectively makes a concentration-based standard less stringent for wet kilns. Consequently, the Agency will consider whether the final rule should express the floor standard as 0.3 lb/ton of raw material (dry basis) feed to the kiln.

EPA estimates that 30 percent of cement kiln test conditions (in our database) are currently meeting the floor level. The national annualized compliance cost for the remaining CKs to reduce PM emissions to the floor level would be $6.5 million for the entire hazardous waste-burning cement industry, and would reduce PM emissions nationally by 2400 tons per year.

b. Beyond-the-Floor Considerations. EPA considered but is not proposing a more stringent beyond-the-floor level (e.g., 35 mg/dscm (0.015 gr/dscf)) for cement kilns. For this analysis, EPA determined that it does not have adequate data to ensure that, given the high inlet grain loading caused by entrained raw material, CKs can routinely achieve that emission level day-in and day-out with a single PM control device—ESP or FF. We note that, to ensure compliance with a 35 mg/dscm standard 99 percent of the time, a source with average emissions variability must be designed and operated to achieve an emission level of approximately 18 mg/dscm (or 0.008 gr/dscf). EPA estimates that 15 percent of CKs currently have average PM emissions below 18 mg/dscm.

Reducing the floor level from 69 mg/dscm to a BTF level of 35 mg/dscm would require an improved technology such as the use of more expensive fabric filter bags (e.g., bags backed with a teflon membrane) or the addition of a FF for kilns with ESPs. The addition or upgrade of FFs to all kilns could potentially be cost effective, since to meet the proposed floor for SVM and LVM, as well as the proposed BTF for D/Fs and Hg, addition of a new FF is projected for a majority of the kilns (about 80 percent). Thus, a PM BTF level of 18 mg/dscm may be the incremental cost between a fabric filter with conventional fiberglass bags and state-of-the-art membrane-type bags for those kilns currently employing FFs; the addition of new FFs with membrane bags for those kilns with ESPs; or new FFs with membrane bags for the remaining facilities which are not projected to need upgrades to meet the floor and proposed BTF levels.

At first glance it may seem cost effective, primarily since an improved BTF PM level would lead to added benefits with reduced SVM, LVM, and condensed organics emissions. However, the Agency is uncertain how facilities will meet the proposed SVM, LVM, D/FS, and Hg levels. For example, kilns could meet the mercury BTF level with feedrate control or carbon injection without addition of a new FF (potentially incurring the penalty of reduced or eliminated kiln dust recycle). Additionally, CKs could meet the D/F BTF level with PM control device temperature reduction instead of carbon injection with an add-on FF. Finally, kilns could meet the SVM and LVM floor levels with feedrate control.

Therefore, many of the kilns may not add new FFs to comply with proposed floor (e.g., SVM, LVM) or proposed BTF levels (e.g., D/FS, Hg) and EPA's estimated engineering cost to meet the floor has been conservatively overstated. Thus, it may not be accurate to conclude that the BTF for PM is close to the incremental cost between FF fabric types. Under this circumstance, the incremental cost is more accurately the cost of many new FF unit additions which the Agency believes would not be cost effective. For these reasons the Agency believes it is not appropriate to propose a BTF PM standard of 35 mg/dscm for existing CKs. EPA specifically invites comment on whether the final rule should establish a BTF standard for PM of 35 mg/dscm (or 0.15 lb/ton of raw material (dry basis) feed into the kiln).

3. Mercury

a. MACT Floor. Mercury emissions from CKs are currently controlled by the BIF rule, and CKs have elected to comply with the BIF standard by limiting the feedrate of Hg in the hazardous waste feed.[88] Thus, the MACT floor level is based on hazardous waste feed control.

Mercury emissions from cement kilns range from 3 μg/dscm to an estimated 600 μg/dscm. The Agency has Hg emissions data from 42 test conditions collected from 21 cement plants, with a total of 28 kilns being tested. Since mercury is a volatile compound at the typical operating temperatures of ESPs and baghouses, collection of mercury by these control devices is highly variable (e.g., Hg removal efficiencies ranged from zero to more than 90 percent). Most of the mercury exits the kiln system as volatile stack emissions, with only a small fraction partitioning to the clinker product or CKD.

To identify the floor level for hazardous waste feed control, the Agency determined that sources with Hg emissions at or below the level emitted by the median of the best performing 12 percent of sources had normalized hazardous waste Hg feedrates, or MTECs, (i.e., maximum theoretical emission rates[89]) of 110 μg/dscm or less. Analysis of all existing cement kiln sources using this hazardous waste feedrate control resulted in a MACT floor level of 130 μg/dscm. To meet this standard 99 percent of the time, EPA estimates that a source with average emissions variability[90] must be designed and operated to routinely achieve an emission level of 81 μg/dscm.

We note that raw materials and fossil fuels also contribute to cement kiln Hg feedrates and emissions. Given that all sources must be able to meet the floor level using the floor control, we investigated whether all CKs could meet the floor level by only controlling hazardous waste Hg feedrate to the MACT MTEC of 110 μg/dscm. We have determined that all CKs in the Hg emissions database, except for one kiln with apparently anomalous data on mercury in raw material, would be able to meet the floor level using floor control.[91] The one kiln reported substantially higher Hg feedrates in the raw material than other kilns. We believe that this data may either be erroneous or the kiln may have spiked Hg into the raw material during BIF compliance testing. We specifically invite data and comment on the issue of normal Hg content in raw material.

EPA estimates that nearly 80 percent of CKs could currently comply with the floor level. The total annualized compliance cost for the remaining kilns

[88] BIF Hg emission limits are implemented by establishing limits, in part, on the maximum feed rate of Hg in total feedstreams. Feedstream sources of mercury include hazardous waste, Hg spiking during compliance testing, raw material, coal and other fuels.

[89] MTEC is the hazardous waste Hg feedrate divided by the gas flow rate.

[90] This represents the variability of emissions among runs within a test condition included within the expanded MACT pool.

[91] USEPA, "Draft Technical Support Document for HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies", February 1996.

to reduce Hg emissions to the floor level is estimated to be up to $7.5 million for the entire cement industry, and would reduce Hg emissions nationally by 7,200 lbs per year, or by 58 percent from baseline emissions.

b. Beyond-the-Floor Considerations. The Agency has considered two BTF control options for improved Hg control: flue gas temperature reduction to 400°F or less followed by either carbon injection (CI) or carbon bed (CB). Either control option would be implemented in conjunction with hazardous waste feedrate control of Hg. Due to the uncertainty surrounding the actions that cement kilns will undertake in achieving increased Hg control (i.e., with respect to reducing the Hg content of the hazardous waste received at the kiln versus installing the carbon injection technology to capture volatilized mercury without reducing Hg content in the hazardous waste feed), the Agency assumed a conservative emissions level attributable to feedrate control to which the Agency applied the BTF control technology (i.e., 300 μg/dscm). EPA believes that CI systems can routinely achieve Hg emission reductions of 80 to 90 percent or better[92] and that CB systems can routinely achieve Hg emissions of 90 to 99 percent or better.[93]

The BTF level under the CI-controlled option would, therefore, be 50 μg/dscm (corresponding to a design level of 30 μg/dscm), based on 90 percent reduction after the source has controlled its Hg emissions to 300 μg/dscm by limiting Hg in the hazardous waste. As discussed later, EPA is proposing a 50 μg/dscm based on this BTF option.[94]

The BTF level under the CB-controlled option would be 8 μg/dscm (corresponding to a design level of 5 μg/dscm), based on 99 percent reduction after the source has controlled its Hg emissions to 300 μg/dscm by limiting Hg in the hazardous waste.

We note that another control option for identifying BTF levels would be to consider the floor hazardous waste feedrate control—MTEC of 110 μg/dscm or less—an initial component of BTF control followed by either CI or CB. Under this approach, BTF emission levels would be identified by first assuming sources would impose only feedrate controls to meet the floor level of 130 μg/dscm (corresponding to a design level of 81 μg/dscm). Thus, a CI injection system at 90 percent removal could be expected to achieve a standard of 13 μg/dscm (corresponding to a design level of 8.1 μg/dscm). A CB system at 99 percent removal could be expected to achieve a design level of 0.8 μg/dscm to which an emissions variability factor would be added to identify the standard. EPA solicits comment on whether this option of applying BTF reduction based on CI or CB to the floor levels should be adopted.

We also note that an alternative approach to using a statistically-derived variability factor to account for emissions variability would be to assume a more conservative control efficiency for the CI or CB BTF technology. We believe that using a more conservative removal efficiency could be a means to adequately account for emissions variability given that actual emissions using the BTF control would be expected to be lower than the assumed emission level. Under this approach, we would more conservatively assume that CI-controlled systems could achieve a removal efficiency of 80 percent and that CB-controlled systems could achieve an efficiency of 90 percent. When these removal efficiencies are applied, this would result in emission standards of 16 μg/dscm for CI-controlled systems, and 8 μg/dscm for CB-controlled systems[95]. We invite comment on these alternative approaches to account for emissions variability at an individual plant.

EPA believes that CI is a cost-effective BTF control, and is proposing a 50 μg/dscm Hg emission standard based on that control in conjunction with a preceding estimated hazardous waste feedrate control resulting in an emissions level of 300 μg/dscm prior to the CI control. We estimate that 57 percent of CKs are currently meeting this level. The incremental national annualized compliance cost for the remaining CKs to meet this level rather than comply with the floor controls would be $7.8 million, and would provide an incremental reduction in Hg emissions of 2100 lbs per year nationally beyond the MACT floor controls.

We specifically are interested in comment on whether CB is a cost effective BTF control[96]. The CB-based BTF emission level would be 8 μg/dscm (assuming 90 percent removal efficiency). We estimate that 22 percent of CKs are currently meeting this level. The incremental national annualized compliance cost for the remaining CKs to meet this level rather than comply with the floor controls (and proposed CI-based level of 50 μg/dscm) is estimated to be $34.8 million and would provide an incremental reduction in Hg emissions nationally of 5,100 lbs per year from the floor.

The Agency also invites comment on whether special consideration should be given to kilns that may burn hazardous waste with non-detect levels of Hg.[97] Such kilns could be considered to be appropriately regulated, with respect to Hg emissions, by only the standards the Agency is developing for cement kilns that do not burn hazardous waste. Thus, today's proposed Hg standards for waste-burning kilns would be waived. To minimize implementation confusion and difficulties and to accommodate enforcement concerns, if a CK at any time burns hazardous waste with detectable levels of Hg, the kiln would be subject to today's proposed rules at all times, even if it subsequently burned waste with non-detect levels of Hg. Under the waiver, the owner and operator would be required to sample and analyze the hazardous waste as necessary to document that it continues to contain non-detect levels of Hg. We invite comment on whether such a deferral to another MACT standard (yet to be proposed for non-hazardous waste-burning CKs) is workable, given the potential for piece-meal permitting and enforcement.

EPA has considered costs in relation to emissions reductions and the special bioaccumulation potential that Hg poses and determined that proposing a BTF limit is warranted. Hg is one of the more toxic metals known due to its bioaccumulation potential and the adverse neurological health effects at low concentrations especially to the most sensitive populations at risk (i.e.,

[92] Memorandum from Frank Behan, USEPA, to RCRA Docket. Discussion of mercury removal efficiency with activated carbon injection during an emissions test at a Lafarge Corporation cement kiln. February 26, 1996.

[93] USEPA, "Draft Technical Support Document for HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies", February 1996.

[94] To achieve a standard of 50 μg/dscm 99 percent of the time, a source with average emissions variability must be designed and operated to achieve an emission level of 30 μg/dscm.

[95] The same approach could also be utilized with the previously discussed approach of applying the BTF control to an assumed emission level of 300 μg/dscm. When assuming the conservative removal efficiencies of 80 percent for CI and 90 percent for CB, this would result in BTF standards of 60 μg/dscm for CI-controlled systems and 30 μg/dscm for CB-controlled systems. Again a statistically-derived variability factor would not be added because emissions variability is accounted for by assuming conservative removal efficiencies for CI and CB systems.

[96] We also note that, while the Agency does not have information to conclude that application of the carbon bed technology would be problematic for cement kilns, carbon beds have never been tested at a full-scale cement kiln. Thus, we invite comment on the technical feasibility of CB control of Hg emissions from CKs.

[97] We also invite comment on what minimum detection levels would be acceptable.

unborn children, infants and young children). A more detailed discussion of human health benefits for mercury can be found in Part Seven of today's proposal. The indirect exposure pathway resulting from airborne deposition of Hg is of particular concern, and a particular reason that Congress singled out Hg for priority regulation in section 112(c)(6). See S. Rep. No. 228, 101st Cong. 1st Sess. at 153–55, 166. EPA is specifically authorized to take into account such non-air environmental benefits in assessing when to adopt BTF standards. As noted below, hazardous waste-burning cement kilns are a significant source of Hg emissions, and the BTF option will control those emissions from 75 percent over baseline and 47 percent over the floor. EPA believes the cost of controlling this especially dangerous HAP to be warranted in light of the extent of control, magnitude of emissions, limited effect on cost of treating hazardous waste (and no net effect on the cost of cement), and the fact that the control technology, carbon injection, will also control dioxins and furans. Finally, EPA notes that control of Hg at the BTF level should eliminate the uncertainty presently involved in individual RCRA permitting decisions where permit writers may develop site-specific permit limits beyond those required by current regulations if necessary to protect human health and the environment.

4. Semivolatile Metals

a. MACT Floor. Emissions of SVM from CKs are currently controlled under the BIF rule. Kilns use a combination of hazardous waste feedrate control and PM control to comply with those standards. Accordingly, MACT floor control is based on a combination of hazardous waste feedrate control and PM control.

The SVM emissions data for CKs includes results from 45 test conditions collected from 26 cement plants, with a total of 34 kilns being tested. Baseline emissions of the semivolatile metals group (consisting of cadmium and lead) ranged from 3 μg/dscm to slightly over 6,000 μg/dscm. Cadmium and lead are volatile at the usual high temperatures within the cement kilns itself, but typically condense onto the fine particulate at baghouse and ESP temperatures, where they are collected. As a result, control of semivolatile emissions is associated with PM control. However, because of the potential for adsorption for these two metals onto the fine PM that is less effectively collected than larger-sized PM, the control efficiency for semivolatile metals is likely to be lower than that for total PM. As discussed earlier, all cement plants currently use either baghouses or ESPs to control particulate emissions.

The Agency analyzed all available Cd and Pb emissions data and determined that sources with emission levels at or below the level emitted by the median of the best performing 12 percent of sources used fabric filters with air-to-cloth (A/C) ratios of 2.1 acfm/ft^2 or less for a kiln system with a hazardous waste MTEC of 84,000 μg/dscm or less. Analysis of emissions data from all CKs using FFs with the 2.1 acfm/ft^2 A/C ratio and with a HW MTEC of 84,000 μg/dscm or less resulted in a floor level of 57 μg/dscm.

EPA notes that raw materials and fossil fuels also contribute to cement kiln SVM feedrates and emissions. Given that all sources must be able to meet the floor level using the floor control, EPA investigated whether all CKs could meet the floor level employing the MACT technologies without being forced to substitute raw materials. Our preliminary evaluation determined that about 10 percent of sources had raw material containing Cd and Pb in greater concentrations than sources in the expanded MACT pool; thus, these sources may not be able to achieve the floor with MACT alone.[98] Before we reach any final conclusions on this point, the Agency believes that further data are needed on the normal, day-to-day levels of Pb and Cd in raw material feed.

In addition, one approach to address this issue (of sources with higher levels of SVM metals in their raw materials than sources in the expanded MACT pool and that, therefore, cannot meet the floor level using floor control) is to: (1) identify the source with the highest normalized (by MTEC) feedrate of metals in raw material; (2) assume the source is also feeding hazardous waste with the floor control MTEC level of the metals; and (3) project SVM emissions from the source based on combined raw material and hazardous waste MTECs using a representative system removal efficiency (SRE) from the expanded MACT pool considering an appropriate variability factor (e.g., variability of emissions among runs within a test condition in the expanded MACT pool). The Agency has not yet conducted this type of analysis, but intends to do so. Again, we also believe that data reflecting normal, day-to-day levels of Cd and Pb in raw material feed is important in pursuing this avenue of analysis. We invite comment on this approach.

The Agency also notes that the MACT pool for SVM consists entirely of CKs employing FF controls; that is, no cement plants with ESPs are in the MACT pool or expanded MACT pool. EPA believes that well designed, operated, and maintained ESPs can achieve good control of SVMs. In fact several CKS employing ESPs in our database currently achieve the floor level of 57 μg/dscm. Because the Agency is concerned that the SVM floor analysis may be overly exclusive (because comparably designed and operated ESPs were not considered in the MACT floor analysis) in identifying the floor MACT level and technology, EPA specifically requests comment on the merits of the following alternative floor approach. This approach identifies comparably designed and operated ESPs (in our SVM database) equivalent to the MACT FF (and at the MACT MTEC) and includes these sources in the analysis as an "equivalent technology" of MACT. The Agency has identified an ESP with an SCA of 500 ft^2/kacfm or better as an equivalent technology to the MACT FF with an A/C ratio of 2.1 acfm/ft^2. The Agency conducted this analysis and determined that the floor level would increase from 57 to 160 μg/dscm using this approach. To meet this standard 99 percent of the time, EPA estimates that a source with average emissions variability must be designed and operated to routinely achieve an emission level of 99 μg/dscm. EPA investigated whether all CKs could meet the floor level employing the MACT technologies without being forced to substitute raw materials and determined that all CKs (in the SVM emissions database) with the exception of one kiln would be able to meet the 160 μg/dscm level using this less restrictive MACT definition. The Agency specifically requests comment on this alternative floor approach and floor level.

EPA recognizes that PM, SVM, and LVM emissions from cement kilns are similarly controlled, in part, by a good PM control (e.g., ESP, FF). The floor control for SVM (FF with an A/C ratio of 2.1 acfm/ft^2) offers slightly more control than the floor control for LVM (FF with an A/C ratio of 2.3 acfm/ft^2 or an ESP with a SCA of 350 ft^2/kacfm). Thus, the controls necessary to achieve the SVM MACT floor level would appear to be governing for control of these HAPs.

EPA estimates that 33 percent of CKs are currently meeting the floor level of 57 μg/dscm. The national annualized compliance cost for the cement kilns to

[98] USEPA, "Draft Technical Support Document for HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies", February 1996.

reduce SVM emissions to the floor level would be $13.1 million, and would reduce national Pb and Cd emissions by 29 tons per year or 94 percent from current baseline emissions.

b. Beyond-the-Floor Considerations. The Agency considered whether to propose a more stringent level than the floor of 57 μg/dscm, but believes that it would not be appropriate. Since control of SVM emissions is associated with PM control, a more stringent BTF level would require CKs to upgrade to more expensive fabric filter bags (e.g., bags backed with a teflon membrane) or the addition of a FF for kilns with ESPs. Even though the engineering costs to comply with a BTF SVM level would be modest for CKs, the resulting incremental reduction in SVM emissions from the floor level would be minimal. Thus, the Agency believes that lowering the SVM proposed standard is not warranted based on the minimal impact on overall SVM emissions; the floor already provides substantial control by reducing baseline SVM emissions by 94 percent. Thus, the Agency is proposing a MACT floor SVM standard of 57 μg/dscm for existing cement kilns.

5. Low-Volatile Metals

a. MACT Floor. Emissions of LVM from CKs are also currently controlled under the BIF rule. Kilns use a combination of hazardous waste feedrate control and PM control to comply with those standards. Accordingly, MACT floor control is based on a combination of hazardous waste feedrate control and PM control.

The Agency has LVM emissions data which consists of 45 test conditions collected from 26 cement plants, with a total of 35 kilns being tested. Average emissions of the low volatility metals group (arsenic, antimony, beryllium, and chromium) ranged from 4 μg/dscm to 520 μg/dscm. Due to the relatively low volatility of these metals, more than 70 percent of these metals typically partition to the clinker product while the remainder typically condense onto particulate and are collected in the APCD (in this case either an ESP or baghouse). Thus, performance of the control devices is an important factor in controlling LVM emissions.

To identify MACT floor, EPA characterized the LVM controls used by kilns emitting LVM at levels at or below the level emitted by the median of the best performing 12 percent of sources. MACT floor control is thus defined as: (1) a baghouse (i.e., fabric filter) with an air-to-cloth ratio of 2.3 acfm/ft^2 or less with a hazardous waste (HW) MTEC less than 140,000 μg/dscm; or (2) an ESP with specific collection area of 350 ft^2/kacfm with a HW MTEC less than 140,000 μg/dscm. Analysis of available emissions data for all CKs employing either of these controls resulted in a floor emissions level of 130 μg/dscm.

EPA notes that raw materials and fossil fuels also contribute to cement kiln LVM feedrates and emissions. Given that all sources must be able to meet the floor level using the floor control, EPA investigated whether all CKs could meet the floor level employing the MACT controls without being forced to substitute raw material feed. EPA determined that all CKs would be able to meet the floor level using floor control without switching raw materials.[99]

EPA estimates that 80 percent of CKs are currently meeting the floor level. The national annualized compliance cost for the cement kilns to reduce LVM emissions to the floor level would be $2.8 million for the entire hazardous waste-burning cement industry, and would reduce LVM national emissions by 1.7 tons per year or 49 percent from current baseline emissions.

b. Beyond-the-Floor Considerations. The Agency considered whether to propose a more stringent level than the floor of 130 μg/dscm. We determined that proposing such a BTF level is not warranted for several reasons: (1) It would not likely be cost effective; (2) LVM are not of particular concern because they are not bioaccumulative; and (3) establishing the MACT standard at the floor would not trigger the need for a more stringent RCRA standard.

Since control of LVM emissions is associated with PM control, a more stringent BTF level would require CKs to either install new control equipment or to upgrade existing control equipment (e.g., install more expensive FF bags). Even though the engineering costs to comply with a lower LVM BTF level would be moderate, the resulting reduction in LVM emissions is minimal since CK LVM national emissions are estimated to be 1.7 tons/year for the entire industry at the floor. Thus, a LVM BTF standard is not believed to be warranted based on this limited reduction in LVM emissions.

6. Hydrochloric Acid and Chlorine

a. MACT Floor. HCl and Cl_2 (also referred to as total chlorine) emissions from CKs are currently regulated by the BIF rule. CKs use the natural alkalinity of the limestone raw material and hazardous waste feedrate control (of total chlorine and chloride) to comply with those standards. No hazardous waste-burning cement kiln currently employs a dedicated control device (e.g., wet scrubber, venturi scrubber) designed specifically to remove HCl/Cl_2 from the flue gas. Accordingly, MACT floor is based on hazardous waste feedrate control.[100]

The Agency has HCl and Cl_2 emissions data consists of 52 test conditions collected from 26 cement plants, with a total of 35 kilns being tested. Total chlorine emissions from cement kilns range from less than 0.1 ppmv to 220 ppmv. To identify MACT floor, EPA identified the highest hazardous waste feed MTEC (i.e., normalized hazardous waste feedrate of total chlorine) used by kilns emitting HCl/Cl_2 at levels at or below the level emitted by the median of the best performing 12 percent of sources—1.6 g/dscm. The analysis of all available emissions data for kilns with a hazardous waste MTEC for total chlorine of 1.6 g/dscm or less resulted in a floor emissions level of 630 ppmv. Our data indicate that 100 percent of the test conditions in the Agency's database are achieving this floor value.

This determination is confounding given that the highest average emissions from any test condition in the entire database, irrespective of hazardous waste MTEC for total chlorine, was 220 ppmv. This anomalous finding is apparently attributable to: (1) The data set having very high average within-test-condition variability; and (2) adding the average variability factor to the log mean rather than the arithmetic mean of the single test condition with the highest arithmetic mean within the expanded MACT pool (those sources using MACT floor control). If that source had unusually high emissions variability, then the log mean could be substantially higher than the arithmetic mean, resulting in an unusually high emission level to which the variability factor was added.

Because of these concerns, the Agency invites comment on alternative approaches that may identify a more reasonable floor level. One approach could be to add the average variability factor for the data set to the arithmetic mean, rather than the log mean, of the highest test condition in the expanded

[99] USEPA, "Draft Technical Support Document for HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies", February 1996.

[100] Although owners and operators normally have no control over the control provided by raw material alkalinity, we note that kilns equipped with FFs appear to provide better control than kilns equipped with ESPs. This may be due to the longer time of contact between the gas stream and the alkaline dust as the gases pass through the dust bed on the bags.

MACT pool. In addition, if this still resulted in a calculated floor level greater than any emission level in the database, irrespective of hazardous waste MTEC for total chlorine, the floor level could be capped at the highest emission level in the database—220 ppmv.

As for the metals EPA notes that raw materials and fossil fuels also contribute to cement kiln chlorine feedrates and emissions. Given that all sources must be able to meet the floor level using floor control, EPA investigated whether all CKs could meet the floor level employing the MACT controls without being forced to substitute raw material. As discussed above, all CKs would be able to meet the floor level using floor control without switching raw materials.

Sources would not incur cost to comply with the proposed floor level because it is higher than any baseline emission levels in the entire database, and there would be no emissions reductions at the floor level.

b. Beyond-the-Floor Considerations. The neutralization provided naturally by alkaline raw materials essentially acts as a dry scrubber to help control HCl/Cl_2 emissions. Therefore, we do not believe that substantial further reductions could be achieved with the use of dry scrubber systems. Wet scrubbers, however, could be expected to provide 99 percent or greater removal of HCl/Cl_2.

BTF control is therefore being defined as a wet scrubber in conjunction with the floor control for hazardous waste chlorine feedrate (defined by a MTEC of 1.6 g/dscm). Given that the proposed floor level based on hazardous waste chlorine feedrate control only would be 630 ppmv, the resulting BTF level would be 6.3 ppmv (at 99 percent removal).

Selecting a more effective control technology such as a wet scrubber would be expensive and the Agency believes that a BTF level would not be appropriate. For example, in one alternate investigation, we evaluated a 25 ppmv HCl level. The Agency estimated in that case the national incremental annualized compliance cost to meet this level would be $17 million. This represents HCl/Cl_2 emissions reductions of 1,900 tons per year or a 71 percent reduction from baseline emissions. The Agency believes that the total incremental costs associated with a standard of 6.3 ppmv would be approximately equal to the incremental costs at a BTF level of 25 ppmv. We also note that, at a MACT floor standard of 630 ppmv, the Agency would not be required to establish a more stringent standard under RCRA to ensure protection of human health and the environment.

In summary, the Agency is proposing a MACT floor HCl/Cl_2 standard of 630 ppmv for existing cement kilns.

7. Carbon Monoxide and Hydrocarbons

a. MACT Floor. As discussed in Section I above, the Agency believes that control of non-dioxin organic HAP emissions can be achieved, in part, by establishing emissions limits on two surrogate compounds: (1) Carbon monoxide, and (2) hydrocarbons, and also by the presence of controls for D/F. Both CO and HCs are not listed HAPs, but the Agency is using them as surrogates for the enumerated organic HAPs of § 112(b)(1) which can be non-D/F products of incomplete combustion (PICs). The Agency is not proposing main stack MACT standards on carbon monoxide for existing cement kilns for reasons discussed below; however, those kilns with by-pass ducts would be required to either comply with a separate CO or HC limit in the by-pass duct.

i. Carbon Monoxide in the Main Stack. The Agency is not proposing a main stack CO limit because CO is not a universally reliable indicator of combustion intensity and efficiency in cement kilns due to CO generation by process chemistry and evolution from the trace organics in the raw material feedstocks.[101] These feedstocks can generate large quantities of CO emissions which are unrelated to the combustion efficiency of burning the waste and fuel. Whereas all the CO from incinerators is combustion-generated, the bulk of the CO from cement kilns can be the result of process events unrelated to the combustion conditions at the burner where the wastes are introduced, or CO can be produced from CO_2 (contained in the limestone) by dissociation at high sintering conditions. As a result, few cement kilns were able to certify compliance with the CO standard in the BIF rule (§ 266.104(b)), but instead complied with the alternative carbon monoxide standard of § 266.104(c) that allowed CO to exceed the 100 ppmv limit provided that stack gas concentrations of HCs did not exceed 20 ppmv. Thus, the Agency believes it inappropriate to establish a CO standard measured in the main stack for all cement kilns.

ii. Hydrocarbons in the Main Stack. CKs emit hydrocarbon (HC) emissions that result from incomplete combustion of fuels and desorption of trace levels or organic compounds from raw materials. These HC emissions contain organic HAPs. Organics in the raw materials are believed to be primarily from kerogen in the shale and limestone which has a porous structure allowing for organic deposits. These organics cause HC emissions because they are largely not destroyed given that combustion gases flow counter-current to the raw-materials (i.e., fuels are generally fired at the opposite end from where the raw materials are fed).

Even when a CK is operated under good combustion conditions (and thus is generating low or insignificant levels of fuel-related HC), HC levels resulting from organics in the raw materials can range from 10 to 400 ppmv. This makes it problematic to use HC as the only or the principal means to ensure good combustion efficiency of hazardous waste fuels to minimize emissions of toxic PICs (i.e., non-D/F organic HAPs).

Wet Process Kilns and Long Dry Process Kilns. The BIF rule currently limits HC levels in the main stack (i.e., the only kiln off-gas stack) of wet and long dry kilns to 20 ppmv. EPA is aware of five kilns that initially had stack HC levels exceeding the 20 ppmv limit. Four of the kilns changed the source of shale used as raw material to use a shale with lower organic content. (Shale comprises a small fraction of raw material feed.) The fifth kiln feeds limestone with (relatively) high levels of organic matter and has indicated that transporting an alternative source of limestone to the site may be prohibitively expensive. Other potential options, such as installing an afterburner to destroy organics or reconstructing the kiln system to otherwise destroy HC desorbed from the limestone, may likewise be prohibitively expensive approaches.

EPA has determined that MACT floor for HC control for wet and long dry kilns should be control based on the current federally-enforceable BIF standards (i.e., control of organics in raw materials coupled with operating under good combustion practices to minimize fuel-related HC), and the floor level should be the BIF limit of 20 ppmv HC for such kilns. We note further that the source could stop burning hazardous waste and avoid having to comply with the HC floor level.

Cement Kilns with By-pass Ducts. Kilns that are equipped with a by-pass duct (typically preheater or precalciner kilns) to divert a portion of the kiln off-gas to a separate PM control device monitor fuel-related HC separately from raw material-related HC. This is because the by-pass duct diverts the kiln gas before it enters the calcining zone where

[101] See 56 FR at 7150, 7153–55 (February 21, 1991).

the organics from the raw material are desorbed. Thus, in general, fuel-related HC can be monitored in the by-pass duct, and raw material-related HC can be monitored in the main stack. We invite comment on whether hazardous waste fuel combustion by-products (e.g., chlorine) can react with organic compounds desorbed from raw material to form organic HAPs. If the Agency determines that hazardous waste firing can substantially (adversely) affect emissions of organic HAPs from the main stack, then we will consider limiting HC to 20 ppmv. This is the limit we are proposing today for long kilns without a by-pass duct. Monitoring HC in the by-pass is discussed later in this section.

The Agency's RCRA BIF rule does not control HC in the main stack of cement kilns that comply with the BIF HC limit in the by-pass duct because, under the RCRA rule, the Agency was concerned about PICs derived from hazardous waste combustion rather than toxic organics desorbed from raw materials. Therefore, any MACT standard for HC in the main stack of these types of kilns must be a BTF standard since the floor for these sources is uncontrolled, and these CKs do not otherwise control organic HAPs in their stack emissions.

The Agency is concerned that main stack HC emissions contain HAPs for several reasons: (1) Organics desorbed from raw materials, even absent any influence from burning hazardous waste, contain HAPs; (2) it is reasonable to hypothesize that the chlorine released from burning hazardous waste can react with the organics desorbed from the raw material to form generally more toxic chlorinated HAPs; and (3) some preheater and precalciner kilns feed containers of hazardous waste at the preheater or precalciner end of the kiln near the by-pass duct entrance such that hazardous waste PICs may not have time to combust efficiently. We are concerned that these hazardous waste PICs may be emitted from the main stack, and that monitoring of the by-pass duct may not be adequate to determine if inefficient combustion occurs. This is because the by-pass duct gas may not be representative of kiln off-gas when containers of hazardous waste are fed at the off-gas end of the kiln.

However, the Agency does not now have sufficient data to quantify the contribution of hazardous waste (if there is one) to HC emissions in the main stack, and therefore to develop a MACT BTF standard for main stack HC for this class of CKs. We are thus unable to propose controls for HC from main stacks of cement kilns with by-pass stacks. We invite data to remedy this situation as well as comment on this issue. We also invite comment on an alternative of the same 20 ppmv main stack HC standard for this class of cement kilns as for the others.

iii. Emissions Standards for By-pass Ducts.[102] The Agency is proposing that cement kilns with by-pass ducts monitor and comply with either a CO or HC concentration limit in the by-pass duct because levels of CO and HC in the by-pass gas are more representative of combustion efficiency than levels in the main stack.[103] The BIF rule currently limits HC (in the by-pass duct) to 20 ppmv.[104] MACT floor control is operating under good combustion conditions, including conditions that provide adequate oxygen, temperature, turbulence, and residence time. These controls will ensure that kilns with low organic-containing raw materials are operating under good combustion conditions to control PICs formed by the combustion of hazardous waste fuel.[105]

EPA's MACT analysis of the existing by-pass duct data of the best performing sources resulted in a HC MACT floor level of 6.7 ppmv. The Agency's database for CO in the by-pass is incomplete for the purposes of calculating a statistically-derived emission limit, but we believe that it is reasonable and appropriate to establish the by-pass CO floor level at the same level allowed in the BIF rule—100 ppmv. Under this standard the facility would have the option of complying with either the CO or HC standard in the by-pass duct.

The Agency also invites comment on requiring cement kilns with by-pass ducts to comply with both the CO *and* HC standard (measured in the by-pass duct). Given that CO in the by-pass duct should be related only to fuel combustion efficiency, monitoring of CO in addition to HC may be appropriate to ensure complete combustion of organics in the kiln; however, the Agency is concerned that some CO may be generated from the CO_2 by dissociation at high sintering temperatures and thus requests information and data on this option.

Cement kiln sources would not incur costs to comply with the proposed floor level since all cement kilns with by-pass ducts (for which EPA has data) currently meet the floor level for either HC or CO. EPA also notes that approximately half of cement kilns that measured both HC and CO in the by-pass achieved the floor level.

As mentioned above, the Agency is aware of a long wet process cement kiln that is unable to comply with either the CO limit of 100 ppmv or the HC limit of 20 ppmv in the main stack. This kiln cannot achieve either of these levels due to the relatively high organic matter content in the limestone. Since the majority of the raw material fed to the kiln is limestone, substitution with an alternative source of limestone with lower organic content is not readily feasible (e.g., prohibitively expensive transportation costs of a substitute raw material). The facility attempted to retrofit the kiln with a by-pass duct thus allowing monitoring of CO or HC in the by-pass duct as permitted by current BIF regulations. However, efforts to construct and engineer this kiln with a by-pass duct were not successful due to the length of the kiln.[106]

In coordination with state and regional officials, the cement kiln was retrofitted with a mid-kiln sampling port that continuously draws off a portion of the kiln combustion gas for analysis of HC or CO. Since this sampling port does not divert a minimum of 10 percent of the kiln off-gas from the kiln, it does not meet the Agency's current definition of a by-pass duct defined in § 266.104(g). The kiln's mid-kiln sampling port diverts approximately 7 to 8 percent of the kiln off-gas. The Agency specifically invites comment on allowing sources with a mid-kiln sampling port, or other kiln gas extraction mechanism, that is capable of continuously extracting a representative sample of kiln off-gas to comply with

[102] Most precalciner and some preheater kilns are equipped with by-pass ducts where a portion (e.g., 5 to 30 percent) of the kiln exhaust is diverted to a separate APCD, and, sometimes, a separate stack. These gases are typically diverted to avoid a build-up of metal salts that can adversely affect the calcination process.

[103] Provided that: (1) hazardous waste is fired only into the kiln (i.e., not at any location downstream from the kiln exit relative to the direction of gas flow); and (2) the by-pass duct gas is representative of kiln gas. To ensure by-pass gas is representative of kiln gas, the by-pass duct must divert a minimum of 10 percent of kiln off-gas as currently required in the BIF rule. See 266.104(g).

[104] The BIF rule provides for an alternative emissions standard for CO of 100 ppmv. See § 104(f).

[105] When the by-pass duct is vented through a separate stack, compliance with limits on CO or HC would ensure application of MACT regarding fuel-related organic HAPs. When the by-pass is routed back into the main (only) stack, compliance with limits on CO or HC will likewise ensure application of MACT regarding fuel-related organic HAPs. Absent these controls on the by-pass duct, fuel-related organic HAPs could be either: (1) masked by raw material-related HAPs, if the raw material contains substantial organics; or (2) if the raw material contains low levels of organics, the kiln could comply with the main stack standard (if one were proposed) while operating under poor fuel combustion conditions.

[106] For example, the kiln experiences a substantial increase in length due to expansion during start-up as the kiln heats up to operating levels.

the same HC and CO standards proposed for kilns with by-pass ducts. Commenters should specifically address how the gas extraction system ensures that a representable sample of the kiln's fuel combustion gas would be monitored for HC or CO.

b. Beyond-the-Floor Considerations. EPA has considered BTF control for organic HAP emissions from the main stack of all CKs (including those with by-pass ducts) based on use of a combustion gas afterburner. We believe that a BTF level for CO of 50 ppmv and for HC of 6 ppmv are readily achievable with an afterburner, but not appropriate. Therefore, we are not proposing such a BTF standard. EPA has no data indicating that any cement kilns are currently meeting these BTF levels with existing controls. The annualized engineering costs for the cement kilns to meet these BTF levels is estimated to be $280 million, and would provide an incremental reduction in HC emissions nationally beyond the floor controls of approximately 1500 tons per year and 65,000 tons per year for CO.

8. MACT Floor Cost Impacts

The total national annualized compliance costs [107] for existing cement kilns to meet all the MACT floor levels are estimated to be $34 million with the cost per cement kiln averaging $777,000. On a cost per ton of hazardous waste burned, these total compliance costs equate to $40 per ton of waste. We estimate that up to 2 cement facilities will likely cease burning hazardous waste due to the compliance costs associated at the floor.

The Agency is proposing to go beyond-the-floor for two pollutants for existing cement kilns: dioxins/furans and mercury. The total national annualized compliance costs (i.e., total costs not incremental costs from the floor levels) to meet the dioxin/furan and mercury BTF levels in addition to the MACT floor levels for the remaining HAPs are estimated to be $44 million with the cost per cement kiln averaging $1.04 million. On a cost per ton of hazardous waste burned, these total compliance costs increase to $50 per ton of waste. Again, we estimate that up to 2 cement facilities will likely cease burning hazardous waste due to the compliance costs associated with the proposed standards.

[107] Compliance costs represent pre-tax compliance costs. Because compliance costs are tax-deductible, the portion of pre-tax costs borne by the firm would be between 70 and 80 percent of the values shown above, depending on the specific firm's margin tax bracket. See "Regulatory Impact Assessment for Proposed Hazardous Waste Combustion MACT Standards", November 13, 1995, for details.

B. MACT for New Hazardous Waste-Burning Cement Kilns

This section summarizes EPA's rationale for establishing MACT for new cement kilns for each HAP, HAP surrogate, or HAP group. Table IV.4.B.1. summarizes the proposed emissions limits for new cement kilns, which were determined using the analytical process described in Part Three, Section VII and in the technical background document.

TABLE IV.4.B.1.—PROPOSED MACT STANDARDS FOR NEW CEMENT KILNS

HAP or HAP surrogate	Proposed standard [a]
Dioxin/furans (TEQ)	0.20 ng/dscm (TEQ).
Particulate Matter	69 mg/dscm (0.030 gr/dscf).
Mercury	50 μg/dscm.
SVM (Cd, Pb)	55 μg/dscm.
LVM (As, Be, Cr, Sb)	44 μg/dscm.[b]
HCl + Cl_2 (total chlorides).	67 ppmv.
Hydrocarbons:	
Main Stack [c]	20 ppmv.
By-pass Stack [d]	6.7 ppmv.
Carbon Monoxide:	
Main Stack	N/A.
By-pass Stack [d]	100 ppmv.

[a] All emission levels are corrected to 7 percent O_2.

[b] An alternative standard of 80 μg/dscm would apply if the source elects to document compliance using a multi-metals CEM.

[c] Applicable only to long wet and dry process cement kilns (i.e., not applicable to preheater and/or precalciner kilns).

[d] Emissions standard applicable only for cement kilns configured with a by-pass duct (typically preheater and/or precalciner kilns). Source must comply with either the HC or CO standard in the by-pass stack. A long wet or long dry process cement kiln that has a by-pass duct has the option of meeting either the HC level in the main stack or the HC or CO limit in the by-pass duct.

1. MACT New for Dioxins/Furans

a. MACT New Floor. As for existing cement kilns, the Agency is identifying MACT new floor for D/F based on temperature control at the inlet to the ESP or FF. EPA characterized the single best performing source with the lowest TEQ dioxin/furan emissions and determined that the best performing source had an inlet temperature of 409°F or less.

The Agency then evaluated D/F emissions from all kilns that operated the ESP or FF at 409°F or less and determined that 75 percent had D/F emissions less than 0.2 ng/dscm (TEQ). The other 25 percent of kilns generally had TEQs less than 0.8 ng/dscm (TEQ), although one kiln emitted 4.7 ng/dscm (TEQ). The Agency notes that the MACT new expanded pool was virtually identical (with the exception of two test conditions) to the expanded pool of existing sources.

The Agency is, therefore, identifying temperature control at the inlet to the ESP or FF at 409°F as the MACT floor control. Given that 75 percent of sources achieve D/F emissions of 0.20 ng/dscm (TEQ) at that temperature, the Agency believes that it is appropriate to express the floor as "0.20 ng/dscm (TEQ), or (temperature at the inlet to the ESP or FF not to exceed) 409°F". This would allow sources that operate at temperatures above 409°F but that achieve the same D/F emissions as the majority of sources that operate below 409°F (i.e., 0.20 ng/dscm (TEQ)) to meet the standard without incurring the expense of lowering the temperature at the ESP or FF.

b. Beyond-The-Floor Considerations. The Agency has identified activated carbon injection (CI) at less than 400°F as a BTF control for D/F for cement kilns because CI is currently used in similar applications such as hazardous waste incinerators, municipal waste combustors, and medical waste incinerators. The Agency is not aware of any CK flue gas conditions that would preclude the applicability of CI or inhibit the performance of CI that has been demonstrated for other waste combustion applications.

Carbon injection has been demonstrated to be routinely effective at removing greater than 95 percent of D/F and some tests have demonstrated a removal efficiency exceeding 99 percent at gas temperatures of 400°F or less. To determine a BTF emission level, the Agency considered the emission levels that could result from gas temperature control to less than 400°F combined with CI.

As discussed for existing sources, when CI is used in conjunction with temperature control, an additional 95 percent reduction in emissions could be expected. Accordingly, emissions with BTF controls could be expected to be less than a range of 0.04 to 0.24 ng/dscm (TEQ) (i.e., 95 percent reduction from 0.8 ng and 4.7 ng, respectively). Given that CI reductions greater than 95 percent are readily feasible, the Agency believes that it is appropriate to identify 0.20 ng/dscm (TEQ) as a reasonable BTF level that could be routinely achieved.

The Agency notes that, because we have assumed a fairly conservative carbon injection removal efficiency of 95 percent to identify the 0.20 ng/dscm (TEQ) level, we believe that this approach adequately accounts for emissions variability at an individual kiln because CI removal efficiency is likely to be up to or greater than 99 percent. EPA thus believes that it is not

necessary to add a statistically-derived variability factor to the 0.20 ng/dscm (TEQ) level to account for emissions variability at an individual kiln. Thus, the 0.20 ng/dscm (TEQ) BTF level represents the proposed D/F emission standard for new cement kilns.

EPA solicits comment on this approach, and notes that if a statistically-derived variability factor were deemed appropriate, the BTF level of 0.20 ng/dscm (TEQ) would be expressed as a standard of 0.31 ng/dscm (TEQ). We note, however, that under this approach, it may be more appropriate to use a less conservative CI removal efficiency (i.e., because emissions variability would be accounted for using statistics rather than in the engineering decision to use a conservative CI removal efficiency), thus lowering the 0.20 ng/dscm (TEQ) level to approximately 0.04 ng/dscm (TEQ) (i.e., 99 percent reduction from 0.8 ng and 4.7 ng results in levels of 0.008 ng to 0.047 ng/dscm (TEQ), respectively, and 0.04 ng is a reasonable value within this range). If so, the D/F standard would be about 0.15 ng/dscm (TEQ) (i.e., 0.04 ng/dscm TEQ plus the variability factor of 0.11 ng/dscm TEQ).

For similar reasons as discussed for existing cement kilns, the Agency is proposing a BTF standard for D/F of 0.20 ng/dscm (TEQ) for new hazardous waste-burning cement kilns. Costs for new sources are discussed in "Regulatory Impact Assessment for Proposed Hazardous Waste Combustion MACT Standards".

2. MACT New for Particulate Matter

a. MACT New Floor. The Agency analyzed all available PM emissions data and determined that the control used by the single best performing source used a fabric filter with an air-to-cloth (A/C) ratio of 1.8 acfm/ft^2 or less. Analysis of emissions data from all CKs using FFs with the 1.8 acfm/ft^2 A/C ratio or less resulted in a level of 0.065 gr/dscf.

For similar reasons discussed for existing cement kilns, the Agency has chosen the existing NSPS standard (an established regulatory benchmark for PM), not the statistically-derived limit, as the MACT for existing hazardous waste-burning cement kilns. Thus, the Agency is identifying a MACT floor for PM and is identifying the floor level as the NSPS limit of 69 mg/dscm (0.03 gr/dscf) because it is the lowest federally enforceable emission standard.

b. Beyond-the-Floor Considerations. EPA considered but is not proposing a more stringent BTF level (e.g., 35 mg/dscm (0.0105 gr/dscf)) for new cement kilns. For the same reasons discussed for existing sources, the Agency believes that a more stringent level than the floor is not warranted.

3. MACT New for Mercury

a. MACT New Floor. As discussed earlier, hazardous waste-burning cement kilns control their mercury input (and therefore much of their emissions) through control of the mercury content in the hazardous waste. The Agency is defining the MACT floor technology as feedrate control with a hazardous waste MTEC less than 28 μg/dscm based on performance of the best performing source. Analysis of all existing cement kiln sources using this hazardous waste feedrate control resulted in a MACT new floor level of 82 μg/dscm. EPA estimates that a source with average emissions variability must be designed and operated to routinely achieve an emission level of 58 μg/dscm to meet this standard 99 percent of the time. Expanded MACT pools are identical. The MACT new floor analysis results in the same floor as existing sources because their respective expanded MACT pools are identical.

EPA solicits comment on an alternative method to establishing the MACT new floor. Under this alternative, the floor analysis would be similar to the approach proposed today except that the variability factor would be added to the average emissions from the single best performing source. By contrast, under the approach proposed today, the variability factor is added to the emissions of the highest emitting source in the expanded MACT pool. Thus, under this alternative the only purpose that expanding the MACT pool would serve is to identify the variability factor. EPA notes that this approach results in a MACT new floor of 53 μg/dscm (4.4 μg/dscm (average emissions from the best performing source) plus the statistically-derived variability factor of 49 μg/dscm).

b. Beyond-the-Floor Considerations. The Agency has considered the same BTF control alternatives for improved Hg control for new cement kilns: hazardous waste feedrate control of Hg in conjunction with flue gas temperature reduction to 400°F or less followed by either carbon injection (CI) or carbon bed (CB). The BTF design emission level under the CI-controlled option is 30 μg/dscm (assuming a source has controlled its Hg emissions to 300 μg/dscm controlling Hg feed in the hazardous waste). The BTF emission standard corresponding to a design level of 30 μg/dscm would be 50 μg/dscm [108]. The Agency is proposing 50 μg/dscm as the MACT standard for new cement kilns. The Agency specifically requests comment on establishing BTF emission standards based on the alternative approaches discussed for existing cement kilns.

4. MACT New for Semivolatile Metals

a. MACT New Floor. MACT new control is based on hazardous waste feedrate control and PM control. EPA characterized the single best performing source with the lowest SVM emissions and determined that the best performing source used a fabric filter with an air-to-cloth ratio of 2.1 acfm/ft^2 or less for a kiln system with a hazardous waste (HW) MTEC of 36,000 μg/dscm or less. Analysis of all sources (i.e., expanded MACT pool of facilities) using this technology or better resulted in a floor level of 55 μg/dscm for new cement kilns.

EPA solicits comment on an alternative method to establishing the MACT new floor. Under this alternative, the floor analysis would be similar to approach proposed today except that the variability factor would be added to the average emissions from the single best performing source. Thus, the expanded MACT pool serves only to identify the variability factor of the floor technology. EPA notes that this approach results in a MACT new floor of 39 μg/dscm (4 μg/dscm (average emissions from the best performing source) plus the statistically-derived variability factor of 35 μg/dscm).

b. Beyond-the-Floor Considerations. The Agency considered a more stringent level than the floor level of 55 μg/dscm based on improved collection efficiency of the MACT floor FF. Since this level is virtually identical to the floor level for existing sources and considering that EPA is not proposing standards more stringent than the floor for existing sources, the Agency believes for the same reasons that a more stringent floor level is not warranted for new sources as well. Finally, we note that establishing the MACT standard at the floor would not trigger the need for a more stringent standard under RCRA.

5. MACT New for Low-Volatile Metals

a. MACT New Floor. MACT new control is based on hazardous waste feedrate control and PM control. EPA characterized the best particulate control device, and identified the floor technology as a baghouse (i.e., fabric filter) with an air-to-cloth ratio of 2.3 acfm/ft^2 or less with a hazardous waste

[108] To achieve a standard of 50 μg/dscm 99 percent of the time, a source with average emissions variability must be designed and operated to achieve an emission level of 30 μg/dscm.

(HW) MTEC less than 25,000 μg/dscm. Analysis of the expanded MACT pool resulted in a floor emissions level of 44 μg/dscm for new cement kilns.

EPA solicits comment on an alternative method to establishing the MACT new floor. Under this alternative, the floor analysis would be similar to the approach proposed today except that the variability factor would be added to the average emissions from the single best performing source. Thus, the expanded MACT pool only serves to identify the variability factor of the floor technology. EPA notes that this approach results in a MACT new floor of 30 μg/dscm (4 μg/dscm (average emissions from the best performing source) plus the statistically-derived variability factor of 26 μg/dscm).

b. Beyond-the-Floor Considerations. The Agency considered a more stringent level than the floor of 44 μg/dscm based on improved collection efficiency of the MACT floor FF. We initially determined that selecting such a BTF level is not warranted for several reasons: (1) It would not likely be cost effective considering the small increment of LVMs removed; (2) LVM are not of particular concern because they are not bioaccumulative; (3) establishing the MACT standard at the MACT new floor would not trigger the need for a more stringent RCRA standard.

The Agency is proposing an alternative compliance option for LVMs for new cement kilns. Because the Agency anticipates the likelihood of development of a multi-metals continuous emissions monitor (CEM) in the near future and considering that the estimated detection limit for the CEM to be approximately 80 μg/dscm for the LVM metals combined, the Agency is proposing an alternative standard of 80 μg/dscm should the source elect to document compliance using a multi-metals CEM. Thus, the LVM standard is different depending on the compliance method selected.

6. MACT New for Hydrochloric Acid and Chlorine

a. MACT New Floor. Cement kilns use the natural alkalinity of the limestone used as raw material and hazardous waste feedrate control to control HCl and Cl_2 emissions. Thus, the MACT floor is based on hazardous waste feedrate control.

EPA characterized the single best performing source with the lowest HCl/Cl_2 emissions and determined that the best performing source used feedrate control with a hazardous waste (HW) MTEC of 1.6 g/dscm or less. (Combined emissions of HCl and Cl_2 were expressed as HCl equivalents.) Analysis of the expanded MACT pool of facilities resulted in a floor level of 630 μg/dscm for new cement kilns, which is the same result as for existing cement kiln sources because the expanded MACT pools are identical for both existing and new cement kilns.

Again, as discussed for existing cement kilns, this determination is confounding given that the highest average emissions from any test condition in the entire database, irrespective of hazardous waste MTEC for total chlorine, was 220 ppmv. This anomalous finding is apparently attributable to: (1) The data set having very high average within-test-condition variability; and (2) adding the average variability factor to the log mean rather than the arithmetic mean of the test condition within the expanded MACT pool (those sources using MACT floor control) with the highest arithmetic mean. If that source had unusually high emissions variability, then the log mean could be substantially higher than the arithmetic mean, resulting in an unusually high emission level to which the variability factor was added.

Because of these concerns, the Agency invites comment on alternative approaches that may identify a more reasonable floor level. One approach could be to add the average variability factor for the data set to the arithmetic mean, rather than the log mean, of the highest test condition in the expanded MACT pool. In addition, if this still resulted in a calculated floor level greater than any emission level in the database, irrespective of hazardous waste MTEC for total chlorine, the floor level could be capped at the highest emission level in the database—220 ppmv.

b. Beyond-the-Floor Considerations. BTF control is being defined as a wet scrubber in conjunction with the floor control for hazardous waste chlorine feedrate. As discussed earlier for existing systems, more stringent HCl and Cl_2 control based on use of wet scrubbers is readily achievable. The Agency is aware of two cement kilns (not burning hazardous waste) that employ a wet and dry scrubber, respectively, capable of HCl/Cl_2 capture. Wet scrubber use within the hazardous waste incineration industry is well established also, often achieving capture efficiencies exceeding 99 percent. Considering that average HCl/Cl_2 emissions from existing cement kilns range from less than 1 ppmv to 220 ppmv and that a well-designed and operated wet scrubber would be expected to achieve removal efficiencies greater than 90 percent, if not higher, the Agency believes that HCl/Cl_2 control to a standard of 67 ppmv (corresponding to a design level of 25 ppmv [109]) is readily achievable.[110] Thus the Agency is proposing a HCl/Cl_2 standard of 67 ppmv for new cement kilns. See "Regulatory Impact Assessment for Proposed Hazardous Waste Combustion MACT Standards" for further details on the costs.

7. MACT New for Carbon Monoxide and Hydrocarbons

a. MACT Floor. The Agency believes that control of non-dioxin organic HAP emissions (i.e., non-dioxin PICs that are also HAPs) can be achieved by establishing emissions limits on hydrocarbons and carbon monoxide. As discussed earlier for existing cement kilns, the Agency is proposing a MACT standard of 20 ppmv for HCs in the main stack (not applicable for preheater and precalciner kilns), and either a CO limit of 100 in the by-pass duct or HC standard of 6.7 ppmv in the by-pass duct. Thus, the proposed standards for new cement kilns are identical to those for existing kilns.

b. Beyond-the-Floor Considerations. As for existing sources the Agency requests comment on a main stack hydrocarbon standard of 6 ppmv and a carbon monoxide standard of 50 ppmv for all new cement kilns (including those with by-pass ducts) based on performance of a combustion gas afterburner to burn-out incompletely combusted organics that escape the primary combustion zone.

8. MACT New Cost Impacts

A discussion of the costs and economic impacts for new cement kilns is presented in Part Seven of today's proposal.

C. Evaluation of Protectiveness

In order to satisfy the Agency's mandate under the RCRA to establish standards for facilities that manage hazardous wastes and issue permits that are protective of human health and the environment, the Agency conducted an analysis to assess the extent to which

[109] Considering the highest total chlorine data point of 220 ppmv with a 90 percent removal efficiency yields a design level of approximately 25 ppmv.

[110] The Agency notes that assuming a 99 percent capture efficiency would result in a design level of approximately 2.2 ppmv (corresponding to an emission level of 6.7 ppmv). Since the application of wet scrubbers is still limited in the cement industry, EPA believes that a total chlorine standard of 6.7 ppmv is unnecessarily low and is thus assuming a more conservative total chlorine removal efficiency of 90 percent. In addition, the Agency notes that further controls under RCRA would not be necessary at a level of 67 ppmv (corresponding to a design level of 25 ppmv) for new cement kilns.

potential risks from current emissions would be reduced through implementation of MACT standards. The analysis conducted for hazardous waste-burning cement kilns is similar to the one described above for hazardous waste incinerators. The procedures used in the Agency's risk analyses are described in detail in the background document for today's proposal.[111] In evaluating the MACT standards, the Agency used the design value which is the value the Agency expects a source would have to design to in order to be assured of meeting the standard on a daily basis and hence is always a lower value than the actual standard for all HAPs controlled by a variable control technology.[112]

The risk results for hazardous waste-burning cement kilns are summarized in Table IV.4.C.1 for cancer effects and Table IV.4.C.2 for non-cancer effects for the populations of greatest interest, namely subsistence farmers, subsistence fishers, recreational anglers, and home gardeners. The results are expressed as a range where the range represents the variation in exposures across the example facilities (and example waterbodies for surface water pathways) for the high-end and central tendency exposure characterizations across the exposure scenarios of concern. For example, because dioxins bioaccumulate in both meat and fish, the subsistence farmer and subsistence fisher scenarios are used to determine the range.[113]

TABLE IV.4.C.1—INDIVIDUAL CANCER RISK ESTIMATES FOR CEMENT KILNS [1]

	Dioxins	Semi-volatile metals [2]	Low volatile metals [3]
Existing Sources			
Baseline	1E–8 to 9E–5	1E–9 to 4E–7	5E–11 to 5E–7
Floor	4E–9 to 2E–5 [4]	3E–9 to 1E–7	9E–9 to 4E–6
BTF	4E–9 to 2E–6 [5].		
New Sources			
Floor	4E–9 to 2E–5 [4]	3E–9 to 1E–7	3E–9 to 1E–6
BTF	4E–9 to 2E–6 [5].		
CEM Option [6]		3E–9 to 1E–7	1E–8 to 4E–6

[1] Lifetime excess cancer risk.
[2] Carcinogenic metal: cadmium.
[3] Carcinogenic metals: arsenic, beryllium, and chromium (VI).
[4] Based on 0.2 ng/dscm TEQ as a central tendency estimate and 1.4 ng/dscm TEQ as a high-end estimate.
[5] Based on 0.20 ng/dscm TEQ.
[6] Based on SVM standard of 60 μg/dscm and LVM standard of 80 μg/dscm (applicable only if the source elects to document compliance using a multi-metals CEM).

TABLE IV.4.C.2.—INDIVIDUAL NON-CANCER RISK ESTIMATES FOR CEMENT KILNS [1]

	Semi-volatile metals [2]	Low volatile metals [3]	Hydrogen chloride	Chlorine
Existing Sources				
Baseline	<0.001 to 0.06	<0.001 to 0.004	<0.001 to 0.04	<0.001 to 0.06
Floor	<0.001 to 0.004	<0.001 to 0.01	0.01 to 0.1 [4]	0.05 to 0.8 [5]
New Sources				
Floor	<0.001 to 0.004	<0.001 to 0.005	0.01 to 0.1 [4]	0.05 to 0.8 [5]
BTF			0.001 to 0.01 [4]	0.005 to 0.08 [5]
CEM Option [6]	<0.001 to 0.004	<0.001 to 0.01		

[1] Hazard quotient.
[2] Cadmium and lead.
[3] Antimony, arsenic, beryllium, and chromium.
[4] HCl + Cl_2 assuming 100 percent HCl.
[5] HCl + Cl_2 assuming 10 percent Cl_2.
[6] Based on SVM standard of 60 μg/dscm and LVM standard of 80 μg/dscm (applicable only if the source elects to document compliance using a multi-metals CEM).

The risk analysis indicates that for the semi-volatile and low-volatile metals categories, the MACT standards for cement kilns are protective at the floor for both existing and new sources. The analysis indicates that the CEM compliance option for new sources is also protective. For hydrogen chloride and chlorine (Cl_2), the MACT standards for cement kilns are also protective at the floor for both existing and new sources. However, the analysis indicates

[111] "Risk Assessment Support to the Development of Technical Standards for Emissions from Combustion Units Burning Hazardous Wastes: Background Information Document," February 20, 1995.

[112] For the semi-volatile and low volatility metals categories, the Agency assumed the source could emit up to the design value for each metal in the category for the purpose of assessing protectiveness.

[113] For the semi-volatile and low volatility metals categories, the inhalation MEI scenarios are also used. For hydrogen chloride and chlorine (Cl_2) only the inhalation MEI scenarios are used.

that for dioxins the proposed beyond the floor standards, rather than the floor levels, are protective.

V. Lightweight Aggregate Kilns: Basis and Level for the Proposed NESHAP Standards for New and Existing Sources

Today's proposal would establish maximum achievable control technology (MACT) emissions standards for dioxin/furans, mercury, semivolatile metals (cadmium and lead), low volatile metals (arsenic, beryllium, chromium, and antimony), particulate matter (PM), acid gas emissions (hydrochloric acid plus chlorine), hydrocarbons, and carbon monoxide from existing and new hazardous waste-burning lightweight aggregate kilns (LWAKs). See proposed § 63.1205. The following discussion addresses how MACT floor and beyond-the-floor (BTF) levels were established for each HAP and EPA's rationale for the proposed standard. The Agency's overall procedural approach for MACT determinations has been discussed in Part Three, Sections V and VI for existing sources and in Section VII for new sources.

Again, the Agency wishes to emphasize that these standards were developed using a database that contains primarily short-term certification of compliance data that may not adequately reflect more normal, day-to-day operations and emissions. As noted earlier, EPA believes it preferable to use long-term, more normal operating emissions data for MACT standard-setting purposes and specifically invites commenters to submit this type of data.

A. Summary of MACT Standards for Existing LWAKs

This section summarizes EPA's rationale for establishing the MACT floor emission level and choosing MACT for existing LWAKs for each HAP, HAP surrogate, or HAP group.

Table IV.5.A.1 summarizes the MACT standards for existing LWAKs. The basis for the floor level and BTF considerations for each HAP or HAP surrogate is then discussed.

Table IV.5.A.1.—PROPOSED MACT STANDARDS FOR EXISTING LWAKS

HAP or HAP surrogate	Proposed standards [1]
Dioxin/furans	0.20 ng/dscm TEQ.
Particulate Matter	0.030 gr/dscf (69 mg/dscm)
Mercury	72 μg/dscm.
SVM [Cd, Pb]	12 μg/dscm.[2]
LVM [As, Be, Cr, Sb]	340 μg/dscm.
HCl + Cl_2	450 ppmv.
CO	100 ppmv.
HC	14 ppmv.

[1] All emission levels are corrected to 7 percent O_2.

[2] An alternative standard of 60 μg/dscm would apply if the source elects to document compliance using a multi-metals CEM.

1. Dioxin/Furans

a. MACT Floor. EPA has obtained dioxin/furan (D/F) emissions data for only one LWAK. The data indicated an average test condition D/F emission of 0.04 ng/dscm (TEQ). Based on the Agency's data on the performance of D/F control technology, the Agency is identifying the MACT floor for D/F based on temperature control at the inlet to the fabric filter. EPA is therefore identifying the MACT floor level for D/F emissions from LWAKs as 0.20 ng/dscm (TEQ) or (temperature at the PM control device not to exceed) 418° F.

Given that EPA is not aware of any LWAKs that exceed the floor level, the rule would not require these sources to incur costs to achieve compliance.

The Agency recognizes that its data on dioxin/furan emissions from LWAKs is limited. Therefore, the Agency is inviting commenters to submit additional performance data on LWAK D/F emissions.

b. Beyond-The-Floor Considerations. The BTF considerations for LWAKs were the same as for CKs. Therefore, EPA is proposing a BTF standard of 0.20 ng/dscm (TEQ) for the same reasons applicable to CKs. As noted above, given that EPA is not aware of any LWAKs that exceed the proposed BTF standard, LWAKs should not have to incur costs to achieve compliance. EPA notes, however, that LWAKs would nonetheless be required to comply with operating limits established during performance testing and conduct periodic D/F testing to document compliance with the rule. These costs are relatively low when compared to the cost of complying with other provisions of today's rule.

2. Particulate Matter

a. MACT Floor. LWAKs, like cement kilns, have high particulate inlet loadings to the particulate control device due to the nature of the lightweight aggregate manufacturing process; that is, a significant portion of the finely pulverized raw material fed to the kiln is entrained in the flue gas entering the control device. LWAKs are equipped with fabric filters, although one facility is equipped with a spray dryer, venturi scrubber and wet scrubber, in addition to the fabric filter, to control PM to a 0.08 gr/dscf standard under the BIF rule. The PM data for LWAKs include results from 15 test conditions collected from 6 facilities, with a total of 12 units being tested. The Agency's database shows that the average controlled PM emissions ranged from 0.0005 gr/dscf to 0.02 gr/dscf, corrected to 7 percent oxygen, dry basis.

The Agency analyzed all available PM emissions data and determined that sources with emission levels at or below the level emitted by the median of the best performing 12 percent of sources used a fabric filter with an air-to-cloth ratio of 2.8 acfm/ft2 or less. EPA's analysis of all LWAKs employing this floor technology resulted in a MACT floor emissions level of 110 mg/dscm (0.049 gr/dscf). EPA estimates that 100 percent of LWAKs are currently meeting the floor level. The national annualized compliance cost for LWAKs to meet the floor level is estimated to be $290,000 for the entire LWAK industry.

b. Beyond-The-Floor Considerations. EPA is proposing a more stringent beyond-the-floor (BTF) level of 69 mg/dscm (0.03 gr/dscf) for LWAKs. As mentioned above, since 1971, some cement kilns have been subject to the more stringent NSPS (see 40 CFR 60.60, Subpart F) of 0.3 lb/ton of raw material feed (dry basis) to the kiln, which is generally equivalent to 69 mg/dscm (0.03 gr/dscf). Because of design and process similarities between LWAKs and cement kilns, such as high inlet grain loading and similar APCDs, the Agency believes that 69 mg/dscm is achievable for LWAKs.

EPA estimates that 80 percent of LWAKs are currently meeting this BTF level. The Agency estimates that there would be no national incremental annualized compliance cost for the remaining LWAKs to meet the BTF level rather than comply with the floor controls. This is because sources are already meeting the BTF level, or they would be able to meet it with the upgrades or retrofits needed to meet the floor level. The BTF level would provide an incremental reduction of 4 tons per year, or 9 percent, in PM emissions nationally beyond that achieved with floor controls. (Note that emissions reductions estimates are based on the design level, not the standard.) Therefore, the Agency is proposing a MACT standard of 69 mg/dscm (0.030 gr/dscf) for existing LWAKs.

EPA considered but is not proposing an alternative more stringent beyond-

the-floor level (e.g., 35 mg/dscm (0.015 gr/dscf)) for LWAKs. EPA notes that, to ensure compliance with a 35 mg/dscm standard 99 percent of the time, a source with average emissions variability must be designed and operated to achieve an emission level of approximately 18 mg/dscm. EPA estimates that 60 percent of LWAKs currently have average PM emissions below 18 mg/dscm.

All of the remaining LWAKs may require the installation of new fabric filters to comply with the proposed standards for all HAPs discussed in today's rule. The average emissions level for the 40 percent of LWAKs that do not meet a PM emission level of 18 mg/dscm is 28 mg/dscm. All of these LWAKs would require an upgrade from fiberglass bags to improved performance filter media on the newly installed fabric filters. Although the engineering costs to comply with a PM design level of 18 mg/dscm is modest for LWAKs, the resulting reduction in PM emissions is minimal because 40 percent of the kilns are emitting at an average emission level slightly above the BTF level. Lowering the PM design level to 18 mg/dscm may not be appropriate based on this minimal impact on overall PM emissions.

Thus, EPA specifically invites comment on whether the final rule should establish BTF standard for PM of 35 mg/dscm (or 0.15 lb/ton of raw material (dry basis) feed into the kiln).

3. MACT for Mercury

a. MACT Floor. Mercury emissions from LWAKs are currently controlled by the BIF rule, and LWAKs have elected to comply with the BIF standard by limiting the feedrate of Hg in the hazardous waste.[114] Thus, the MACT floor is based on hazardous waste feed control.

The LWAK mercury emissions data reflect results from 13 test conditions collected from 6 facilities, with a total of 10 kilns being tested. The average mercury emissions for the test conditions ranged from 0.4 µg/dscm to 560 µg/dscm.

To identify the floor level for hazardous waste feed control, the Agency determined that sources with Hg emissions at or below the level emitted by the median of the best performing 12 percent of sources had normalized hazardous waste feedrates (i.e., MTECs)[115] of Hg of 17 µg/dscm or less. Analysis of all LWAKs using this level of hazardous waste feedrate of Hg, or less (i.e., sources having a MTEC of 17 µg/dscm or less), resulted in a MACT floor level of 72 µg/dscm. To meet this standard 99 percent of the time, EPA estimates that a source with average emissions variability among runs of a test condition would need to design and operate the kiln to meet a level of 36 µg/dscm.

EPA estimates that approximately 70 percent of LWAKs can meet this floor level. The national annualized compliance cost of the remaining LWAKs to reduce mercury emissions to the floor level is estimated to be $1.6 million for the entire hazardous waste-burning LWAK industry, and would reduce mercury emissions by 540 pounds per year or by 86 percent from current baseline emissions.

EPA notes that it considered whether all LWAKs would be likely to be able to meet the floor level of 72 µg/dscm using control of hazardous waste feed for Hg at an MTEC of 17 µg/dscm, given that Hg emissions also result from Hg in the raw material feed. EPA has determined that all LWAKs should be able to meet the floor level using the floor control without substituting raw material.

b. Beyond-The-Floor Considerations. The Agency has considered beyond-the-floor (BTF) control for Hg using carbon injection (CI) in combustion gas at temperatures below 400°F, coupled with the MACT floor level control of Hg in the hazardous waste feed. As discussed for CKs, EPA believes that CI can control Hg emissions at or above 90 percent removal efficiency.

To identify a BTF level, EPA considered two approaches that would result in virtually the same BTF standard—6 µg/dscm. Under one approach, EPA would apply a 90 percent removal efficiency for CI to the floor design level of 36 µg/dscm to identify a BTF standard of 6 µg/dscm, which includes a statistically-derived variability factor.

Under a second approach, EPA could account for emissions variability by using a conservative CI removal efficiency of 80 percent to identify a BTF emission standard of 7.2 µg/dscm (based on a design floor level of 36 µg/dscm). Under this approach, a statistically-derived variability factor would not be added.

EPA invites comment on which approach would be more appropriate for identifying a BTF level. EPA, however, is not proposing a BTF standard.

In conjunction with earlier evaluations, the Agency has evaluated the cost and emissions reductions associated with an emission standard of 8 µg/dscm. Although the BTF levels presented above are somewhat different, EPA does not believe that the difference is large enough to significantly affect the information presented below.

One of 11 LWAKs in the database would be able to meet a BTF level of 8 µg/dscm currently. The national annualized compliance cost for the remaining LWAKs to meet the BTF level is estimated to be $4.4 million for the entire hazardous waste-burning LWAK industry. The BTF level would provide an incremental reduction of 60 pounds per year (72 percent) in Hg emissions nationally beyond that achieved with floor controls.

EPA has considered the costs in relation to emissions reductions and the special bioaccumulation potential that Hg poses and has decided that the floor level of 72 µg/dscm best balances those factors. Mercury is one of the more toxic metals known due to its bioaccumulation potential and the neurological health effects at low concentrations. For further discussion see the mercury benefits discussion in Section VII of today's preamble. EPA invites comment, however, on whether there are cost-effectiveness or other factors that would lead the Agency to promulgate a final rule based on the BTF level.

4. Semivolatile Metals

a. MACT Floor. Emissions of SVM from LWAKs are currently controlled under the BIF rule. LWAKs use a combination of hazardous waste feedrate control and PM control to comply with those standards. Accordingly, MACT floor control is based on hazardous waste feedrate control and PM control.

The LWAK semivolatile metals (SVM) (consisting of cadmium and lead) data reflect results from 13 test conditions collected from 6 facilities, with a total of 10 units being tested. Average emissions of the SVM group ranged from 1 µg/dscm to 1670 µg/dscm. Control of semivolatile emissions is associated with PM control (see discussion of SVM control for existing cement kilns). All LWAKs are equipped with a fabric filter as the air pollution control device, although one facility is equipped with a spray dryer, venturi scrubber and wet scrubber in addition to the fabric filter.

The Agency analyzed all available lead and cadmium emissions data and determined that sources with emission levels at or below the level emitted by

[114] EPA notes that one LWAK is equipped with a venturi scrubber that can provide control of Hg. That kiln, however, is the highest Hg-emitting kiln in our database because, EPA believes, it burns waste with high levels of Hg.

[115] MTEC, or maximum theoretical emission concentration, is calculated as the feedrate of (Hg) divided by the gas flow rate. It is used to normalize feedrates of Hg (and other metals and chlorine) across sources with different waste (or fuel) burning capacities.

the median of the best 12 percent of sources employed either: (1) A fabric filter with an air-to-cloth ratio of 1.5 acfm/ft^2 or less with a hazardous waste MTEC less than 270,000 μg/dscm; or (2) a fabric filter and venturi scrubber with an air-to-cloth ratio of 4.2 acfm/ft^2 or less with a hazardous waste MTEC less than 54,000 μg/dscm. Analysis of emissions data from all LWAKs using these MACT technologies resulted in a floor level of 12 μg/dscm.

EPA notes that raw materials and fossil fuels also contribute to LWAK SVM feedrates and emissions. Given that all sources must be able to meet the floor level using the floor control, EPA investigated whether all LWAKs could meet the floor level employing the MACT floor technologies without being forced to substitute raw material. EPA preliminary evaluation determined that 25 percent of sources in the SVM emissions database had raw material containing Cd and Pb in greater concentrations than sources in the expanded MACT pool; thus, these sources may not be able to achieve the floor with MACT alone.[116] However, the Agency believes that the data on which this preliminary finding is based may not reflect the normal, day-to-day Pb and Cd levels in raw material feed.

As noted in the earlier section on cement kilns, one approach to address this issue (of sources with higher levels of SVM metals in their raw materials than sources in the expanded MACT pool and that, therefore, cannot meet the floor level using floor control) is to: (1) Identify the source with the highest normalized (by MTEC) feedrate of metals in raw material; (2) assume the source is also feeding hazardous waste with the floor control MTEC level of the metals; and (3) project SVM emissions from the source based on combined raw material and hazardous waste MTECs using a representative system removal efficiency (SRE) from the expanded MACT pool considering an appropriate variability factor (e.g., variability of emissions among runs within a test condition in the expanded MACT pool). The Agency has not yet conducted this type of analysis, but intends to do so in the near future. EPA also believes that data reflecting normal, day-to-day levels of Pb and Cd in raw materials would be important for this type of analysis, and specifically invites commenters to submit such data as well as their views on the approach suggested above.

EPA estimates that 38 percent of LWAKs are currently meeting the floor level. The national annualized compliance cost of the remaining LWAKs to reduce SVM emissions to the floor level is estimated to be $2.1 million for the entire LWAK industry, and would reduce lead and cadmium emissions nationally by 0.66 tons per year, or by 97 percent from current baseline emissions.

The Agency is proposing an alternative compliance option for SVMs. Since the Agency anticipates the likelihood of development of a multi-metals continuous emissions monitor (CEM) in the near future, the Agency is proposing establishing a higher standard for sources using a properly designed and operated multi-metals CEM. This alternative compliance option would be based on the minimum detection limit of the device, which is estimated to be 60 μg/dscm for SVMs combined.

b. Beyond-The-Floor Considerations. The Agency considered whether to propose a more stringent level than the floor of 12 μg/dscm. EPA has determined that a BTF standard would not be appropriate. Since control of semivolatile emissions is associated with PM control, a more stringent SVM BTF level would require LWAKs to upgrade to more expensive fiberglass bags (e.g., bags backed with teflon membranes) or the addition of newly installed FFs with improved performance media. Although the engineering costs to comply with a BTF SVM level are moderate, the resulting incremental reduction in SVM emissions from the floor level is minimal because the floor level already provides substantial control by reducing baseline emissions by 97 percent. Thus, the Agency believes a SVM BTF standard is not appropriate and is proposing a SVM MACT standard of 12 μg/dscm for existing LWAKs.

5. Low-Volatility Metals

a. MACT Floor. Emissions of LVM from LWAKs are also currently controlled under the BIF rule. LWAKs use a combination of hazardous waste feedrate control and PM control to comply with those standards. Accordingly, MACT floor control is based on hazardous waste feedrate control and PM control.

The low volatility metals (LVM) (consisting of arsenic, antimony, beryllium, and chromium) data reflect results from 13 test conditions collected from 6 facilities, with a total of 10 units being tested. Average emissions of the LVM group ranged from 10 μg/dscm to 289 μg/dscm. Due to the relatively low volatility of these metals, performance of the APCD is the most important factor in controlling LVM emissions.

The Agency analyzed all available LVM emissions data and determined that sources with emission levels at or below the level emitted by the median of the best 12 percent of sources used a fabric filter with an air-to-cloth ratio of 1.8 acfm/ft^2 or less with a hazardous waste MTEC less than 46,000 μg/dscm. Analysis of available emissions data for all LWAKs employing these controls resulted in a floor emission level of 340 μg/dscm.

EPA notes that raw materials and fossil fuels also contribute to LWAK LVM feedrates and emissions. Given that all sources must be able to meet the floor level using the floor control, EPA investigated whether all LWAKs could meet the floor level employing the MACT floor technologies without being forced to substitute raw material. EPA's preliminary evaluation determined that one of the sources in the LVM emissions database had raw material containing LVM in greater concentrations than sources in the expanded MACT pool; thus, this sources may not be able to achieve the floor with MACT alone.[117] EPA requests comments on addressing this issue.

One approach to address this issue (of sources with higher levels of LVM metals in their raw materials than sources in the expanded MACT pool and that, therefore, cannot meet the floor level using floor control) is to: (1) Identify the source with the highest normalized (by MTEC) feedrate of metals in raw material; (2) assume the source is also feeding hazardous waste with the floor control MTEC level of the metals; and (3) project LVM emissions from the source based on combined raw material and hazardous waste MTECs using a representative system removal efficiency (SRE) from the expanded MACT pool considering an appropriate variability factor (e.g., variability of emissions among runs within a test condition in the expanded MACT pool). The Agency has not yet conducted this type of analysis but intends to do so in the near future. EPA also believes that data reflecting normal, day-to-day levels of LVM in raw materials would be important for this type of analysis and specifically invites commenters to submit such data as well as their views on the approach suggested above.

EPA estimates that 92 percent of LWAKs are currently meeting the floor level. The national annualized cost of

[116] USEPA, "Draft Technical Support Document for HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies", February 1996.

[117] USEPA, "Draft Technical Support Document for HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies", February 1996.

the remaining LWAKs to reduce LVM emissions to the floor level is estimated to be $380,000 for the entire hazardous waste-burning LWAK industry; this would reduce LVM emissions nationally by 0.011 ton per year or by 5 percent from current baseline emissions.

b. Beyond-The-Floor Considerations. The Agency considered whether to propose a more stringent level than the floor of 340 μg/dscm. Since control of low-volatile emissions is associated with PM control, a more stringent LVM BTF level would require LWAKs to upgrade to more expensive fiberglass bags (e.g., bags backed with teflon membranes) or the addition of newly installed FFs with improved performance media. Although the engineering costs to comply with a BTF LVM level are moderate, the resulting reduction in LVM emissions is minimal since LWAK LVM national emissions are estimated to be 0.2 tons per year for the entire industry at the floor level. Thus, the Agency believes a LVM BTF standard is not appropriate and is proposing a LVM MACT standard of 340 μg/dscm for existing LWAKs.

6. Hydrochloric Acid and Chlorine

a. MACT Floor. HCl and Cl_2 emissions from LWAKs are currently regulated by the BIF rule. Only one LWAK facility currently utilizes a venturi scrubber, which is a dedicated control device, designed specifically to remove HCl/Cl_2 (referred to as total chlorine where combined HCl and Cl_2 levels are expressed as HCl equivalents) from the flue gas.

The total chlorine emission database reflects results from 13 test conditions collected from 6 facilities, with a total of 10 units being tested. Average total chlorine emissions range from 13 ppmv to 2080 ppmv. The Agency analyzed all available total chlorine emissions data and determined that sources with emission levels at or below the level emitted by the median of the best 12 percent of sources used either: (1) Hazardous waste feedrate control of total chlorine with a MTEC less than 1.5 g/dscm; or (2) venturi scrubber with hazardous waste MTEC less than 14 g/dscm. The analysis of all available emissions data for LWAKs using these technologies resulted in a floor emissions level of 2100 ppmv, which the Agency has identified as the MACT floor level. To meet this standard 99 percent of the time, a source with average within test condition emission variability would need to be designed and operated to achieve an emission level of 1400 ppmv.

EPA notes that raw materials and fossil fuels also contribute to LWAK chlorine feedrates and emissions. Given that all sources must be able to meet the floor level using the floor control, EPA investigated whether all LWAKs could meet the floor level employing the MACT floor technologies without being forced to substitute raw material. EPA determined that all LWAKs in the total chlorine emissions database would be able to meet the floor level using floor control[118] without switching raw material.

EPA estimates that 85 percent of LWAKs are currently meeting the floor level. The national annualized compliance cost of the remaining LWAKs to reduce total chlorine emissions to the floor level is estimated to be $890,000 for the entire hazardous waste-burning LWAK industry; this would reduce total chlorine emissions nationally by 190 tons per year or 6 percent from current baseline emissions.

b. Beyond-The-Floor Considerations. The Agency has considered BTF controls for improved total chlorine control using a dry scrubber or spray tower scrubber. A dry scrubber should achieve a total chlorine removal efficiency of 90 percent, and a spray tower scrubber should achieve a removal efficiency of 99 percent. Applying the 90 percent removal factor (the more conservative of the two removal efficiencies)[119] to the highest test condition in the database resulted in a BTF standard of 450 ppmv. To meet this standard 99 percent of the time, EPA estimates that a source with average emissions variability (among runs within a test condition) would need to meet a design level of 210 ppmv.

EPA believes that dry scrubbers or spray tower scrubbers are appropriate controls and is proposing a 450 ppmv total chlorine emission standard based on these controls. EPA estimates that 38 percent of LWAKs are currently meeting this BTF level. The national annualized compliance cost for the remaining LWAKs to meet this BTF level rather than comply with the floor controls is estimated to be $5.0 million for the entire hazardous waste-burning LWAK industry. This BTF level would provide an incremental reduction of 2200 tons per year (80 percent) in total chlorine emissions nationally beyond that achieved with the floor controls.

The Agency believes that both wet and dry scrubbing control techniques are applicable to LWAKs for chlorine control. Dry scrubbing is being used at some hazardous waste-burning LWAKs. Control efficiency and outlet chlorine emissions levels are unclear due to conflicting trial burn results, however. One potential problem with the application of dry scrubbing to LWAKs is contamination of the captured LWAK dust with dry sorbent. This may affect whether captured dust can be recycled back into the kiln or incorporated into the final light weight aggregate product. The addition of dry scrubbing could force some kilns either to add a separate, additional FF dedicated to capturing the dry sorbent or dispose of the mixed sorbent and LWAK dust. The Agency invites comment on the effectiveness (and implications on dust management) of dry scrubbing for control of chlorine in hazardous waste-burning LWAKs.

The Agency also considered an additional BTF level of 25 ppmv for LWAKs based on wet scrubbing alone. A further reduction from the proposed BTF design level of 210 ppmv (based on dry scrubbing or spray tower scrubbing) to 25 ppmv would require all thirteen LWAK sources to either install new control equipment, or modify existing control equipment. The incremental cost of this enhanced control would be moderate to high for each of the individual LWAK sources. Although the engineering cost for each facility is moderate to high, the overall cost for LWAKs as a group is high since upgrades are required by every facility. The Agency believes that the resulting moderate decrease in total chlorine emissions may not justify this relatively high engineering cost.

Based on cost-effectiveness considerations, EPA has determined that proposing a BTF standard of 450 ppmv is warranted. As discussed elsewhere in today's preamble, EPA's risk analysis developed for purposes of RCRA shows that the emissions of total chlorine from hazardous waste-burning LWAKs could pose significant risks by direct inhalation, and these risks would be reduced by BTF controls.[120] Thus, the BTF controls would make separate RCRA standards unnecessary.

Additionally, the Agency requests comments on an alternative option to identify the BTF level. Under this

[118] USEPA, "Draft Technical Support Document for HWC MACT Standards, Volume III: Selection of Proposed MACT Standards and Technologies", February 1996.

[119] The Agency believes that many, but not all, LWAKs could use a dry scrubber without adversely affecting the quality of the LWAK dust (which is primarily raw material) for incorporation into products or recycling back into the kiln. See discussion in the text below.

[120] EPA notes that under the BIF regulations, LWAKs are currently subject to site-specific, risk-based emissions standards for HCl/Cl_2. EPA is uncertain why our risk assessment to consider RCRA concerns under today's proposed rule shows that baseline emissions for some LWAKs can pose significant risk.

option the 90 percent reduction in emissions provided by a dry scrubber or spray tower scrubber would be applied to the floor level resulting from hazardous waste feedrate control of total chlorine—2100 ppmv. Thus, at 90 percent control efficiency, the BTF emission standard would be 210 ppmv. To comply with this standard 99 percent of the time, a source with average within test condition emissions variability would need to be designed and operated to meet an emission level of approximately 140 ppmv. EPA invites comment on whether this option is more appropriate to establish the BTF level than applying the BTF percent reduction to the test condition in the database with the highest emissions.

As discussed above, EPA believes that a dry scrubber or spray tower scrubber (in conjunction with the levels achieved using MACT floor controls) are appropriate alternative controls. EPA estimates that 38 percent of LWAKs are currently meeting this alternative BTF level of 210 ppmv. EPA estimates that this BTF level would provide a further incremental reduction in total chlorine emissions nationally beyond that achieved with the proposed BTF standard of 450 ppmv. EPA invites comment on this alternative approach to identify the BTF level.

7. Carbon Monoxide and Hydrocarbons

The Agency is proposing to use carbon monoxide (CO) and hydrocarbons (HC) as surrogates for non-D/F organic HAPs.[121]

a. MACT Floor.

i. Carbon Monoxide. The BIF rule currently limits CO emissions from LWAKs to 100 ppmv on an hourly rolling average (HRA). See § 266.104(b). However, the BIF rule provides an alternative standard that allows higher CO levels if HC levels are less than 20 ppmv.

LWAKs generally have low CO levels (i.e., less than 100 ppmv HRA) achieved by operating under good combustion practices. Good combustion practices include techniques such as thorough fuel, air, and waste mixing; adequate excess oxygen; maintenance of adequate combustion temperature; and blending of waste fuels to minimize combustion perturbations. Accordingly, operating under good combustion practices is identified as the floor control.

Given that 10 of 12 LWAKs for which EPA has CO emissions data have maximum hourly rolling averages for the test condition of less than 100 ppmv, EPA believes it is reasonable and appropriate to identify the floor level as the BIF limit of 100 ppmv. Two LWAKs have CO levels exceeding the 100 ppmv level, however, and these higher levels (i.e., 190 ppmv and 1900 ppmv) are allowed under the BIF rule. EPA is not sure whether these elevated CO levels were caused by operating under poor combustion conditions, or by trace levels of organics desorbing from the raw materials.

If the CO were caused by organics desorbing from raw material, EPA would consider this situation analogous to CKs that do not have a by-pass duct (and thus stack emissions are affected by organics desorbed from raw material). Accordingly, such LWAKs would be exempt from the CO limit (and would be subject to a HC limit of 20 ppmv). (In this situation, floor control (i.e., good combustion practices) could not be used to meet the floor level.) EPA invites comment on how to distinguish between LWAKs that have elevated CO levels because of poor combustion (and that should be subject to the 100 ppmv floor level) and LWAKs that have elevated CO levels because of desorption of organics from raw material (and that should be exempt from the 100 ppmv floor level). If an effective approach to distinguish between these situations is developed, the final rule could distinguish among LWAKs based on those high levels of organics in raw material versus those with low levels.

EPA estimates that over 80 percent of LWAKs are currently meeting the proposed standard. The national annualized compliance cost of the remaining LWAKs to reduce carbon monoxide emissions to the floor level[122] is estimated to be $1.4 million for the entire LWAK industry; this would reduce carbon monoxide emissions nationally by 600 tons per year, or 81 percent from current baseline emissions.

ii. Hydrocarbons. As discussed above, the BIF rule limits HC levels to 20 ppmv HRA when CO exceeds 100 ppmv HRA. As with CO, floor control is operating under good combustion practices. EPA believes it is appropriate to establish the floor level at the lower of the BIF emission limit or the levels that sources actually achieved. An analysis of the available HC data determined that sources with emission levels at or below the level emitted by the median of the best 12 percent of sources used good combustion practices as the control technology. The analysis of all available emissions data for LWAKs believed to be using good combustion practices resulted in a floor emissions level of 14 ppmv.[123]

EPA estimates that 86 percent of LWAKs are currently meeting the floor HC level. The national annualized compliance cost of the remaining LWAKs to reduce hydrocarbon emissions to the floor level is estimated to be $760,000 for the entire LWAK industry; this would reduce hydrocarbon emissions nationally by 14 tons per year, or 31 percent from current baseline emissions.

b. Beyond-The-Floor Considerations. EPA considered BTF levels for CO of 50 ppmv and for HC of 6 ppmv. Control of organic HAP emissions would require the use of a combustion gas afterburner. Addition of an afterburner to a LWAK would be expensive due to the requirement of a large amount of auxiliary fuel to reheat the kiln exit flue gas to temperatures required for organics burnout. Preliminary estimates suggest that going beyond-the-floor for CO and HC would more than double the national costs of complying with the proposed rule. EPA believes that a BTF standard is not appropriate.

EPA estimates that 29 percent of LWAKs are currently meeting the BTF level of 6 ppmv for HC and that 46 percent of LWAKs are currently meeting the BTF levels of 50 ppmv for CO. The Agency has determined that selecting these BTF levels is not appropriate. Therefore, the Agency is proposing a MACT standard for hydrocarbons of 14 ppmv HRA and for carbon monoxide of 100 ppmv HRA.

8. MACT Floor Cost Impacts

The total national annualized compliance costs for existing LWAKs to meet all the MACT floor levels are estimated to be $3 million with the cost per kiln averaging $390,000. These total compliance costs equate to $39 per ton of hazardous waste burned. EPA estimates that one LWAK facility may cease burning hazardous waste due to the compliance costs associated at the floor.

[121] This is in addition to controlling PM as a surrogate for (condensed) semivolatile HAPs.

[122] EPA assumed that the LWAK with CO levels of 1900 ppmv would need to install an afterburner to meet the floor level. EPA acknowledges that this is inappropriate because all sources must be able to meet the floor level using floor control—good combustion practices. As discussed in the text, EPA invites comment on how to identify appropriate MACT floor levels for sources that may have elevated CO levels due to desorption of organics from raw material.

[123] EPA notes that one of seven LWAKs in the HC database had substantially higher test condition maximum HC levels (i.e., 13 ppmv HRA) than the other sources (i.e., 6 to 8 ppmv HRA). As discussed in the text above for CO, it is not clear whether the elevated HC levels were caused by operating under poor combustion conditions or desorption of organics from raw material. EPA invites comment on how to address this situation.