ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 260, 261, 264 and 270

[FRL-3358-6 EPA/OSW/FR/90-007]

RIN 2050-AB90

Standards for Owners and Operators of Hazardous Waste Incinerators and Burning of Hazardous Wastes in Boilers and Industrial Furnaces

AGENCY: Environmental Protection Agency.

ACTION: Proposed rule, supplemental proposed rule, technical corrections, and request for comments.

SUMMARY: Under this proposal, the Environmental Protection Agency (EPA) would amend the hazardous waste incinerator regulations to improve control of toxic metal emissions, hydrogen chloride emissions, and residual organic emissions; amend the definitions of incinerators and industrial furnaces; propose definitions for plasma arc incinerators and infrared incinerators; propose to regulate carbon regeneration units as thermal treatment devices; and make a number of minor revisions to permitting procedures.

At present, toxic metal emissions from incinerators are controlled indirectly by a limitation on particulate matter. Under some conditions, the particulate standard may not sufficiently control toxic metals to ensure adequate protection of human health. Under today's proposal, EPA would establish risk-based emission limits for individual toxic metals in addition to the existing particulate standard.

Under existing rules, hydrogen chloride emissions are controlled by a technology-based standard. Because that standard may under-regulate emissions in particular situations, risk-based emissions limits would be established in addition to the existing standard.

In addition, organic emissions that result from inadequate combustion of toxic organic hazardous wastes are controlled under present rules by a destruction and removal efficiency (DRE) standard. The DRE standard requires destruction of toxic organic constituents in the waste, but does not directly control products of incomplete combustion. To address the potential health risk from products of incomplete combustion, today's proposed rule would require that incinerators continuously operate at high combustion efficiency by establishing limits on flue gas carbon monoxide and hydrocarbon levels.

Finally, EPA is noticing technical corrections as well as requesting comment on three regulatory alternatives to issues presented in the October 26, 1989 supplement to the proposed rule for burning hazardous waste in boilers and industrial furnaces (54 FR 43718). These items are set forth in part One, section III.C of this notice. The issues of concern are: regulation during interim status of the direct transfer of hazardous waste from a transport vehicle to a boiler or furnace; controls on emissions of free chlorine; and limiting stack gas temperature at the inlet to a dry emissions control device to below 450 °F.

DATES: EPA will accept public comments on this proposed rule and on the other issues opened for public comment by this notice until June 26, 1990.

ADDRESSES: Comments on this proposed rule, including the boiler and furnace supplemental issues, should be sent to RCRA Docket Section (OS-305), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460 ATTN: Docket No. F-90-BWIP-FFFFF. The public docket is located in Room 2427 and is available for viewing from 9 a.m. to 4 p.m., Monday through Friday, excluding legal holidays. Individuals interested in viewing the docket should call (202) 475-9327 for an appointment.

FOR FURTHER INFORMATION CONTACT: RCRA HOTLINE, at (800) 424-9346 (toll free) or at (202) 382-3000. Single copies of the proposed rule are available by calling the RCRA Hotline. For technical information, contact Shiva Garg, Combustion Section, Waste Management Division, Office of Solid Waste, OS-322, U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460, Telephone: (202) 382-7924.

SUPPLEMENTARY INFORMATION:

Preamble Outline

Today's preamble is organized in five major parts. Part One contains background information that summarizes major provisions of the rule. It also describes how today's rule fits into the Agency's strategy for regulating all burning of hazardous waste. Finally, this part identifies the need for increased regulatory controls beyond the present hazardous waste incinerator regulations.

Part Two discusses why the proposed controls limit emissions based on risk assessment rather than using technology-based standards. Part Two also discusses the proposed definitions for incinerators, industrial furnaces, and plasma arc and infrared incinerators; the regulation of carbon regeneration units as thermal treatment devices; and minor revisions to existing permitting requirements.

Part Three discusses the proposed revisions to the existing emissions standards. It explains EPA's use of risk assessment to develop the proposed rule; describes conservative screening limits for toxic metals, hydrogen chloride, and total hydrocarbons; and explains how site-specific dispersion modeling would be used to establish emission limits when the screening limits are exceeded.

Part Four discusses the permit procedures that would be used to implement the controls, and also discusses issues regarding the already proposed listing of halogen acid furnaces as industrial furnaces under § 260.10. This section also explains the impact of these proposed rules on existing permits and the added information requirements. Sampling and analytical procedures that may be used to analyze wastes for metals and to determine actual metal emissions during trial burns are also discussed. In addition, this part discusses a number of proposed revisions to permitting procedures that would clarify ambiguities and provide more flexibility to applicants and permit writers.

Part Five discusses the applicability of the rules in authorized States and their effect on State authorizations. This part also discusses the economic impacts the rule would have on the regulated community.

PART ONE: BACKGROUND

I. Legal Authority

These regulations are proposed under authority of sections 1006, 2002, 3001 through 3007, 3010, and 7004 of the Solid Waste Disposal Act of 1970, as amended by the Resource Conservation and Recovery Act of 1976, the Quiet Communities Act of 1978, the Solid Waste Disposal Act Amendments of 1980, and the Hazardous and Solid Waste Amendments of 1984, 42 U.S.C. 6905, 6912, 6921 through 6927, 6930, and 6974.

II. Overview of the Proposed Rule

EPA proposes today to amend the hazardous waste incinerator regulations at 40 CFR part 264, subpart O, part 260 and part 261; and the associated permit rules at 40 CFR part 270 to provide improved control of toxic metals emissions, hydrogen chloride emissions, and residual organic emissions. EPA also proposes to definition for sludge dryers and a revised definition for industrial furnaces. Minor amendments to a number of permit requirements are also proposed.

A. Toxic Metals

Wastes bearing high levels of metals are commonly burned in incinerators (spent solvents and their still bottoms are examples). Metals and metal compounds in hazardous waste are not destroyed by incineration but are transformed into other metal species (usually oxides) and then either are removed as ash or in scrubber water, or are emitted with stack gases. Metals are usually emitted as particulates, but can be emitted as metal vapors if the metal is volatile.

EPA has conducted risk assessments to determine the levels of toxic metals that would create an unacceptable risk to human health if released to the atmosphere. EPA's analysis indicates that the present hazardous waste incinerator particulate standard of 0.08 grain per dry standard cubic foot (180 milligrams per dry standard cubic meter) may not adequately control emissions of toxic metals.[1]

In 1982 and 1983, EPA conducted field studies on eight incinerators to quantify emissions of pollutants. The Agency then evaluated the risk posed by those emissions and concluded that metals emissions probably did not present an unacceptable level of risk. However, the metals levels in the waste feed to the incinerators in these tests were relatively low. Emissions from incinerators burning waste with high levels of metals have not been determined in actual field tests. Thus, the Agency is concerned that, under conditions of high concentrations of toxic metals in waste and inadequate flue gas cleaning methods, the potential for unacceptable levels of risk could exist at some incinerators.

After considering the options for limiting such potential risk, the Agency is proposing to establish risk-based emission limits for the individual toxic metals listed in Appendix VIII of 40 CFR part 261. The limits would be back-calculated from ambient levels that EPA believes pose acceptable health risk. To reduce the burden to the applicant and permitting officials, EPA has developed conservative Screening Limits. If the

[1] Mitre Corp. "Mitre Working Paper: Hazardous Waste Stream Trace Metal Concentrations and Emissions." USEPA, Office of Solid Waste. November 1983.

Screening Limits are not exceeded, emissions do not pose unacceptable risk. If the Screening Limits are exceeded, however, site-specific dispersion analysis would be required to demonstrate that emissions would not result in an exceedance of acceptable ambient levels.

B. Hydrogen Chloride

EPA's present standard for control of acid gas at 40 CFR 264.343(b) requires that the rate of emission of hydrogen chloride (HCl) be no greater than the larger of 1.8 kilograms per hour (4 pounds per hour) or 1 percent of the HCl in the stack gas before entering any pollution control device. EPA believes that this standard may not be protective of public health in some instances.[2] Thus, EPA is proposing to regulate HCl under the same risk-based approach proposed for metals. The risk-based controls would be used on a case-by-case basis to ensure that the existing technology-based standard is protective.

C. Control of Products of Incomplete Combustion

Existing regulations control organic emissions by the destruction and removal effeciency (DRE) standard at 40 CFR 264.343(a). This standard limits stack emissions of principal organic hazardous constituents (POHCs) to 0.01 percent (0.0001 percent for dioxin-containing waste) of the quantity of the POHC fed to the incinerator. The standard considers a POHC to be destroyed (or removed in ash or scrubber water) if it is not present in the stack emissions. EPA's concern is that although the POHC itself may not be present at significant levels, intermediate combustion products, or products of incomplete combustion (PICs), may be present at levels that could pose significant health risk. The complete combustion of all hydrocarbons to produce only water and carbon dioxide is theoretical and could occur only under ideal conditions. Real-world combustion systms (e.g., incinerators, fossil fuel steam generators, diesel engines), however, virtually always produce PICs, some of which could be highly toxic.

EPA believes that requiring incinerators to operate at high combustion efficiency is a prudent approach to minimize the potential health risk posed by PIC emissions. Given that stack gas CO is a conventional indicator of combustion efficiency and a conservative indicator of combustion upsets (i.e., poor combustion conditions), today's rule would limit CO emissions to a *de minimis* level that ensures high combustion efficiency and low unburned hydrocarbon emissions. In cases where the *de minimis* CO limit is exceeded, the owner or operator would be required to demonstrate that higher CO levels would not result in high hydrocarbon emissions. We are taking comment on two alternative approaches to ensure that hydrocarbon emissions are acceptable: (1) A demonstration that hydrocarbon emissions are not likely to pose unacceptable health risk using conservative, prescribed risk assessment procedures; or (2) a technology-based demonstration that the hydrocarbon concentration in the stack gas does not exceed a good operating practice-based limit of 20 ppmv. Although we prefer the technology-based approach for reasons discussed below, we request comment on the health-based alternative as well.

D. Definitions

EPA is today proposing revised definitions for industrial furnaces and incinerators and new definitions for infrared incinerators and plasma arc incinerators. These definitions would include infrared and plasma arc incinerators within the definition of incinerator, and include nonflame combustion devices within the definition of industrial furnaces. EPA also proposes to regulate both direct flame and nonflame carbon regeneration units as thermal treatment units and, because of ambiguity regarding the current regulatory status of flame units, to establish the date of promulgation as the "in existence" date for interim status. EPA is also taking comment on an alternate regulatory approach that would simply regulate all types of hazardous waste thermal treatment devices (e.g., incinerators, boilers, industrial furnaces) under one set of standards, subpart O of parts 264 and 265.

E. Permitting Procedures

The EPA is today proposing to make a number of revisions to current permitting procedures. The purpose of these revisions is to clarify ambiguities in the present regulations and to give the permit writer flexibility in implementing the rules while providing adequate protection of public health. Examples of these changes include: all hazardous waste combustion units at a site would be considered when implementing the risk-based controls proposed today; compounds may be chosen as POHCs even though they may not be on appendix VIII or in the waste (at the permit writer's discretion); information relating to emergency relief valves and their use must be provided in the part B application; automatic waste feed cutoffs must be noted in an operating log and reported on a quarterly basis; and temperature must be maintained in the combustion chamber until all wastes (and residues) exit the chamber.

We note that EPA has already published at 54 FR 4286 (January 30, 1989) clarifications to 40 CFR 270.62(d) which better reflect the initial intent of the regulations with regard to requiring existing incinerators either to complete a trial burn, or submit data in lieu of a trial burn, prior to permit issuance.

F. Halogen Acid Furnaces

On May 6, 1987, EPA proposed to add Halogen Acid Furnaces (HAFs) to the list of industrial furnaces under § 260.10. See 52 FR 17018. We are today requesting comment on revisions to the proposed definition of HAFs to better distinguish between HAFs and incinerators burning halogenated waste. In addition, we are proposing to list as inherently waste-like under § 261.2(d) any secondary material fed to a HAF that is identified or listed as a hazardous waste under part 261, subparts C or D. Without that listing, HAFs burning wastes solely as an ingredient (i.e., wastes that have low heating value and, so, are not burned partially for energy recovery) to produce acid gas would be unregulated under § 261.2(e)(l)(i). Wastes with high heating value (i.e. greater than 5,000 Btu/lb), however, are considered to be burned at least partially for energy recovery and, thus, would be subject to the proposed boiler and industrial furnace rules.

III. Relationship of the Proposed Rule to Other Rules

A. Existing Hazardous Waste Incinerator Standards

The permit standards for incinerators now in effect at 40 CFR part 264, subpart O, establish three performance standards. The Agency believes that these standards may not be adequately protective in all cases and, thus, is today proposing to strengthen the standards.

Incinerators burning hazardous waste must achieve a destruction and removal efficiency (DRE) of 99.99 percent for each Principal Organic Hazardous Constituent (POHC) designated for each waste feed. This approach was based upon data indicating the hazardous waste incinerators burning a wide range of organic hazardous wastes could achieve such a destruction efficiency

[2] U.S. EPA, "Technical Background Document: Control of Metals and Hydrogen Chloride Emissions from Hazardous Waste Incinerators." August 1989.

and risk assessments indicating levels of unburned POHC would not pose an unacceptable health risk.

Metals emissions are controlled indirectly by a particulate matter emissions limit of 180 milligrams per dry standard cubic meter (or 0.08 gr/dscf).

Finally, hydrogen chloride (HCl) emissions are controlled by a standard that requires emissions to be reduced by 99 percent if emissions exceed 4 lb/hr. This standard is based upon the expected HCl removal efficiency from existing wet scrubber technology.

B. Other Related Actions

The Agency has promulgated some regulations and proposed others for the burning of hazardous waste in boilers and industrial furnaces that would ensure that combustion controls and emissions standards are identical for boilers, industrial furnaces, and incinerators.

On January 4, 1985, EPA revised its rules to state that listed hazardous wastes and sludges are subject to transportation and storage controls prior to their being burned as fuels in boilers and industrial furnaces and prior to their processing or blending to produce a waste-derived fuel (50 FR 665). On November 29, 1985, EPA promulgated administrative controls for marketers and burners of hazardous waste fuels (50 FR 49164) that included a provision regulating transportation and storage of any hazardous waste used as a fuel or used to produce a fuel.

On May 6, 1987, EPA proposed rules that would establish technical (i.e., emissions) controls for boilers and industrial furnaces burning hazardous waste (52 FR 16982). The proposed boiler and industrial furnace rules would extend the concept of risk assessment to establish national performance standards to control stack emission of metals and hydrogen chloride (HCl) and would control products of incomplete combustion by limiting flue gas carbon monoxide levels. The rules would also require a DRE of 99.99 percent to be demonstrated.

On October 26, 1989, EPA published in the **Federal Register** (54 FR 43718) a supplemental notice to the May 1987 proposed rule. That notice requested comment on alternative approaches to address the following issues: control of PIC emissions by limiting flue gas concentrations of CO and hydrocarbons; control of metals, HCl and particulate emissions; the small quantity burner exemption; the definition of waste that is indigenous when processed for reclamation; applicability of the proposed metals and organic emissions controls to smelting furnaces involved in materials recovery; and the status under the Bevill amendment of residues from burning hazardous waste. The PIC, metals, and HCl emission controls proposed today for incinerators are identical to those which the Agency proposed for boilers and industrial furnaces in the October 1989 supplemental notice. As discussed below, the Agency is also today making several technical corrections to the October 1989 notice. In addition, the Agency is requesting comment on several regulatory issues pertaining to boilers and industrial furnaces burning hazardous waste.

We note that EPA is also proposing today to amend the definition of industrial furnace to include devices that otherwise meet EPA's criteria for classification as an industrial furnace but that are heated by means other than controlled flame combustion (e.g., electric arc smelting furnaces). See section III of part Two. Moreover, we are also requesting comment today on whether and how to regulate all hazardous waste thermal treatment devices (e.g., incinerators, boilers, and industrial furnaces) under parts 264 and 265, subpart O. Under this regulatory scheme, we may be able to eliminate the need for the sometimes ambiguous distinction between boilers, industrial furnaces, and incinerators and the redundant regulatory language that would occur if we promulgate boiler and industrial furnace regulations (part 266, subpart D) as proposed, that are virtually identical to existing and proposed regulations for incinerators.

Finally, we note that we are requesting comments on several issues regarding the proposed listing (52 FR 17018) of halogen acid furnaces as industrial furnaces under § 260.10.

C. Technical Corrections To The October 26, 1989, Boiler/Furnace Supplemental Notice And Request For Comment On Regulatory Issues

For convenience and because today's proposed amendments to the incinerator standards are closely related to the Agency's proposed boiler and industrial furnace rules, the Agency is using today's notice to make several technical corrections to the October 26, 1989, supplemental notice (54 FR 43718). We are also requesting comment on several additional regulatory issues and are reopening the comment period on the supplemental notice to take comment on these issues.

1. *Technical Corrections.* The Agency is making the following corrections to FRL–3358–5EPA/OSW–FR–89–024, Supplement to Proposed Rule for Burning of Hazardous Waste in Boilers and Industrial Furnaces (54 FR 43718 (October 26, 1989)):

a. On page 43720 under the heading "3. Apply Existing Hazardous Waste Incinerator Standard", the cite should be 40 CFR 264.343(c), not 40 CFR 340.342(c).

b. On page 43731, the second equation should read:

$$\frac{x}{140} + \frac{y}{40} < 1$$

c. On page 43757, footnote 56 referencing the source for the HCl RAC of 7 ug/m3 should read "Memo dated May 4, 1989, from Mike Dourson, EPA Office of Health and Environmental Assessment, to the RfD Workgroup, entitled "RfD Meeting of February 16, 1989".

d. On page 43762 in Appendix I, the long-term (i.e., annual) exposure RAC for HCl should be 7 $\mu g/m^3$, the 3-minute exposure RAC for HCl should be 150 $\mu g/m^3$, and the RAC for mercury should be 0.3 $\mu g/m^3$.

e. On page 43763 in Appendix J, the unit risk for beryllium should be 2.4E–03 $m^3/\mu g$ and the unit risk for a n-nitroso-n-methylurea should be 8.6 E–02 $m^3/\mu g$.

2. *Request for Comment on Regulatory Issues.* The Agency is reopening the comment period on the October 26, 1989, supplemental notice to take comment on three issues: (a) the regulation during interim status of the direct transfer of hazardous waste from a transport vehicle to a boiler or furnace; (b) controls on emissions of free chlorine; and (c) limiting stack gas temperature at the inlet to a dry emissions control device (e.g., bag house, ESP) to 450°F. (We note that we are reopening the comment period for the October 26, 1989, supplemental notice to receive comment on these issues only.)

a. Transfer Operations. In the October 26 supplemental notice (see page 43736), the Agency requested comment on two approaches to regulate direct transfer operations: (1) permit writers could use the omnibus authority provided by the statute to establish additional permit conditions as necessary to ensure adequate protection of human health and the environment from such operations; and (2) a requirement that all facilities that burn hazardous waste use blending and surge storage tanks to avoid flow interruptions and waste stratification, which, in turn, could affect the ability of the combustion device to meet the performance standards.

During the comment period for the boiler/furnace supplemental notice, commenters suggested that blending/surge storage tanks were not necessary to ensure compliance with performance standards. This issue will be discussed further in the promulgation of the final boiler/furnace rules. Commenters also stated, however, that controls on transfer operations were needed *during interim status.* They noted that it could take several years for the States or the Agency to issue a final permit to a boiler or furnace facility with a direct transfer operation. They argued that controls were needed in the interim to ensure adequate protection of human health and the environment from spills, fires, explosions, and toxic fumes. We agree and are today requesting comment on regulating direct transfer operations under the appropriate interim status standards for containers and tank systems provided by Subparts I and J of 40 CFR part 265. The other nontechnical standards for interim status facilities could also be applied, as applicable, including subparts A, B, C, D, E, G, and H.

These standards would become effective at the same time that the interim status standards become effective for the boiler or furnace—six months after promulgation.

The transport vehicle, once connected to the boiler or furnace firing system, could be subject to the Subpart I container standards. The once-a-week inspection frequency provided by § 265.174, however, could be revised to require daily inspection.

The piping system from the transport vehicle to the boiler or furnace could be subject to the tank system standards of Subpart J. We note that the compliance dates provided by Subpart J could be revised to reflect the date of promulgation of a final rule.

In the final rule, we could revise the subpart I and J standards as indicated above and include them under the boiler/furnace rules in subpart D of part 266.

The Agency requests comments on the need to regulate transfer operations during interim status and whether the suggested revised standards would be appropriate. The date of the final rule would be the "in existence" date for purposes of interim status qualification.

b. Controls for Emissions of Free Chlorine (Cl_2). As discussed in section III.B. of today's proposal, we are concerned that Cl_2 could be emitted from burning chlorinated wastes if there was insufficient hydrogen available (i.e., from other hydrocarbon compounds or water vapor) to react with all the chlorine in the waste. To address this problem, we are requesting comment on whether to require owners and operators of boilers and industrial furnaces burning hazardous waste to demonstrate that the maximum exposed individual (MEI) is not exposed to Cl_2 concentrations exceeding an annual average reference air concentration (RAC) of 0.4 $\mu g/m^3$.[3] The Cl_2 RAC is based on 100% of the interim inhalation RfD because other sources of Cl_2 are expected to have little or no effect on background levels due to the short life of Cl_2 in the atmosphere. This approach is consistent with the approach EPA proposed for HCl. As with the HCl standards, compliance could be demonstrated by: (1) emissions testing and dispersion modeling; (2) emissions testing and conformance with Cl_2 emissions Screening Limits; or (3) waste analysis and conformance with chlorine feed rate Screening Limits.

The Cl_2 Screening Limits could be developed using the same methodology used for the metals Limits (e.g., same dispersion or dilution factors; feed rate limits assume all chlorine in the feed is emitted as Cl_2). (The dispersion factors used to establish the HCl Screening Limits would not be appropriate because they are based on short-term (i.e., 3-minute) exposures. A short-term RAC is not yet available for Cl_2.) Given that the RAC for Cl_2 is 1.33 times the RAC for mercury, the Screening Limits for Cl_2 would be 1.33 times the Limits established for mercury in Appendix E of the boiler/furnace supplemental notice.

Emissions testing for Cl_2 should be conducted in accordance with "Draft Method for Determination of HCl Emissions from Municipal and Hazardous Waste Incinerators", U.S. EPA, Quality Assurance Division, July, 1989. In using this method for Cl_2 determination, caustic impingers must be used after the water impingers in the sampling train. The caustic solution will then be analyzed for chloride and reported as chlorine.

c. Limiting APCD Inlet Temperatures. We are requesting comment on whether to limit the temperature of stack gas entering a dry emissions control device (e.g., bag house, electrostatic precipitator (ESP)) to minimize formation of chlorinated dibenzodioxin and dibenzofurans (CDD/CDF). After conducting extensive emissions testing of municipal waste combustors (MWCs), the Agency has concluded that CDD/CDF can form on MWC flyash in the presence of excess oxygen at temperatures in the range of 480 to 750°F.[4] Cooling the flue gases and operating the air pollution control device (APCD) at temperatures below 450°F helps minimize the formation of CDD/CDF in the flue gas. Thus, the Agency has recently proposed to limit MWC stack gas temperatures at the inlet to the APCD to 450°F. See 54 FR 52251 (December 20, 1989).

Given that some hazardous waste incinerators and boilers and industrial furnaces burning hazardous waste are equipped with dry particulate control devices, we request comment on the need to control gas temperatures to 450°F to minimize CDD/CDF formation. Although available data indicate that CDD/CDF emissions from hazardous waste combustion devices are much lower than can be emitted from MWCs,[5] it may be prudent to limit gas temperatures in hazardous waste combustion devices as well.

E. Proposed Definition of Sludge Dryer

We note that the Agency plans to discuss the regulatory status of sludge dryers and propose a new definition for such devices in a separate **Federal Register** notice. This definition would distinguish between sludge dryers and incinerators. In that notice, the Agency also will propose to revise the definition of incinerator to exclude sludge dryers that may otherwise meet the definition of incinerator. We summarize below the discussion the Agency plans to present in that notice.

The notice will clarify the current regulatory status of sludge dryers: (1) sludge dryers that meet the § 260.10 definition of a tank[6] and a wastewater

[3] Memo from Priscilla Halloran, EPA, to Dwight Hlustick, EPA, entitled "Health-Based Air Concentrations for Chlorine and N-nitroso-n-methyluera", dated January 4, 1990.

[4] See US EPA, "Municipal Waste Combustion Study: Combustion Control of Organic Emission", EPA/530-SW-87-021C, NTIS Order No. PB87-206090, US EPA, "Municipal Waste Combustion Study: Flue Gas Cleaning Technology", EPA/530-SW-87-021D, NTIS Order No. PB87-206108, and 54 FR 52251 (December 20, 1989).

[5] See discussions in US EPA, "Background Information Document for the Development of Regulations for PIC Emissions from Hazardous Waste Incinerators", October 1989 (Draft Final Report), and Engineering Sciences, "Background Information Document for the Development of Regulations to Control the Burning of Hazardous Waste in Boilers and Industrial Furnaces, Volume III: Risk Assessment", February 1987. (Available from the National Technical Information Service, Springfield, VA, Order No. PB87173845.)

[6] We believe that virtually all sludge dryers meet the tank definition and therefore would be exempt when used as part of a wastewater treatment system.

treatment unit are exempt from regulation; and (2) sludge dryers that are not exempt are subject to regulation under part 265, subpart P, or part 264, subpart X, as thermal treatment units, including those sludge dryers that meet the current definition of an incinerator. Given that the Agency never intended to regulate as incinerators sludge dryers that met the definition of incinerator when it was revised in 1985, nonexempt sludge dryers (those not meeting the definition of wastewater treatment unit) are subject to regulation under the interim status standards of part 265, subpart P, and the permit standards of part 264, subpart X, for other treatment devices. Accordingly, EPA plans to propose a revision to the incinerator definition to explicitly exclude sludge dryers.

To distinguish between sludge dryers and incinerators, EPA plans to propose the following definition: "sludge dryer" means any enclosed thermal treatment device used to dehydrate sludge and that has a maximum thermal input (from wastes and auxiliary fuel) of 1,500 Btu/lb of waste treated. EPA believes that this definition would clearly distinguish dryers from incinerators because incinerators require much higher thermal input—from 3,300 to more than 19,000 Btu/lb of waste treated—to achieve the temperatures required to destroy organic compounds to levels required by the subpart O destruction and removal efficiency standard. EPA believes that, for sludge dryers, the thermal input is invariably less than 1,500 Btu/lb.

IV. Need for Controls

A. Risks From Toxic Metals Emissions

The Agency has determined that risks from the burning of metal-bearing hazardous wastes in incinerators can be unacceptable under reasonable, worst-case circumstances, as defined by concentrations of metals in the incinerated waste, incinerator capacity or feed rate, partitioning of metals to bottom ash, collection efficiency of emission control equipment, and local terrain and meteorological conditions. For purposes of this rule, unreasonable risks are considered to be either: (1) exceedance of incremental lifetime cancer risk of greater than 1×10^{-5} to the potential maximum exposed individual (MEI) [7]; or (2) exceedance at the MEI of Reference Air Concentrations (RACs) for noncarcinogens established as 25 percent of the Reference Dose (RfDs) (except that for lead, the RAC is established at 10 percent of the National Ambient Air Quality Standard and for HCl, the RAC is based directly on inhalation exposure studies). (See discussion in part three below.)

For the purposes of this regulation, the Agency conservatively defines the maximum exposed individual in terms of *potential* exposure: the MEI is assumed to be located where ambient pollutant concentrations created by a facility are highest, even if this location is not currently populated. Thus, the potential MEI exposure predicitions are more conservative than the actual MEI concentrations.[8]

EPA has evaluated potential health risks from metals emissions under reasonable, worst-case scenarios. Conservative dispersion coefficients and ambient levels of metals that pose acceptable health risk (see section I of part III) were used to estimate health risk from a liquid injection incinerator and a rotary kiln incinerator. See table 1. Clearly, metals emissions can pose significant health risk. For the liquid injection incinerator analysis, we made the following assumptions: (1) the waste feed contained metals at the 50th percentile level [9] according to our data base; (2) all metals in the feed are emitted (i.e., emissions are not controlled, and no metals are removed with the bottom ash); and (3) 10 percent of the chromium emitted is hexavalent chromium. For the rotary kiln incinerator, we made the following assumptions: (1) the waste feed contained metals at the highest levels in the data base; (2) 0 to 5 percent of each metal is removed with the bottom ash; (3) the incinerator is equipped with a venturi scrubber (VS–20) to control particulate emissions that has a metal collection efficiency as shown in table G–3 of the boiler/furnace supplemental notice (54 FR 43761 (October 26, 1989)); and (4) 10 percent of the chorimum emitted is hexavalent chromium.

[7] In selecting a risk thresh of 10^{-5} for these rules, EPA considered risk thresholds in the range of 10^{-4} to 10^{-6}. As discussed in section I.D. of Part Three of the text, the Agency requests comment on alternative risk thresholds.

[8] An MEI location is sometimes defined in terms of current land use, i.e., as that location where people are currently exposed to the highest ambient pollutant concentrations. By this definition, MEI concentrations may be *lower* than maximum observed concentrations. Since EPA's intention is to be fully protective of health in the future as well as the present, and since this analysis must generalize on the basis of a sample of situations, we have defined the MEI in terms of maximum potential exposure. We also note that the ground-level concentrations of interest are the *off-site* concentrations except where people reside on site such as military bases, colleges, and universities. Whether on site or off site ground-level concentrations will be considered in demonstrating conformance with the proposed controls will be left to the discretion of the permit writer based on whether people acutally live on site.

[9] The data base is inadequate to derive percentile values. The values shown represent 50 percent of the highest levels of metals in the data base.

TABLE 1.—METALS EMISSIONS CAN POSE SIGNIFICANT RISK

Metal	Liquid injection incinerator			Rotary kiln incinerator		
	Concentration (ppm)	MEI cancer risk	Ambient conc/ RAC	Concentration (ppm)	MEI cancer risk	Ambient conc/ RAC
Carcinogens						
Arsenic	250.0	1E−03		500.0	4E−04	
Beryllium	7.5	4E−06		15.0	2E−06	
Cadmium	500.0	1E−03		1,000.0	3E−04	
Chromium (VI)	1,725.0	3E−03		3,450.0	2E−05	
Noncarcinogens						
Antimony	500.0		2E+00	1,000.0		6E−01
Barium	4,000.0		1E−01	8,000.0		1E−03
Lead	7,000.0		1E+02	14,000.0		3E+01
Mercury	2.0		1E−03	4.0		9E−04
Silver	500.0		2E−01	1,000.0		4E−02
Thallium	500.0		2E+00	1,000.0		6E−01

B. Risks from Hydrogen Chloride Emissions

EPA is today proposing to supplement the existing technology-based HCl standard with a standard based entirely upon evaluation of health risk. The existing HCl standard requires that an incinerator control HCl emissions by 99 percent or emit only 4 lb/hr (1.8 kg/hr).

The Agency has determined through risk assessments of reasonable, worst-case facilities that the short-term reference air concentration (RAC) for HCl can be exceeded under the existing rule. Thus, EPA is proposing to regulate HCl under the same risk-based standard-setting approach proposed for metals. These standards will be in the form of site-specific risk analysis standards, with conservative screening limits provided to ease the burden on the applicant. For more information on the proposed HCl standards, see Part Three, Section III: Proposed Controls for Emissions of Hydrogen Chloride.

C. Potential Risks from Products of Incomplete Combustion (PICs)

The destruction and removal efficiency (DRE) approach to control organic emissions used in the present regulations has some inherent limitations. It does not control the actual mass of POHCs emitted since, for any given DRE, the mass emissions vary directly in proportion to variations in mass feed rate. More importantly, the approach fails to account directly for emissions of PICs, which can be as toxic as, or more toxic than, the POHCs.

As discussed in part Three of this preamble, available data on PIC emissions are limited. The studies done thus far indicate that emissions of toxic organic compounds from incinerators could result in an increased lifetime cancer risk of 10^{-6} (i.e., 1 in 1,000,000) to persons exposed to the maximum annual average ground-level concentration. The data base on PIC emissions is limited, however, and thus those risk assessments under-estimate the risk. Those assessments consider only the organic compounds that have been actually identified and quantified. Only 0 to 60 percent of total unburned hydrocarbon emissions have been chemically identified at any particular facility. Thus, the bulk of the hydrocarbon emissions have not been considered in those risk assessments. Although many of the unidentified, unquantified organic compounds may be nontoxic, some fraction of the organic emissions is undoubtedly toxic. Considering that the available data are limited, EPA believes it is prudent to require incinerators to operate at a high combustion efficiency to minimize the potential health risks from PIC emissions.

PART TWO: REGULATORY OPTIONS CONSIDERED

This part discusses the options considered by the Agency when developing the standards proposed today.

I. Particulate Emission Limits

A. Consideration of Controlling Metals with a Particulate Standard

The existing regulations control metal and some organic emissions through the performance standard for particulates. Metals can be contained in particulates or condense out onto particulates and are then captured by air pollution control devices. The present particulate standard of 180 milligrams per dry standard cubic meter may not provide adequate protection if a substantial percentage of the particulate is composed of toxic metals.[10] Further, in the case of volatile metals such as arsenic, mercury, and chlorides of lead and cadmium, the particulate standard may provide little control.

Existing hazardous waste composition data make it difficult to estimate the average, or reasonable, worst-case levels of toxic metals in wastes that are incinerated. In addition, as the Agency continues to prohibit land disposal of untreated hazardous waste, hazardous wastes with very high metals levels may be incinerated in the future. Also, testing for metals levels in incinerator emissions has been insufficient to determine the average, or reasonable, worst-case levels of metals emissions to be expected from hazardous waste incinerators. However, there is nothing in the present regulations that would prohibit an incinerator operator from introducing extremely high concentrations of toxic metal-containing wastes into an incinerator, thereby creating a situation that would present high risks from toxic metals emissions.

Analysis of a hypothetical reasonable, worst-case situation indicates that present rules may not be adequate to maintain low levels of risk from toxic metals under all possible scenarios.

Even relatively low concentrations of toxic metals in wastes can result in unacceptable levels of risk if the wastes are burned in incinerators without air pollution control devices. Based upon the 1981 mail survey,[11] almost half of all interim status incinerators had no air pollution control device because, as liquid waste incinerators, they did not emit enough particulate matter to require an air pollution control device to meet the particulate standard of 180 mg/dscm.

It does not appear sufficient at this time, in the Agency's judgment, to rely solely on a particulate standard as a surrogate for adequate control of toxic metals. Given that there is virtually no upper bound in the levels of metals in hazardous wastes that may be incinerated (absent regulatory control), we have no assurance that the particulate control provided by state-of-the-art technology would be adequate in all cases. Thus, we believe that the risk-based standards proposed today are preferable to a technology-based particulate standard alone to control metals.

B. Consideration of a More Stringent Particulate Standard

EPA is not proposing to revise at this time the existing standard of 0.08 gr/dscf for the control of particulate matter (see 40 CFR 264.343(c)). This standard was based on the new source performance standard (NSPS) developed under the Clean Air Act in 1979 for solid waste incinerators. On December 20, 1989, however, EPA proposed a particulate emissions NSPS for municipal waste combustors (MWCs) of 0.015 gr/dscf. See 54 FR 52251. This more stringent standard takes advantage of technology advances made in the field of air pollution control.

The Agency has considered lowering the hazardous waste incinerator particulate standard of 0.08 gr/dscf to be consistent with the proposed MWC standard. However, reasonable, worst-case dispersion analyses show that the existing particulate standard of 0.08 gr/dscf limits ambient levels generally to less than 30 percent of the 24-hour average PM_{10} (particulate matter sized less than 10 microns) National Ambient Air Quality Standard (NAAQS), 150 $\mu g/m^3$. Further, we note that the existing particulate standard would, under today's rule, be supplemented with risk-based standards to control emissions of organic compounds and metals that may be adsorbed on particulate matter. In addition, where a problem with the NAAQS is identified in a particular area, the Agency or authorized State should be including all sources of particulates in the State Implementation Plans (SIPs). Therefore, if an incinerator creates or aggravates a problem with the NAAQS, regulation of that source (with respect to particulate emissions) would

[10] Mitre, op. cit., page 8.

[11] DPRA. 1981. Regulatory Impact Analysis Mail Survey. Manhattan, Kansas.

be addressed under the SIP process or potentially by a RCRA permit writer using the omnibus permitting authority.

In developing today's proposed rule, a number of people representing a wide range of interests (e.g., industry representatives, environmentalists) have indicated, however, that the rule may be simpler to implement and more protective if the controls were technology-based. They advocate using risk assessment only as a check to determine if the standards are protective on a site-specific basis. They cite the current limitations of risk-based standards in this particular situation, including: (1) indirect exposure (e.g., uptake through the food chain) has not been considered for carcinogens; (2) metals controls are proposed only for those metals for which sufficient health effects data exist to establish acceptable ambient levels; and (3) the metals controls are difficult to implement by limiting feed rates of individual metals given the physical matrices of wastes and the variability of metals concentrations. We agree with these concerns and are initiating a testing program to develop technology-based controls for particulate matter to provide a measure of control for particulates, including metal particulates and adsorbed organic compounds, commensurate with best demonstrated technology (BDT) for hazardous waste incinerators. See RCRA section 3004(a)(1)—section 3004 standards are to be revised periodically to take into account improvements of measurement and technology. If EPA establishes a BDT particulate standard, the risk-based controls for metals emissions would still apply and would then be used as a check to determine if the BDT standard provides adequate protection on a case-by-case basis. Given the limitations of current risk assessment methodologies, we do not believe that it could be demonstrated that a BDT standard substantially over-regulates in many situations.

We are not proposing at this time to lower the existing particulate standard because we have not conducted adequate field testing of hazardous waste incinerators to establish a BDT particulate standard.[12] Further, once the BDT standard is identified, we would then need to consider the impact on the regulated community of applying the standard to establish a reasonable compliance schedule.

II. Definitions of Incinerators and Industrial Furnaces

We discuss below the basis for proposing to revise the definitions of incinerator and industrial furnace, the regulatory status for sludge dryers, and a request for comment on regulating all hazardous waste thermal treatment devices under parts 264 and 265, subpart O.

A. Definition of Incinerator and Industrial Furnace

Existing definitions in § 260.10 for incinerators and industrial furnaces consider how thermal energy is provided to the device. Both definitions stipulate that the device must utilize controlled flame combustion, thus excluding devices using other means to supply the heat necessary to combust or otherwise themally treat waste. Thus, for example, electric arc smelters are not industrial furnaces and devices using infrared heat to destroy waste are not incinerators. Significant regulatory consequences result from these determinations. Electric arc smelters that reclaim nonindigenous metal hydroxide sludges are not industrial furnaces, and, thus, are exempt from regulation under § 261.6(c)(1), while smelters using direct flame combustion to reclaim the same sludge would be regulated under the May 6, 1987, proposed rules for boilers and industrial furnaces. Infrared devices used to destroy waste would be regulated under the subpart X permit standards of part 264 and the subpart P interim status standards of part 265, while controlled flame incinerators would be regulated under subpart O of parts 264 and 265 (and any amendments resulting from today's proposal). The subpart X permit standards under part 264 are not prescriptive; permit writers use engineering judgment and risk analysis to determine appropriate permit conditions.

We believe that incinerators and industrial furnaces pose much the same risk irrespective of whether they use controlled flame combustion or some other means to provide heat energy. Therefore, we are proposing to replace or temper the reference to controlled flame combustion in respective definitions.

1. *Revised definition of industrial furnace.* We are proposing to revise the definition of industrial furnace to refer to thermal treatment rather than to controlled flame combustion. We believe that there are very few additional industrial furnaces (that process nonindigenous waste) that would be regulated under this expanded definition, and it makes no sense to regulate these few furnaces differently than other industrial furnaces processing the same materials. EPA specifically requests comments on the need for the revised industrial furnace definition and resulant impacts on the regulated community.

2. *Plasma arc and infrared devices are incinertors.* We are proposing to revise the definition of incinerator to include explicitly two nonflame combustion devices: plasma arc and infrared incinerators. Although these devices are sometimes considered to be nonflame devices rather than incinerators, we believe that they should be regulated as Subpart O incinerators for two reasons. First, they invariably employ afterburners to combust hydrocarbons driven off by the plasma arc or infrared process. Thus, it can be argued that these units, in fact, meet the current definition of an incinerator. Second, we believe that the Subpart O incinerator standards can be appropriately applied to these devices; the technical requirements of subpart O are appropriate to address the hazards posed by these devices. We also note that applying the Subpart O standards will reduce the burden on both permit writers and applicants. The Subpart X standards are nonprescriptive standards under which permit writers apply permit conditions as appropriate to protect human health and the environment. Thus, under subpart X, permit writers would need to determine on a case-by-case basis whether particular provisions of subpart O are appropriate and whether additional permit conditions would be needed. Using Subpart O strandards removes the ambiguity for both permit writers and applicants over what requirements are necessary.

Today's proposed amendments to the incinerator standards likewise appear suitable for plasma arc and infrared incinerators. We request comment on whether there are other "nonflame" combustion devices for which the Subpart O incinerator standards are applicable (i.e., devices that use an afterburner to combust hydrocarbons generated from hazardous waste by a nonflame process).

We note that we are proposing only to change (or clarify) the regulatory status of these two classes of devices, not to subject them to regulation for the first time. Thus, interim status is not being reopened for these devices. They have

[12] We note that several States control hazardous waste incinerator particulate emissions to levels well below EPA's standard of 0.08 gr/dscf. In addition, several hazardous waste incinerators have been demonstrated to be capable of routinely controlling particulate emissions to levels in the 0.01–0.02 gr/dscf range, or less. Further, as discussed above in the text, the proposed particulate standard for MWCs is 0.015 gr/dscf. Thus, we anticipate that a BDT particulate standard for hazardous waste incinerators would be within that range of 0.01 to 0.02 gr/dscf.

been regulated since 1980 under subpart P (interim status standards for thermal treatment units), subpart X (permit standards for other treatment units), or subpart O (interim status and permit standards for incinerators). We note that the interim status standards of part 265, subpart P, are virtually identical to the interim status standards of part 265, subpart O.

3. *Fluidized bed devices are incinerators.* EPA would also like to clarify that fluidized bed devices are incinerators and are regulated under subpart O. They are not subject to the thermal treatment standards of part 265, subpart P, or requirements established under part 264, subpart X. Fluidized bed incinerators are enclosed devices that are designed to provide contact between a heated inert bed material fluidized with air and the solid waste. Gas is passed upwards through a column of fine particulates at a sufficient velocity to cause the solids/gas mixture to behave like a liquid. The bed is preheated by overfired or underfired auxiliary fuel. It is generally accepted that fluidized beds meet the definition of incinerator, although there may have been some confusion in the past. Although we are clarifying that they do meet the definition of incincerator, we specifically request comment on whether there is sufficient ambiguity to warrant adding fluidized bed devices to the definition of incinerator.

4. *Revised regulatory status of carbon regeneration units.* We are also proposing to revise the regulatory status of carbon regeneration units. Controlled flame carbon regeneration units currently meet the definition of incinerator and have been subject to regulation as such since 1980,[13] while carbon regeneration nonflame units have been treated as exempt reclamation units. We are proposing to regulate both direct flame and nonflame carbon regeneration units as thermal treatment units under the interim status standards of part 265, subpart P, and the permit standards of part 264, subpart X. Our reason for doing this is that we are concerned that emissions from these devices may present a substantial hazard to human health or the environment. We are not proposing to apply the part 264, subpart O, incinerator standards to these units because we are concerned that demonstration of conformance with the DRE standards (and the proposed CO/THC standards) may not be achievable considering the relatively low levels of toxic organic compounds absorbed onto the activated carbon.

The prevailing view appears to be that carbon regeneration units currently are exempt recycling units. We have considered whether or not these units truly are engaged in reclamation, or whether the regeneration of the carbon is just the concluding aspect of the waste treatment process that commenced with the use of activated carbon to absorb waste contaminants, which are now destroyed in the "regeneration" process.[14] Irrespective of whether these units are better classified as waste treatment or recycling units (or whether the units are flame or nonflame devices), we are concerned, as indicated above, that emissions from the regeneration process can pose a serious hazard to public health if not properly controlled. Consequently, nonflame units in existence on the date of promulgation (like flame units) would be subject to part 265, subpart P, and new units would be subject to part 264, subpart X.

We note that we intend for this proposal to also apply to those carbon regeneration units that meet the definition of wastewater treatment units in § 260.10 while they are in active service. These units would not be exempt from regulation when they are being regenerated because they are no longer treating wastewater. Rather, the activated carbon columns themselves are being treated thermally.

B. Regulation of All Thermal Treatment Units Under Subpart O

The Agency has done some preliminary thinking on an alternative approach to regulating combustion devices—the regulation of all thermal treatment devices under virtually identical standards under subpart O. This would avoid a number of problems with the current regulatory approach, including: (1) Ambiguous definitions for boilers and industrial furnaces; (2) incomplete coverage of the incinerator and industrial furnace definitions (e.g., although today's proposal would expand regulatory coverage of industrial furances to include heating by means other than controlled flame combustion, furances other than those that are "integral components of a manufacturing process" (see § 260.10), such as off-site facilities engaged solely in waste management, could be engaged in *bona fide* reclamation and should be classified as an industrial furnace rather than an incinerator); (3) the burden on the regulated community and EPA and State officials to process petitions to classify individual devices as boilers or industrial furnaces rather than incinerators; and (4) the numerous provisions in the proposed boiler and furnace rules that would merely parrot the current and proposed incinerator standards.

Under this alternative approach, all thermal treatment devices would be regulated under the same risk-based standards to control metals and HCl emissions—the standards proposed today for incinerators.[15] Control of organic emissions could also be the same as those CO controls proposed today for incinerators coupled with the existing DRE standards for incinerators. Devices handling wastes with low levels of toxic organic constituents (e.g., smelters, sludge dryers, certain incinerators), however, would not be subject to organic emissions controls. The applicability of standards could, in many cases, be a function of waste properties and composition. It may not be necessary to identify applicability by type of device.

EPA is continuing to consider this alternative. In particular, we are investigating whether the temporary exclusion for the special wastes in RCRA section 3001(b)(3) and the special standards and exemptions proposed for boilers and industrial furnaces can be implemented without definitions for these devices. We specifically request comments on this alternative regulatory approach whereby all thermal treatment units could be regulated under one set of standards under subpart O.

PART THREE: DISCUSSION OF PROPOSED CONTROLS

I. Overview of EPA's Risk Assessment

In developing this regulation, the Agency has used risk assessment to: (1) determine that absent regulatory

[13] There appears to be confusion as to the current regulatory status of direct flame activated carbon regeneration units. Because EPA indicated in the May 19, 1980, preamble that all activated carbon regeneration units were engaged in a form of recycling presently exempt from regulation (45 FR 33094), EPA is proposing in this notice to amend the regulations to control these devices, both direct and indirect fired. Consequently, the "in existence" date for all activated carbon regeneration units would be the date of promulgation of final regulations.

[14] We note that activated carbon units used as air emissions control devices frequently regenerate the carbon in place by steam stripping, condensing the organic contaminants for reuse. The trapped organics in such columns are not hazardous wastes because the gas originally being treated is not a solid waste (it is an uncontained gas), and therefore any condensed organics do not derive from treatment of a listed hazardous waste.

[15] We note that EPA is requesting comment on applying these controls (as well as the proposed CO controls) to boilers and industrial furnaces as well in lieu of those proposed on May 6, 1987. See the Federal Register notice published today entitled, "Burning of Hazardous Waste in Boilers and Industrial Furnaces: Supplement to Proposed Rule."

controls, emissions of products of incomplete combustion, and certain metals can pose significant health effects; (2) determine that the current hydrogen chloride emissions standard may not be fully protective in all situations; and (3) establish risk-based, conservative emission Screening Limits for metals, hydrogen chloride (HCl), and, under one alternative approach, unburned hydrocarbons. The risk assessment methodology is discussed in detail in the background document supporting this proposed rule—*Technical Background Document: Controls for Metals and Hydrogen Chloride Emissions for Hazardous Waste Incinerators.* The methodology is summarized below for the convenience of the reader.[16]

A. Overview of the Risk Assessment Approach

EPA's risk assessment approach involves: (1) Establishing ambient levels of pollutants (i.e., metals, hydrogen chloride (HCl), and hydrocarbons (HC)) that pose acceptable health risk; and (2) developing conservative dispersion coefficients [17] for reasonable worst-case facilities as a function of key parameters (i.e., effective stack height,[18] terrain type, and land use classification). To establish the conservative Screening Limits for metals, HCl, and HC, we back-calculated from the acceptable ambient levels using the conservative dispersion coefficients.

Under today's proposal, applicants would be required to demonstrate that emissions of metals, HCl, and (when stack gas carbon monoxide concentrations exceed 100 ppmv, and under the health-based alternative approach to assess HC emissions) HC emissions do not result in an exceedance of the acceptable ambient levels. If the conservative Screening Limits are not exceeded, applicants need not conduct site-specific dispersion modeling to make this demonstration.

In developing the conservative coefficients and acceptable ambient levels for metals, HCl, and HC, EPA also found that, under reasonable worst-case situations, emission levels could pose unacceptable risk absent regulatory controls.

B. Identification of Reasonable Worst-Case Incinerators by Terrain Type

1. *Factors influencing ambient levels of pollutants.* Ambient levels of pollutants resulting from stack emissions are a function of the dispersion of pollutants from the source in question. Many factors influence the relationships between releases (emissions) and ground-level concentrations, including: (1) The rate of emission; (2) the release specifications of the facility (i.e., stack height, exit velocity, exhaust temperature and inner stack diameter, which together define the facility's "effective stack height"); (3) local terrain; and (4) local meteorology and (5) urban/rural classification.

2. *Selection of Facilities and Sites for Dispersion Modeling.* Hazardous waste incinerators are known to vary widely in capacity, configuration, and design, making it difficult to identify typical parameters that affect dispersion of emissions (i.e., release parameters). For instance, stack heights of incinerators listed in the 1981 survey [19] vary from less than 15 feet to over 200 feet. Furthermore, many new facilities that are now in operation that are not listed on the survey, and EPA expects that a large number of additional facilities of various types of designs are likely to be constructed over the next several years.

For currently operating facilities, the worst-case dispersion situation would be a combination of release specifications, local terrain, urban/rural land use classification, and local meteorology that produces the highest ambient concentrations of hazardous pollutants per unit of pollutant released by a facility. This can be expressed, for any specific facility, as a dispersion coefficient, which, for purposes of this proposal, is the maximum annual average (or, as explained later, for HCl, maximum 3-minute) ground-level concentration for an emission of 1 g/s (a unit release); the units of the dispersion coefficient are, therefore, $\mu g/m^3/g/s$.[20]

Since dispersion coefficients are, as a general rule, inversely correlated with effective stack heights, worst-case facilities are most likely to be those with the shortest effective stack heights. No similar *a priori* judgment, however, should be made with respect to terrain or meteorology; evaluation of the influence of these factors requires individual site-by-site dispersion modeling. It was therefore not possible to screen facility locations in advance to select for probable worst-case situations simply by considering stack height.

Instead, out of a total number of 154 existing facilities for which data were available from the mail survey,[21] we roughly sorted the facilities into three terrain types based on broad-scale topographic maps: flat, rolling, and complex terrain. We then ranked the facilities by effective stack heights. Next, we evaluated terrain rise out to 50 km for each of the 24 facilities and ranked the facilities by maximum terrain rise. Finally, we subdivided the 24 facilities into three groups which are loosely defined as flat, rolling, and complex terrain. In addition, to enable us to determine conservative dispersion coefficients as a function of effective height, we developed 11 hypothetical incinerators and modeled each of these "incinerators" at the 24 sites. The hypothetical facilities were selected by dividing the range of facilities listed in the 1981 survey into 10 categories based on effective stack height. Then, within each stack height category, we selected a hypothetical effective stack height that approximated the 25th percentile of the range of heights that existed within the category. The 25th percentile was chosen in order to select a facility likely to reflect the higher end of dispersion coefficients (and ambient levels) in each height category. In addition, an eleventh hypothetical source was defined in order to represent facilities whose heights of release do not meet good engineering practice (see the discussion on good engineering practice in Part Three, II C, Site-Specific Risk Analysis Standards). Such devices will experience "building wake effects"—turbulence created by adjacent structures that immediately mixes the

[16] We note that this discussion has been presented virtually verbatim in the October 26, 1989, supplemental notice to the May 1987 proposed boiler and industrial furnace proposed rules. See 54 FR 43752 (Appendix F). We have, however, made minor revisions to that discussion to: (1) explicitly request comment on alternative risk levels within the range of 10^{-4} to 10^{-6}; (2) better explain the Agency's selection of a 10^{-5} aggregate risk threshold for this rule; (3) explain that the Agency does not intend for the methodology used to establish the proposed reference air concentrations (RACs) to imply a decision to supplant standards established under the Clean Air Act; and (4) request comments on whether the conservative assumptions used in the risk methodology properly balance the nonconservative assumptions, or whether the methodology creates RACs that are unnecessarily stringent.

[17] For purposes of this document, the term dispersion coefficient refers to the ambient concentration that would result from an emission rate of 1 gram/sec. This parameter is also commonly called a dilution factor.

[18] Effective stack height is the height above ground level of a plume, based on summing the physical stack height plus plume rise.

[19] DPRA, op. cit.

[20] Dispersion coefficients can be defined for any specific location surrounding a release. The maximum dispersion coefficient will, under the assumptions used in this regulation, be the dispersion coefficient for the MEI. It may occur at any distance and in any direction from the facility. However, locations within the property boundary of a facility would not be considered when implementing these proposed rules unless individuals reside on site.

[21] We note that the survey should be representative because it addressed over 50 percent of the 250 hazardous waste incinerators now in operation.

plume resulting in high ground-level concentrations close to the stack.

Finally, we also included the site that resulted in the worst-case complex terrain conditions during development of the proposed rule for boilers and industrial furnaces.[22] Although there is currently no hazardous waste incinerator at that site, we used the site as another theoretical location for the 11 hypothetical incinerators and merged the results into those from the actual incinerator sites. Under certain conditions, this site provided higher dispersion coefficients for some stacks.

In summary, 11 hypothetical incinerators and the actual incinerators were modeled at each of 24 sites evenly distributed among flat, rolling, and complex terrain. In addition, the 11 hypothetical incinerators were modeled at an additional complex terrain site.

C. Development of Dispersion Coefficients

Estimating the air impacts of the facilities required the use of five separate air dispersion models. We used the *EPA Guideline on Air Quality Models (Revised),*[23] and consulted with the EPA Office of Air Quality Planning and Standards to select the most appropriate model for each application.

For each of the 25 locations, five consecutive years of concurrent surface and twice-per-day upper air data (to characterize mixing height) were acquired. The data sets contained hourly records of surface observations for five years, or approximately 44,000 consecutive hours of meteorological data. The same five-year data set was used to estimate the highest hourly dispersion coefficient during the five-year period, and to estimate annual average concentrations based on a five-year data set for all release specifications modeled at each location.

The actual incinerator release specifications at each location were used to select the appropriate model for short-term and long-term averaging periods. Once selected, the release specifications for the actual incinerator and the 11 hypothetical incinerators were modeled. Table 2 lists the models selected.

TABLE 2.—MODELS SELECTED FOR THE RISK ANALYSIS

Terrain classification	Urban/ Rural	Averaging period	Model selected
Flat or Rolling.	Urban or Rural.	Annual average.	ISCLT
Flat or Rolling.	Urban or Rural.	Hourly	ISCST
Complex	Urban	Annual average.	LONGZ
Complex	Urban	Hourly	SHORTZ
Complex	Rural	Hourly or annual.	COMPLEX I

The Industrial Source Complex models (ISCLT and ISCST) were selected for flat and rolling terrain because they can address building downwash or elevated releases and can account for terrain differences between sources and receptors. The long-term mode (ISCLT) was used for annual averages, while the short-term mode (ISCST) was used to estimate maximum hourly concentrations.

To meet the EPA guidance on model selection, we used three different models to characterize dispersion over complex terrain. For urban applications, OAQPS recommends SHORTZ for short-term averaging periods and LONGZ for seasonal or annual averages. For rural sites located in complex terrain, OAQPS recommends the COMPLEX I model.

We used U.S. Geological Survey 7.5-minute topographic maps to document terrain rise out to 5 km from each stack. For purposes of this proposed rule, a facility is considered to be in flat terrain if the maximum terrain rise within 5 km of the stack is not greater than 10 percent of the physical stack height. The facility is in rolling terrain if terrain rise is greater than 10 percent but not greater than the physical stack height, and in complex terrain if terrain rise is greater than the physical stack height.[24]

We also used the topographic maps as the basis to classify land use as urban or rural. A simplified version of the Auer technique [25] based on the preferred land use approach (rather than population density) was used for this classification. If greater than 50 percent of the land was classified as urban, the models were executed in the urban mode for that facility. If greater than 50 percent was classified as rural, the rural modes were used.[26]

To identify conservative dispersion coefficients as a function of effective stack height, we graphically plotted for each terrain type (i.e., flat, rolling, and complex) and each land use classification (i.e., urban and rural) dispersion coefficients for the modeled facilities and locations as a function of effective stack height. The outer envelope representing the highest dispersion coefficients was drawn to enable us to identify conservative coefficients for any effective stack height within the range of those modeled (i.e., 4 m to 120 m).

We determined that there was no significant difference in dispersion coefficients (under the severe conditions modeled) between flat and rolling terrain. Thus, those terrain types were merged together and termed noncomplex terrain. In addition, a discontinuity was observed between the SHORTZ/LONGZ and Complex I [27] models, which resulted in our not distinguishing between land use classifications in complex terrain. Finally, we note that there was no significant difference in 3-minute exposures between urban and rural land use in either noncomplex or complex terrain. Thus, we have not distinguished between land use classifications in establishing the HC1 Screening Limits. There is, however, a significant difference in maximum annual average dispersion coefficients between urban and rural land use in noncomplex terrain, and so we have established separate metals and THC Screening Limits for those situations.

We note that the dispersion coefficients used to establish the Screening Limits are designed to be conservative, but may, in fact, not be conservative in extremely poor dispersion conditions, or when the receptor (location (i.e., residence)) is

[22] See "Background Information Document for the Development of Regulations to Control the Burning of Hazardous Waste in Boilers and Industrial Furnaces, Volume III: Risk Assessment", Engineering-Sciences, February 1987. (Available from the National Technical Information Service, Springfield, VA, Order No. PB 87 173845.)

[23] USEPA. *Guideline on Air Quality Models (Revised).* U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N.C. EPA-450/2/78-027R. July 1986.

[24] We note that EPA can consider terrain well past 5 km of a stack to define terrain type for some facilities. We believe, however, that a radius of 5 km is adequate because we are concerned with MEI exposures (as opposed to aggregate population exposures) and because the effective stack heights of concern are relatively low in comparison to facilities such as major power plants. Thus, MEI exposures for the conditions modeled will always occur within 5 km of the stack.

[25] Auer, August, H., Jr. *Correlation of Land Use and Cover with Meteorological Anomalies. Journal of Applied Meteorology,* Vol. 17, pp. 636-643, May 1978.

[26] OAQPS guidelines indicate that 50 percent is the cutoff point between urban and rural; however, to be conservative and to account for differences in the accuracy of different measurement methods, EPA is recommending that for permitting purposes land use be considered urban if greater than 75 percent is urban; that it be considered rural if land use is greater than 75 percent rural; and that if the land use is between 75 percent urban and 75 percent rural the more conservative Screening Limit of the two be used.

[27] Complex I was found to produce relatively low estimates of short-term concentrations.

close-in to the source. Under the situations identified below, the Screening Limits may not be protective and the permit writer should require site-specific dispersion modeling consistent with EPA's *Guideline on Air Quality Models (Revised)* to demonstrate that emissions do not pose unacceptable health risk:

- Facility is located in a narrow valley less than 1 km wide; or
- Facility has a stack taller than 20 m and is located such that the terrain rises to the stack height within 1 km of the facility; or
- Facility has a stack taller than 20 m and is located within 5 km of the shoreline of a large body of water (such as an ocean or large lake); or
- The facility property line is within 200 m of the stack and the physical stack height is less than 10 m; or
- On-site receptors are of concern, and the stack height is less than 10 m.

In addition to the situations identified above, there is a probability, albeit small, that the combination of critical parameters, stack height, stack gas velocity, effluent temperature, meteorological conditions, etc., will result in higher ambient concentrations than resulted from the conservative modeling done to support this rule. As a result, the Agency is reserving the right to require that the owner or operator submit, as part of the permit proceeding, an air quality dispersion analysis consistent with EPA's *Guideline on Air Quality Models (Revised)* in order to ensure that acceptable ambient levels of pollutants are not exceeded irrespective of whether the facility meets the specific Screening Limits that would be established by this regulation.

Finally, we specifically request comment on whether less conservative assumptions, coupled with a safety factor then applied to assure that ambient levels are not underestimated, should be used to develop the Screening Limits. This alternative approach may have merit because the repeated use of conservative assumptions in an analysis may "multiply" the conservatism unreasonably. Comments are solicited on: (1) the extent to which less conservative assumptions would enable applicants to meet the Limits; (2) how to reduce the conservatism of the Screening Limits while still ensuring that they are protective; and (3) how the reduced conservatism would affect the criteria discussed above that must be considered to determine if the Screening Limits are protective for a particular situation. Note that, in section I.D. of Part Three of the preamble, the Agency requests comment on basing the standards on alternative risk thresholds.

D. Evaluation of Health Risk

1. *Risk from Carcinogens.* EPA cancer risk policy suggests that any level of human exposure to a carcinogenic substance entails some finite level of risk. Determining the risk associated with a particular dose requires knowing the slope of the modeled dose-response curve. On this basis, EPA's Carcinogen Assessment Group (CAG) has estimated carcinogenic slope factors for humans exposed to known and suspected human carcinogens. Slope factors are estimated by a modeling process. The slope of the dose-response curve enables estimation of a unit risk. The unit risk is defined as the incremental lifetime risk estimated to result from exposure of an individual for a 70-year lifetime to a carcinogen in air containing 1 microgram of the compound per cubic meter of air. Both the slope factors and unit risks are reviewed by the Agency's Cancer Risk Assessment Validation Endeavor (CRAVE) workgroup for verification.

The unit risk values that the Agency is proposing to use for today's incinerator amendments are identical to those the Agency proposed for boilers and industrial furnaces burning hazardous waste. The unit risk values are presented in Appendix J of the October 26, 1989 Supplement to Proposed Rule for boilers/furnaces. See 54 FR 43763. (We note that the unit risk for beryllium presented in Appendix J should be 2.4E–03 m^3/ug.) The acceptable ambient level for a carcinogenic compound is termed the risk-specific dose (RSD) and is derived by dividing the acceptable health risk by the unit risk value. As discussed below, the risk threshold proposed for this rule is 10^{-5}.[28] Thus, the RSDS for the metals that would be regulated by today's rules can be calculated by dividing $1X10^{-5}$ by the unit risk values for the metals presented in appendix J of the boiler/furnace supplemental notice.[29] The RSDs for the metals are presented in appendix H of the boiler/furnace supplemental notice (see page 43762).

In setting acceptable risk levels to develop today's proposed rule, we considered the fact that not all carcinogens are equally likely to cause human cancers, as discussed in *Guidelines for Carcinogenic Risk Assessment* (51 FR 33992 (September 24, 1986)). The Guidelines have established a weight-of-evidence scheme reflecting the likelihood that a compound causes tumors in humans. The weight-of-evidence scheme categorizes carcinogens according to the quantity and quality of both human and animal data as known, probable, and possible human carcinogens. The proposed approach places a higher weight on cancer unit risk estimates that are based on stronger evidence of carcinogenicity. The proposed approach will provide for making fuller use of information by explicitly examining risk for different categories of carcinogens. In reaching the conclusion of the level of cancer risks to be used to support this proposal, we have considered available information on the constituents being emitted, the evidence associating these compounds with cancer risk, the quantities of emissions of these constituents, and the exposed populations.

For purposes of today's rule, we are proposing the following risk levels as acceptable incremental lifetime cancer risk levels to the hypothetical maximum exposed individual (MEI): (1) for Group A and B carcinogens, on the order of 10^{-6},[30] and (2) for Group C carcinogens, on the order of 10^{-5}. These risk levels are within the range of levels historically used by EPA in its hazardous waste and emergency response programs—10^{-4} to 10^{-7}.

Under the weight-of-evidence approach to assess carcinogenic risk for this proposed rule, we believe it is appropriate to add the risk from carcinogens *within* the category of those that are known or probable human carcinogens, the Group A and B carcinogens. Such a group is composed of certain metals which cause lung cancer (arsenic, beryllium, cadmium, and chromium).

Similarly, it is appropriate to add the risk from carcinogens within the category of those that are probable or possible human carcinogens, C carcinogens.

[28] In selecting a 10^{-5} risk threshold for these rules, EPA considered risk thresholds in the range of 10^{-4} to 10^{-6}. As discussed in Section I.D. of Part Three of the text, the Agency requests comment on alternative risk thresholds.

[29] We note, however, that the risk threshold proposed for these rules is based on the aggregate (i.e., summed) risk for all carcinogenic metals. Thus, the RSD calculated by dividing $1X10^{-5}$ by the unit risk value for a carcinogenic metal would be the acceptable ambient level if that were the only carcinogenic metal emitted. If other carcinogenic metals are emitted, the allowable ambient level for a metal depends on the ambient levels of all the carcinogenic metals. The sum of all carcinogenic metals of the ratios of the actual ambient level to the RSD cannot exceed one to ensure that the aggregate risk does not exceed $1X10^{-5}$.

[30] A dose is calculated to correspond to a risk of causing cancer to one individual in one million exposed to that dose over a lifetime.

To implement this carcinogenic risk assessment approach, we are proposing to limit the *aggregate* risk to the MEI to 10^{-5}. This would limit the risk from *individual* carcinogenic metals to levels on the order of 10^{-6} but below 10^{-5}. In selecting a 10^{-5} aggregate risk threshold level for this rule, we considered risk thresholds in the range of 10^{-4} to 10^{-6}, the range the Agency generally uses for various aspects of its hazardous waste programs.

We considered limiting the aggregate risk to the MEI to 10^{-6} but determined that this risk threshold would be unnecessarily conservative for the purpose of this rule. In reaching this determination, we considered that, at an aggregate risk level of 10^{-6}, the risk level for individual metals would be on the order of 10^{-7}, which we believe is overly conservative for this rule.

Alternatively, we considered limiting the aggregate risk to the MEI to 10^{-4}. An aggregate risk threshold of 10^{-4} would result in limiting the risk level for individual carcinogens on the order of 10^{-5}. We did not select a 10^{-4} aggregate risk threshold for this proposed rule because the risk assessment methodology used to establish emission limits considers only direct exposure to the metals via inhalation of dispersed emissions. Other routes of exposure are not accounted for by this methodology, which means risks could be somewhat higher. The Agency requests comments on the magnitude and nature of these risks.

As noted above, the Agency has proposed that an aggregate risk level of 10^{-5} is appropriate in today's regulation because it would limit the risk level for individual carcinogens to the order of 10^{-6}. The Agency points out, however, that in selecting the appropriate risk level for a particular regulatory program, it considers such factors as the particular statutory mandate involved, nature of the pollutants, control alternatives, fate and transport of the pollutant in different media, and potential human exposure. These same factors can also influence choice of a risk level where the Agency is making site-specific determinations.

The Agency would like to use the weight-of-evidence approach in developing the health-based alternative approach to assess hydrocarbon (HC) emissions under the Tier II PIC controls.[31] However, there are a number of unidentified compounds in the mix of hydrocarbon emissions. These unidentified compounds could be either carcinogens or noncarcinogens, or both. Of the compounds that may be carcinogens, the Agency does not know whether they would be classified as A, B1, B2, or C carcinogens. Since the Agency cannot classify these unknown carcinogens, the Agency is unable to use a weight-of-evidence approach to select an acceptable risk level for HC. In order to be conservative, the Agency is assuming that HC can be treated as a single compound for which a unit cancer risk is calculated. To derive this unit cancer risk value, the historical data base of HC emissions from hazardous waste incinerators, boilers, and industrial furnaces was used. For each organic compound identified in the emissions, the 95th percentile concentration value was taken as a reasonable worst-case value. (The highest concentration was often used because there were too few data to identify the 95th percentile value.) For organic compounds listed in appendix VIII of part 261 for which health effects data are adequate to establish an RSD or RAC, but which have not been detected in emissions from hazardous waste combustion, an arbitrary emission concentration of 0.1 ng/L was assumed. The data base was further adjusted to increase the conservatism of the calculated HC unit risk value by assuming that the carcinogen formaldehyde is emitted from hazardous waste combustion devices at the 95th percentile levels found to be emitted from municipal waste combustors. The proportion of the emission concentration of each compound to the total emission concentration for all compounds was then determined. This proportion, termed a proportional emission concentration, was then multiplied by the unit cancer risk developed by CAG to obtain a risk level for that compound. A unit risk of zero was used for noncarcinogens like methane. All the cancer risks were added together to derive a weighted average 95th percentile unit risk value for HC. This procedure for developing a HC unit risk value assumes that the proportion of the various hydrocarbons is the same for all incinerators. In addition, it weighs all carcinogens the same regardless of current EPA classification.

As explained in section IV of part III of the preamble, we are proposing to limit hydrocarbon emissions—when stack gas carbon monoxide levels exceed 100 ppmv, and under the health-based alternative—based on a 10^{-5} aggregate risk level.[32] Thus, we are limiting each of the constituents to a risk level on the order of 10^{-6}.

Finally, in assessing the risk from facilities that emit both HC and carcinogenic metals, we are not proposing that the risk from HC emissions be added to the aggregate MEI risk from metals emissions. Adding the risk would be inappropriate because we do not know how all the HC would be classified according to weight of evidence. (We note again that we prefer the technology-based approach to limit HC emissions for reasons discussed in section IV of part III of the preamble.)

We specifically request comment on this proposed approach to assess carcinogenic risk. We also welcome suggestions or alternative ways to account for additivity.

The Agency also requests comment on whether aggregate population risk or cancer incidence (i.e., cancer incidents per year) should also be considered in developing the national emission limits and in site-specific risk assessments. This approach could, in some situations, be more conservative than considering only MEI risk because, even if the "acceptable" MEI risk level were not exceeded, large population centers may be exposed to emissions such that the increased cancer incidence could be significant. However, it would be difficult to develop acceptable aggregate cancer incidence rates. Nevertheless, it is likely that many facilities that perform a site-specific MEI exposure and risk analysis would also generate an aggregate population exposure and risk analysis that could be considered by the Agency. Based on public comment and further thought on how to implement this dual approach, the final rule could incorporate consideration of both the MEI and aggregate population risk. Alternatively, EPA could provide guidance to the permit writer on when and how to consider cancer incidence on a case-by-case basis under authority of section 3005(c)(3) of HSWA, as codified at § 270.32(b)(2).

2. *Risk from Noncarcinogens.* For toxic substances not known to display carcinogenic properties, there appears to be an identifiable exposure threshold below which adverse health effects usually do not occur. Noncarcinogenic effects are manifested when these

[31] We note that the following discussion in the text pertains only to the health-based alternative for limiting THC when CO exceeds 100 ppmv. Although we request comment on the health-based approach, we prefer the technology-based approach of limiting THC to a good operating practice-based level of 20 ppmv. See discussion in section IV of part Three of the text.

[32] In selecting a risk threshold of 10^{-5} for these rules, EPA considered risk thresholds in the range of 10^{-4} to 10^{-6}. As discussed in Section I.D. of part three of the text, the Agency requests comment on alternative risk thresholds.

pollutants are present in concentrations great enough to overcome the homeostatic, compensating, and adaptive mechanisms of the organism. Thus, protection against the adverse health effects of a toxicant is likely to be achieved by preventing total exposure levels from exceeding the threshold dose. Since other sources in addition to the controlled source may contribute to exposure, ambient concentrations associated with the controlled source should ideally take other potential sources into account. The Agency has therefore conservatively defined reference air concentrations (RACs) for noncarcinogenic compounds that are defined in terms of a fixed fraction of the estimated threshold concentration. The RACs for lead and hydrogen chloride, however, were established differently, as discussed below. The RACs are identical to those the Agency has proposed for boilers and industrial furnaces burning hazardous waste. See appendix H of the Supplement to Proposed Rule at 54 FR 43762 (October 26, 1989).[33] (The Agency notes that it does not intend for RACs to be used as a means of setting air quality standards in other contexts. For instance, the RAC methodology does not imply a decision to supplant standards established under the Clean Air Act.)

RACs have been derived from oral reference doses (RfDs) for those noncarcinogenic compounds listed in Appendix VIII of 40 CFR part 261 (except for lead and hydrogen chloride) for which the Agency considers that it has adequate health effects data. An oral RfD is an estimate (with an uncertainty of perhaps an order of magnitude) of a daily exposure (via ingestion) for the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects even if exposure occurs daily for a lifetime. Since these oral-based RACs are subject to change, EPA contemplates publishing Federal Register notices if the RACs change in a way that affects the regulatory standard (see also the discussion of this issue in the Boiler/Furnace supplemental notice published on October 26, 1989 at 54 FR 43718.)

The Agency is proposing RACs derived from oral RfDs because it believes that the development of the RfDs has been technically sound and adequately reviewed. Specifically:

1. EPA has developed verified RfDs and is committed to establishing RfDs for all constituents of Agency interest. The verification process is conducted by an EPA workgroup, and the conclusions and reasons for these decisions are publicly available.
2. The verification process ensures that the critical study is of appropriate length and quality to derive a health limit for long-term, lifetime protection.
3. RfDs are based on the best available information meeting minimum scientific criteria. Information may come from experimental animal studies or from human studies.
4. RfDs are designed to give long-term protection for even the most sensitive members of the population, such as pregnant women, children, and older men and women.
5. RfDs are designated by the Agency as being of high, medium, or low confidence depending on the quality of the information on which they are based and the amount of supporting data. The criteria for the confidence rating are discussed in the RfD decision documents.

The Agency used the following strategy to derive the inhalation exposure limits proposed today:

1. Where a verified oral RfD has been based on an inhalation study, we will calculate the inhalation exposure limit directly from the study.
2. Where a verified oral RfD has been based on an oral study, we will use a conversion factor of 1 for route-to-route extrapolation in deriving an inhalation limit.
3. Where appropriate EPA health documents exist, such as the Health Effects Assessments (HEAs) and the Health Effects and Environmental Profiles (HEEPs), containing relevant inhalation toxicity data, their data will be used in deriving inhalation exposure limits. We will also consider other agency health documents (such as NIOSH's criteria documents).
4. If RfDs or other toxicity data from agency health documents are not available, then we will consider other sources of toxicity information. Calculations will be made in accordance with the RfD methodology.

The Agency recognizes the limitations of route-to-route conversions used to derive the RACs and is in the process of examining confounding factors affecting the conversion, such as: (a) the appropriateness of extrapolating when a portal of entry is the critical target organ; (b) first pass effects; and (c) effect of route on dosimetry.

The Agency, through its Inhalation RfD Workgroup, is developing reference dose values for inhalation exposure, and some are expected to be available this year. The Agency will use the available inhalation RfDs—after providing appropriate opportunity for public comment—when this rule is promulgated. Certainly, if the workgroup develops inhalation reference doses prior to promulgation of today's rule that are substantially different from the RACs proposed today, and if the revised inhalation reference dose could be expected to have a significant adverse impact on the regulated community, the Agency will take public comment on the revised RACs after notice in the Federal Register.

EPA proposed this same approach for deriving RACs on May 6, 1987 (52 FR 16993) for boilers and industrial furnaces burning hazardous waste. We received a number of comments on the proposed approach of deriving reference air concentrations (RACs) from oral RfDs. As stated in today's proposal and the May 6, 1987, proposal, we would prefer to use inhalation reference doses. Some comments suggested other means of deriving RACs. We will consider those comments and others that may be submitted as a result to today's proposal in developing the final rule.

As previously stated, EPA has derived the RACs from oral reference doses (RfDs) for the compounds of concern. An oral RfD is an estimate of a daily exposure (via ingestion) for the human population that is likely to be without an appreciable risk of deleterious effects, even if exposure occurs daily throughout a lifetime.[34] The RfD for a specific chemical is calculated by dividing the experimentally determined no-observed-adverse-effect-level (NOAEL) or lowest-observable-adverse-effect-level (LOAEL) by the appropriate uncertainty factor(s). The RAC values inherently take into account sensitive populations.

The Agency is proposing to use the following equation to convert oral RfDs to RACs:

$$\text{RAC (mg/m}^3\text{)} = \frac{\text{RfD (mg/kg-bw/day)} \times \text{body weight} \times \text{correction factor} \times \text{background level factor}}{\text{m}^3 \text{ air breathed/day}}$$

[33] Note that the RAC for HCl presented in Appendix I of the Boiler/Furnace supplemental notice is incorrect. The long-term (i.e., annual) exposure RAC should be 7 $\mu g/m^3$, and the 3-minute exposure RAC should be 150 $\mu g/m^3$.

[34] Current scientific understanding, however, does not consider this demarcation to be rigid. For brief periods and for small excursions above the RfD, adverse effects are unlikely in most of the population. On the other hand, several circumstances can be cited in which particularly sensitive members of the population suffer adverse responses at levels well below the RfD. See 51 FR 1627 (January 14, 1986).

where:

- RfD is the oral reference dose
- Body weight (bw) is assumed to be 70 kg for an adult male
- Volume of air breathed by an adult male is assumed to be 20 m^3 per day
- Correction factor for route-to-route extrapolation (going from the oral route to the inhalation route) is 1.0
- Background level factor is 0.25. It is a factor to fraction the RfD to the intake resulting from direct inhalation of the compound emitted from the source (i.e., an individual is assumed to be exposed to 75 percent of the RfD from the combination of indirect exposure from the source in question and other sources).

a. *Short-term exposures.* In today's proposed rule, the RACs are used to determine if adverse health effects are likely to result from exposure to stack emissions by comparing maximum annual average ground-level concentrations of a pollutant to the pollutant's RAC. If the RAC is not exceeded, EPA does not anticipate adverse health effects. The Agency, however, is also concerned about the impacts of short-term (less than 24-hour) exposures. The ground-level concentration of an emitted pollutant can be an order of magnitude greater during a 3-minute or 15-minute period of exposure than the maximum annual average exposure. This is because meteorological factors vary over the course of a year resulting in a wide distribution of exposures. Thus, maximum annual average concentrations are always much lower than short-term exposure concentrations. On the other hand, the short-term exposure RAC is also generally much higher than the lifetime exposure RAC. Nonetheless, in some cases, short-term exposure may pose a greater health threat than annual exposure. Unfortunately, the use of RfDs limits the development of short-term acute exposure limits because no acceptable methodology exists for the derivation of less than lifetime exposure from the RfDs.[35] However, despite these limitations, the Agency is proposing a short-term (i.e., 3-minute) RAC for HC1 of 150 $\mu g/m^3$, based on limited data documenting a no-observed-effect-level in animals exposed to HC1 via inhalation.[36] We do anticipate, however, that short-term RACs for other compounds will be developed by the Agency in the future.

b. *RAC for HC1.* The RAC for annual exposure to HC1 is 7 $\mu g/m^3$ [37] and is based on the threshold of its priority effects. Background levels were considered to be insignificant given that there are not many large sources of HC1 and that this pollutant generally should not be transported over long distances in the lower atmosphere. The RAC for 3-minute exposure is 150 $\mu g/m^3$.[38] As noted above, EPA also proposed these RACs for HC1 in the boiler and furnace proposed rule. See 54 FR 43718 (October 26, 1989). The Agency requests comment on whether the conservative assumptions used in its methodology properly balance the nonconservative assumptions, or whether the methodology creates RACs that are unnecessarily stringent.

c. *RAC for Lead.* To consider the health effects from lead emissions, we adjusted the National Ambient Air Quality Standard (NAAQS) by a factor of one-tenth to account for background ambient levels and indirect exposure from the source in question. Thus, although the lead NAAQS is 1.5 $\mu g/m^3$, for purposes of this regulation, sources could contribute only up to 0.15 $\mu g/m^3$. Given, however, that the lead NAAQS is based on a quarterly average, however, the equivalent annual exposure is 0.09 $\mu g/m^3$ for a quarterly average of 0.15 $\mu g/m^3$. Thus, the lead RAC is 0.09 $\mu g/m^3$. EPA has also proposed this RAC in the boiler and furnace proposed rule. See 52 FR 17006.

d. *Relationship to NAAQS.* The Clean Air Act (CAA) requires EPA to establish ambient standards for pollutants determined to be injurious to public health or welfare. Primary National Ambient Air Quality Standards (NAAQS) must reflect the level of attainment necessary to protect public health allowing for an adequate margin of safety. Secondary NAAQS must be designed to protect public welfare in addition to public health, and, thus, are more stringent.

As discussed above, the Reference Air Concentration (RAC) proposed today for Lead is based on the Lead NAAQS. As the Agency develops additional NAAQS for toxic compounds that may be emitted from hazardous waste incinerators, we will consider whether the acceptable ambient levels (and, subsequently, the feed rate and emission rate Screening Limits) ultimately established under this rule should be revised.

The reference air concentration values (and risk-specific dose values for carcinogens) proposed here in no way preclude the Agency from establishing NAAQS as appropriate for these compounds under authority of the CAA.

E. Risk Assessment Assumptions

We have used a number of assumptions in the risk assessment, some conservative and others nonconservative, to simplify the analysis or to address issues where definitive data do not exist.

Conservative assumptions include the following:

- Individuals reside at the point of maximum annual average and (for HCl) maximum short-term ground-level concentrations. Furthermore, risk estimates for carcinogens assume that the maximum exposed individual resides at the point of maximum annual average concentration for a 70-year lifetime.
- Indoor air contains the same levels of pollutants contributed by the source as outdoor air.
- For noncarcinogenic health determinations, background exposure already amounts to 75 percent of the RfD. This includes other routes of exposure, including ingestion and dermal. Thus, the incinerator is only allowed to contribute 25 percent of the RfD via direct inhalation. The only exception is for lead, where an incinerator is only allowed to contribute 10 percent of the NAAQS. This is because ambient lead levels in urban areas already represent a substantial portion (e.g., one-third or more) of the lead NAAQS. In addition, the Agency is particularly concerned about health risks from lead in light of health effects data available since the lead NAAQS was established. EPA is currently reviewing the lead NAAQS to determine if it should be lowered.[39]

[35] Memo from Clara Chow through Reva Rubenstein, Characterization and Assessment Division, EPA, to Robert Holloway, Waste Management Division, EPA, entitled "Use of RfDs Versus TLVs for Health Criteria," January 13, 1987.

[36] Memo from Lisa Ratcliff, Characterization and Assessment Division to Dwight Hlustick, Waste Management Division, October 2, 1986, interpreting results from Sellakumar, A.R.; Snyder, C.A.; Solomon, J.J.; Albert, R.E. (1985) *Carcinogenicity of Formaldehyde and Hydrogen Chloride in Rats. Toxicol. Appl. Pharm.* 81:401–406.

[37] Memo dated May 4, 1989, from Mike Dourson, EPA Office of Health and Environmental Assessment, to the RfD Workgroup, entitled RfD Meeting of February 16, 1989.

[38] Memo from Lisa Ratcliff, EPA, to Dwight Hlustick, EPA, entitled "Short-term Health-based Number for Hydrogen Chloride," September 15, 1986.

[39] At this point, we have not attempted to quantify indirect exposure through the food chain, ingestion of water contaminated by deposition, and dermal exposure, because as yet no acceptable methodology for doing so has been developed and approved by the Agency for use for evaluating combustion sources. We note, however, that by allowing the source to contribute only 25 percent of the RfD (or 10 percent of the NAAQS in the case of lead) accounts for indirect exposure by assuming a person is exposed to 75 percent of the RfD from other sources and other exposure pathways. (EPA has developed such a methodology for application to waste combustion sources. The Agency's Science Advisory board has reviewed this methodology, and the Agency is continuing to refine the methodology. When the Agency completes development of procedures to evaluate indirect exposure, a more detailed analysis may be applied to incinerators burning hazardous wastes.)

- Risks are considered for pollutants that are known, probable, and possible human carcinogens.
- Individual health risk numbers have large uncertainty factors implicit in their derivation to take into effect the most sensitive portion of the population.

Nonconservative assumptions include the following:

- Although emission are complex mixtures, interactive effects of threshold or carcinogenic compounds have not been considered in this regulation because data on such relationships are inadequate.[40]
- Environmental effects (i.e., effects on plants and animals) have not been considered because of a lack of adequate information. Adverse effects on plants and animals may occur at levels lower than those that cause adverse human health effects. (The Agency is also developing procedures and requesting Science Advisory Board review to consider environmental effects resulting from emissions from all categories of waste combustion facilities.)

F. Risk Assessment Guideline

EPA proposes to implement the risk-based controls for metals, HCl, and (under the health-based alternative) THC emissions using procedures and information presented in today's preamble. The procedures and information would be provided to permit writers in a document that would be entitled *Risk Assessment Guideline for Permitting Hazardous Waste Thermal Treatment Devices* (RAG). The RAG would be incorporated by reference in the rules at § 270.6. Although the document has not yet been written, it would include information presented in today's notice such as: (1) RACs and RSDs for pollutants of concern (i.e., metals, HCl, and THCs); (2) Screening Limits for metals, HCl, and THCs; and (3) procedures for reviewing site-specific dispersion modeling plans and results submitted by applicants. The RAG would be published concurrently with final promulgation of the amendments proposed today.

In lieu of providing this information in a guidance document, we are considering codifying it as part of the regulation. Our concern is that guidance documents do not carry the weight of a regulation—permit writers would be free to accept or reject the guidance (e.g., Screening Limits, RACs, RSDs) and would be obligated to justify use and appropriateness of the guidance on a case-by-case basis. This could place a substantial burden on the permit writer and result in inconsistent and, perhaps, inappropriate permit conditions. We specifically request comment on whether the Screening Limits, RACs, and RSDs should be codified.

II. Proposed Controls for Emission of Toxic Metals

A. Overview

As in the proposed rule on the burning of hazardous waste in boilers and industrial furnaces (see 52 FR 16982 (May 6, 1987) and 54 FR 43718 (October 26, 1989)), EPA is proposing to control metals emissions by requiring a site-specific risk analysis when metals emissions (or feed rates) exceed conservative Screening Limits. EPA developed the Screening Limits to minimize the need for conducting site-specific risk assessments, thereby reducing the burden to applicants and permit officials. When the Screening Limits are exceeded, the applicant would be required to conduct a site-specific risk assessment that demonstrates that the potential exposure of the maximum exposed individual to carcinogenic and noncarcinogenic metals does not result in an exceedance of reasonable acceptable marginal additional risks, namely:

- That exposure to all carcinogenic metals be limited such that the sum of the excess risks attributable to ambient concentrations of these metals does not exceed an additional lifetime individual risk (to the (potential) maximum exposed individual) of 10^{-5} [41]; and
- That exposure to each noncarcinogenic metals be limited such that exposure (to the (potential) maximum exposed individual) does not exceed the reference air concentration (RAC) for the metal.

B. Metals of Concern

Although the limited data available on metals composition of incinerated waste indicates that some of the 12 Appendix VIII metals may not pose unacceptable health risk (i.e., either because no waste concentration data are available for a particular metal or because the available data indicate that a metal is not present at a particular facility at levels that would pose unacceptable risk), EPA nonetheless is proposing standards to control emissions of all 12 Appendix VIII metals, except for selenium and nickel as discussed below. We believe that controls are needed for the other 10 metals—the carcinogens arsenic, beryllium, cadmium, and chromium VI and the noncarcinogens antimony, barium, lead, mercury, silver, and thallium—because our waste composition data base is both limited and outdated, especially considering the Agency's efforts (and statutory mandate) to require treatment of waste, often by incineration, prior to land disposal. We have no assurance that any particular waste to be burned in an incinerator would not contain levels of any of the 10 metals that could result in unacceptable health risk. Rather than establishing controls for the four or five key metals (e.g., arsenic, cadmium, chromium VI, and lead) and requiring permit officials to determine on a case-by-case basis whether other metals are present at levels that could pose unacceptable risk and controlling those emissions under the Section 3005(c)(3) omnibus provision of HSWA (codified at § 270.32(b)(2)), we believe it is more straightforward and less burdensome on both applicants and permit officials to establish controls for all 10 metals. We note that although EPA proposed to control boiler and furnace emissions only for the metals arsenic, cadmium, chromium, and lead, and to require permit writers to determine the need to control other metals on a case-by-case basis (see 52 FR 17005), the Agency has requested comment in a supplemental notice to the boiler/furnace proposed rules on promulgating controls on all 10 metals. See 54 FR 43718 (October 26, 1989).

The basis for controlling emissions of chromium only in the hexavalent form and for not establishing controls for nickel and selenium is discussed below.

1. *Chromium.* We have assumed that chromium is emitted in its most potent carcinogenic form, hexavalent chromium. We believe this assumption is conservative, but reasonable at this time for the purpose of determining whether chromium emissions could pose significant risk.

Chromium is likely to be emitted in either the highly carcinogenic, hexavalent state or in the relatively low-toxicity trivalent state. (The data available to EPA at this time are inadequate to classify the trivalent chromium compounds as to their carcinogenicity.) Although the hexavalent state could be expected to result from combustion because it represents the more oxidized state, some investigators speculate that most of the chromium is likely to be emitted in the trivalent state given that the hexavalent state is highly reactive and, thus, likely to be reduced to the trivalent state. However, preliminary investigations [42] indicate that 50 percent

[40] Additive effects of carcinogenic compounds are considered by summing the risks for all carcinogens to estimate the aggregate risk to the most exposed individual (MEI).

[41] In selecting a risk threshold of 10^{-5} for these rules, EPA considered risk thresholds in the range of 10^{-4} to 10^{-6}. As discussed in Section I.D. of Part Three of the text, the Agency requests comment on alternative risk thresholds.

[42] US EPA, "Pilot Scale Evaluation of the Fate of Trace Metals in a Rotary Kiln Incinerator with a

Continued

or more of chromium emissions from hazardous waste incinerators can be in the hexavalent state when chlorinated wastes are burned. Unfortunately, data on hexavalent chromium emissions is sparse because a reliable emissions sampling and recovery methodology has only recently been developed.[43] Thus, the Agency is not able to establish at this time a reasonable, worst case assumption for the fraction of chromium emissions that may be hexavalent, other than assuming 100 percent of chromium emissions are hexavalent. Consequently, the proposed emission controls under under the Emissions Screening Limits and Site-Specific Risk Analysis alternative would be based on emissions of total chromium unless the applicant conducts emissions testing capable of reliably determining actual chromium emissions in the hexavalent state (e.g., by using the soon-to-be-validated methodology referenced above). In such a case, the Emissions Screening Limits and Site-Specific Risk Analysis standards would be applied to the measured hexavalent chromium emissions. (The Feed Rate Screening Limits, however, would apply to the total chromium present in the waste because emissions testing is not used to comply with these limits.)

As additional data become available on the health effects of chromium emissions from combustion sources, the Agency will consider what, if any, amendments would be appropriate to the rule proposed today. For example, if additional data indicate that hexavalent chromium emissions invariably account for less than 75 percent of total chromium emissions, the Screening Limits could be adjusted accordingly (i.e., by increasing them by 25 percent). The Agency specifically requests data (using validated procedures) documenting hexavalent chromium emissions from incinerators burning hazardous waste.

2. *Nickel.* Nickel carbonyl and nickel subsulfide are suspected human carcinogens. The Agency is continuing to study other nickel compounds with respect to carcinogenic potency. Given that neither nickel carbonyl nor nickel subsulfide is likely to be emitted from a conventional incinerator because of the highly oxidizing environment, we are not proposing controls for nickel. If the Agency determines that nickel compounds in the oxidized state may be human carcinogens or that nickel carbonyl or nickel subsulfide could, in fact, be emitted from some incinerators, we will propose to control those compounds. We note however, that we are proposing today to include two innovative types of incinerators—infrared and plasma arc—in the definition of incinerator. These devices may not use oxidation to thermally destruct organic compounds and, thus, could conceivably emit nickel in reduced species such as carbonyl and subsulfide. Given that we do not have fully developed and validated sampling and analysis procedures specifically for these compounds, we would have to assume conservatively that any nickel emitted from these devices was carbonyl or subsulfide. We specifically request comment on whether these noncombustion incinerators are likely to emit significant levels of nickel carbonyl or subsulfide. If so, we also request information on the availability of validated sampling and analysis procedures for these compounds.

3. *Selenium.* At the present time, the Agency does not have the health effects data needed to establish acceptable ambient levels for selenium. At such time that health effects data become available, selenium emissions will be controlled, if warranted.[44]

C. Metals Emissions Standards [45]

The metals emissions standards require site-specific risk assessment to demonstrate that metals emissions will not: (1) result in exceedances of the reference air concentrations (RACs) for noncarcinogens at the potential MEI; and (2) result in an aggregate increased lifetime cancer risk to the potential MEI of greater than 1×10^{-5}.[46] As discussed above, the RACs for noncarcinogens and risk specific doses (RSDs) for carcinogens are presented in Appendix H of the boiler/furnace supplemental notice. See 54 FR 43763 (October 26, 1989).

To reduce the burden on applicants and permitting officials, EPA has developed conservative Screening Limits for metals emissions (and feed rates) as a function of terrain adjusted effective stack height, terrain, and land use. See discussion below. If the Screening Limits are not exceeded, site-specific dispersion modeling would not be required to demonstrate conformance with the proposed standard.

If the Screening Limits are exceeded, the applicant would be required to conduct site-specific dispersion modeling in conformance with "Guideline on Air Quality Models (Revised)" (1986), and Supplement A (1987), EPA Publication Number 450/2-78-027R, available from National Technical Information Service, Springfield, Virginia, Order Nos. PB 86-245286 and PB88-150958. We are proposing to incorporate that document by reference in § 270.6(a).

The use of physical stack height in excess of Good Engineering Practice (GEP) stack height is prohibited in the development of emission limitations under EPA's Air Program at 40 CFR 51.12 and 40 CFR 51.18. We propose to adopt a similar policy by limiting the height of the physical stack for which credit will be allowed in complying with the metals (and other) standards (i.e., both site-specific dispersion modeling and Screening Limits). GEP identifies the minimum stack height at which significant adverse aerodynamic effects are avoided. Although higher than GEP stack heights are not prohibited, credit will not be allowed for stack heights greater than GEP. Good Engineering Practice (GEP) maximum stack height means the greater of: (1) 65 meters, measured from the ground-level elevation at the base of the stack; or (2) $Hg=H+1.5L$.[47]

where:

Hg=GEP minimum stack height measured from the ground-level elevation at the base of the stack;

H=height of nearby structure(s) measured from the ground-level elevation at the base of the stack;

L=lesser dimension, height or projected width, of nearby structure(s).

If the result of the above equation is less than 65 meters, then the actual physical stack height, up to 65 meters, could be used for compliance purposes. If the result of the equation is greater than 65 meters, the physical stack height considered for compliance purposes cannot exceed that level.

Venturi Scrubber/Packed Column Scrubber, Vol. I, Technical Results", April 1989.

[43] Steinsberger, S. C. and Carver, A. C., Entropy Environmentalists, Inc., and Knoll J. E., et al, US EPA, "Sampling and Analytical Methodology for Measurement of Low Levels of Hexavalent Chromium from Stationary Sources", Paper presented at EPA/AWMA Symposium at Raleigh, N. C., May 1989, as revised by draft dated November 10, 1989, entitled "Method Cr^{+6}—Determination of Hexavalent Chromium Emissions From Stationary Sources".

[44] Memo from Reva Rubenstein, Chief, Health Assessment Section, Technical Assessment Branch to Bob Holloway, Chief Combustion Section, Waste Treatment Branch, EPA, entitled "Hydrogen Bromide, Hydrogen Fluoride, Selenium, and Lead," October 16, 1987.

[45] This discussion has been taken virtually verbatim from the October 26, 1989 boiler/furnace supplemental notice (see 54 FR 43758-60).

[46] In selecting a risk threshold of 10^{-5} for these rules, EPA considered risk thresholds in the range of 10^{-4} to 10^{-6}. As discussed in Section I.D. of Part Three of the text, the Agency requests comment on alternative risk thresholds.

[47] We note that this equation also identifies the GEP *minimum* stack height necessary to avoid building wake effects. EPA recommends the application of GEP to define minimum stack heights to minimize potentially high concentration of pollutants in the immediate vicinity of the unit.

EPA requests comment on this use of GEP maximum stack height. We note that although an owner or operator could increase his physical stack height up to the GEP maximum to achieve better dispersion and a higher allowable emission rate, he should first consider that that EPA plans to establish (after proposals and opportunity for comment) a best demonstrated technology (BDT) particulate standard that is likely to be 0.01 to 0.22 gr/dscf. Thus, he would be more likely to upgade his emission control equipment to state-of-the-art control rather than increase stack height.

EPA specifically requests comments on how many facilities are likely to exceed the Screening Limits discussed below and, thus, would conduct site-specific dispersion modeling to comply with the proposed rule. Further, we request information on the changes to equipment and operations that would be required to comply with the Screening Limits if the provision for site-specific dispersion modeling was not available.

D. Screening Limits

EPA developed conservative Screening Limits for metals emission rates (and feed rates) to minimize the need for site-specific dispersion modeling, and thus, reduce the burden on applicants and permitting.[48] The Screening Limits are provided as a function of terrain-adjusted effective stack height, terrain, and urban/rural classification as discussed below. The Screening Limits would be included in the "Risk Assessment Guideline for Permitting Hazardous Waste Thermal Treatment Services" (RAG) which would be incorporated by reference in the rule at § 270.6. See section I.H of part Three for a discussion of the RAG.

The Screening Limits proposed today for incinerators are identical to those proposed for boilers and industrial furnaces in the October 26, 1989 supplemental notice. See 54 FR 43758–62 (appendices F and G) for discussion of the derivation and implementation of the Limits and pages 43745–51 (appendix E) where the Limits are presented. We are not repeating that information in today's notice.

III. Proposed Controls for Emissions of Hydrogen Chloride

A. Summary of Existing Standard

Highly-chlorinated wastes from the manufacturing of organic chemicals, highly-chlorinated spent solvents, and solvent recovery distillation bottoms are routinely incinerated in hazardous waste incinerators. Chlorine in hazardous waste produces hydrochloric acid (HCl) upon combustion, which can cause serious health hazards if it is not removed with flue gas cleaning equipment such as wet scrubbers. (Other halogens of potential health concern such as fluorine and bromine are also common constituents in hazardous waste. However, EPA does not have adequate health data upon which to base a regulation at this time. When data becomes available, EPA intends to revise the regulation to include other halogens if we determine that they can pose unacceptable health risks.[49]

Under EPA's existing rules, an incinerator burning hazardous waste must control HCl emissions to the larger of either 1.8 kilograms (4 pounds) per hour or 1 percent of the HCl in the stack gas prior to entering any pollution control equipment. This performance standard at § 264.343 (b) is based on the capability of wet scrubbers to remove acid gas, with the expectation that the industrial threshold limit value for hydrogen chloride would rarely, if ever, be exceeded.

B. The Existing Standard May Not Be Fully Protective in Certain Situations

Risk assessment using reasonable, worst-case facilities discussed previously indicates that incineration of hazardous waste with total chlorine levels of 35 percent (350,000 ppm) can pose exceedances of the HCl short term reference air concentations (RACs) even when 99 percent of HCl emissions are assumed to be removed from the stack gas as currently required by § 264.343(b). See Table 3. Long term (i.e., annual) reference air concentations, however, are not likely to be exceeded. In addition the *de minimis* HCl emission rate that triggers the 99 percent removal requirement, 4 lb/hr, may not provide adequate protection. See table E–9 of appendix E in the boiler furnace supplement notice (54 FR 43751) indicating that when terrain adjusted effective stack height is less than 30 m in noncomplex terrain and 50 m in complex terrain, a 4lb/hr emission rate could result in an exceedance of the short-term RAC.

[48] We note that the Screening Limits are designed to be conservative and would likely limit emissions by a factor of 2 to 20 times lower than would be allowed by site-specific dispersion modeling.

[49] Memo from Reva Rubenstein, Chief, Health Assessment Section, Technical Assessment Branch to Bob Holloway, Chief, Combustion Section, Waste Treatment Branch, EPA, entitled "Hydrogen Bromide, Hydrogen Fluoride, Selenium, and Lead," October 16, 1987.

TABLE 3.—MAXIMUM CONCENTRATIONS OF HCl FOR SELECTED WORST-CASE FACILITIES

Dispersion coefficient μg/m3/g/sec 3 minute	Dispersion coefficient μg/m3/g/sec annual	Capacity lb/hr	Ambient conc. μg/m3 3 minute	Ambient conc. μg/m3 annual	Risk ambient/RAC 3 minute	Risk ambient/RAC annual
639.04	8.85	600	169.09	2.34	1.13	0.16
604.07	10.48	820	218.44	3.79	1.46	0.25
264.92	3.32	2920	341.14	4.28	2.27	0.29
170.44	2.72	3241	243.61	3.89	1.62	0.26

The RAC for annual exposure to HCl is 7 $\mu g/m^3$ [50] and is based on the threshold of respiratory effects. Background levels were considered to be insignificant given that there are not many large sources of HCl and that this pollutant generally should not be transported over long distances in the lower atmosphere. The RAC for 3-minute exposures is 150 $\mu g/m^3$.[51]

C. Request for Comment on Controls for Free Chlorine

We noted in the proposed boiler/furnace rules (52 Fr 17008 (May 6, 1987)) that we thought there was a remote possibility that free chlorine (Cl_2) could be emitted from burning chlorined wastes if there was insufficient

[50] Memo dated May 4, 1989, from Mike Dourson, EPA Office of Health and Environmental assessment, to the RfD Workgroup, entitled "RfD Meeting of February 16, 1989".

[51] Memo from Lisa Ratcliff, EPA, to Dwight Hlustick, EPA, entitled "Short-term Health-based Number for Hydrogen Chloride," Sept. 15, 1986.

hydrogen available (i.e., from other hydrocarbon compounds or water vapor) to react with all the chlorine in the waste. We understand, however, that free chlorine emissions have been detected at a number of hazardous waste incinerators. Free chlorine emissions are of concern because Cl_2 is a potent irritant to the respiratory system. To address this problem, we are proposing today to amend § 264.343(b) so that the existing 99% removal standard would apply to both HCl and Cl_2. This standard could be met by providing more hydrogen in the waste or supplementary fuel or the addition of superheated steam to the stack gas. In addition, as with HCl, we are proposing to require a health-based check to ensure that the technology-based standard is protective. Thus, the applicant would be required to demonstrate that the maximum exposed individual (MEI) is not exposed to Cl_2 concentrations exceeding the proposed annual average reference air concentration (RAC) of 0.4 $\mu g/m^3$.[52] As for HCl, the RAC is based on 100% of the interim inhalation RfD because other sources of Cl_2 are expected to have little or no effect on background levels due to the short life of Cl_2 in the atmosphere.

As with the HCl standards, compliance with the health-based Cl_2 standard would be domonstrated by: (1) emissions testing and dispersion modeling; (2) emissions testing and conformance with Cl_2 emissions Screening Limits; or (3) waste analysis and conformance with chlorine feed rate Screening Limits. The Cl_2 Screening Limits would be developed using the same methodology used for the metals Limits (e.g., same dispersion or dilution factors; feed rate limits assume all chlorine on the feed is emitted as Cl_2). (The dispersion factors used to establish the HCl Screening Limits were not used because they are based on short-term (i.e., 3-minute) exposures. A short-term RAC is not yet available for Cl_2.) Given that the RAC for Cl_2 is 1.33 times the RAC for mercury, the Screening Limits for Cl_2 would be 1.33 times the Limits established for mercury in Appendix E of the boiler/furnace supplemental notice. See 54 FR 43745 (October 26, 1989).

D. Basis for Proposed Standards

The basis for the proposed standards HCl standards for incinerators is identical to that proposed for boilers and furnaces as discussed in the October 26, 1989, supplemental notice. In addition, the implementation of the controls and the controls themselves (i.e., compliance with feed rate or emission rate Screening Limits, or demonstration by site-specific dispersion modeling that the RAC is not exceeded at the MEI) would be identical for boilers/furnaces and incinerators. See Appendices, E, F, and G of the supplemental notice at 54 FR 43751–62. Those discussions and information are not repeated here, but are to be considered fully applicable.

IV. Proposed Controls for Emissions of Products of Incomplete Combustion

A. Hazard Posed by Emissions of Products of Incomplete Combustion (PICs)

The burning of hazardous waste containing toxic organic compounds listed in Appendix VIII of 40 CFR part 261 under poor combustion conditions can result in substantial emissions of compounds that result from the incomplete combustion of constituents in the waste, as well as emissions of the original compounds which were not burned. The quantity of toxic organic compounds emitted depends on the concentration of the compounds in the waste, and the combustion conditions under which the waste is burned.

Data on typical PIC emissions from hazardous waste combustion sources were compiled and assessed in recent EPA studies.[53] [54] These studies identified 37 individual compounds in the stack gas of the eight full-scale hazardous waste incinerators tested, out of which 17 were volatile compounds and 20 semivolatile compounds. Eight volatile compounds (benzene, toluene, chloroform, trichloroethylene, carbon tetrachloride, tetrachloroethylene, chlorobenzene, and methylene chloride), and one semivolatile compound (naphthalene) were identified most frequently in over 50 percent of the tests. Some of these compounds are carcinogenic. It was found that PIC emission rates vary widely from site-to-site which may be due, in part, to variations in waste feed composition and facility size. The median values of the nine compounds mentioned above range from 0.27 to 5.0 mg/min. Using a representative emission rate of 1 mg/min, the stack gas concentration for PICs in a medium-sized facility (250 m^3/min combustion gas flow rate) would be 4 $\mu g/m^3$ (0.004 $\mu g/l$).

The health risk posed by PIC emissions depends on the quantity and toxicity of the individual toxic components of the emissions, and the ambient levels to which persons are exposed. Estimates of risk to public health resulting from PICs, based on available emissions data, indicate that PIC emissions do not pose significant risks when incinerators are operated under optimum conditions. However, incinerator do not always operate under optimum conditions. In addition, only limited information about PICs is available. PIC emissions are composed of thousands of different compounds, some of which are in very minute quantities and cannot be detected and quantified without very elaborate and expensive sampling and analytical (S&A) techniques. Such elaborate S&A work is not feasible in trial burns for permitting purposes and can only be done in research tests. In addition, reliable S&A procedures simply do not exist for some types of PICs (e.g., water-soluble compounds). The most comprehensive analysis of PIC emissions from a hazardous waste incinerator identified and quantified only approximately 70 percent of organic emissions. Typical research-oriented field tests identify a much lower fraction—from 1–60 percent. Even if all the organic compounds emitted could be quantified, there are inadequate health effects data available to assess the resultant health risk. EPA believes that, due to the above limitations, additional testing will not, in the foreseeable future, be able to prove quantitatively whether PICs do or do not pose unacceptable health risk. Considering the uncertainties about PIC emissions and their potential risk to public health, it is therefore prudent to require that incinerators operate at a high combustion efficiency to minimize PIC emissions. Given that carbon monoxide (CO) is the best available indicator of combustion efficiency, and a conservative indicator of combustion upset, we are proposing to limit the flue gas CO levels to levels that ensure PIC emissions are not likely to pose unacceptable health risk. In cases where CO emissions exceed a proposed *de minimis* limit, higher CO levels would be allowed under two alternative approaches: (1) if hydrocarbon (HC)

[52] Memo from Priscilla Halloran, EPA, to Dwight Hlustick, EPA, entitled "Health-Based Air Concentrations for Chlorine and N-nitroso-n-methyluera", dated January 4, 1990.

[53] Wallace, D. et al., "Products of Incomplete Combustion from Hazardous Waste Combustion," Draft Final Report, EPA Contract No. 68-03-3241, Acurex Corporation, Subcontractor No. ES 59689A, Work Assignment 5, Midwest Research Institute Project No. 8371-L(1), Kansas City, MO, June 1986.

[54] Trenholm, A., and C. C. Lee, "Analysis of PIC and Total Mass Emissions from an Incinerator," Proceedings of the Twelfth Annual Research Symposium on Land Disposal, Remedial Action, Incineration, and Treatment of Hazardous Waste, Cincinnati, OH, April 21–23, 1986, EPA/600-9-86/022, pp. 378–381, August 1986.

concentrations in the stack gas do not exceed a good operating practice-based limit of 20 ppmv; or (2) if the applicant demonstrates that HC emissions are not likely to pose unacceptable health risk using conservative, prescribed risk assessment procedures. Although we prefer the technology-based approach for reasons discussed below, we are requesting comment on the health-based alternative as well.

B. Existing Regulatory Controls

Section 264.345 of the existing regulations requires that the permit must limit the CO level in the stack exhaust gas based on the trial burn when demonstrating conformance with the destruction and removal efficiency (DRE) standard for principal organic hazardous constituents (POHCs). Section 264.347 requires that CO emissions be monitored continuously at a point downstream of the combustion zone and prior to release to the atmosphere; and § 264.345 requires that the incinerator must be equipped with a functioning system to cut off the waste feed automatically when the CO limit is exceeded. Thus, the existing regulations do not specify an upper limit for CO, but rather limit CO to the levels that occur during the trial burn. The regulations do not specify limits for PIC emissions nor require analysis of risks from such emissions. PICs are assumed to be controlled by the DRE standard for POHCs. Although CO levels may often be at levels that represent high combustion efficiency (e.g., below 100 ppmv, the *de minimis* limit proposed today) when demonstrating conformance with the DRE standard, there is no assurance that such low CO levels will always occur. Test data indicate that 99.99 percent DRE can be achieved when incinerators (and boilers and industrial furnaces) are operating under upset combustion conditions as evidenced by high CO stack gas levels and even smoke. Apparently, organic constituents in the waste are readily destroyed in the flame zone, but combustion by-products or PICs may not be exposed to adequate time, temperature, and turbulence to be reduced to low levels. Thus, existing regulatory provisions may not be adequate to ensure that PICs do not pose unacceptable risk.

C. Basis for CO Standards

EPA is proposing to limit flue gas carbon monoxide levels to ensure that incinerators that burn hazardous waste operate at high combustion efficiency to reduce the potential risk from emissions of PICs. EPA believes that a CO level of 100 ppmv represents high combustion efficiency operations that would virtually ensure that PIC emissions are limited to levels that pose acceptable risk to public health. However, all incinerators (e.g., those that handle containers of volatile waste or that have fluid beds) may not be able to readily meet a 100 ppmv CO limit. Because we have not been able to establish a direct correlation between CO, PIC emissions, and the resulting health risk (i.e., when CO is 150 or 200 ppmv we are uncertain if PIC emissions are likely to pose significant risk), we are proposing an approach to waive the CO limit of 100 ppmv. Under the waiver, any CO level achieved during the DRE trial burn would be allowed provided that emissions of hydrocarbons (HC) do not exceed acceptable levels.

1. *Summary of Proposed Controls.* EPA is proposing a two-tiered approach to control PICs by limiting stack of gas CO levels. The first tier requires compliance with a CO limit of 100 ppmv on an hourly rolling average [55] basis. If a facility meets this CO level, during the trial burn, 100 ppmv will be the permit limit. If this CO limit cannot be met, the facility could operate at higher permitted CO levels under a Tier II waiver. The 100 ppmv CO limit would be waived under two alternative approaches: (1) a demonstration that hydrocarbon (HC) emissions are not likely to pose unacceptable health risk using conservative, prescribed risk assessment procedures; or (2) a technology-based demonstration that the HC concentration in the stack gas does not exceed a good operating practice-based limit of 20 ppmv. Although we prefer the technology-based approach for reasons discussed below, we request comment on the health-based alternative as well.

The CO limits for either Tier I or Tier II must be corrected to dry stack gas and 7 percent oxygen in the stack gas. The correction to dry gas is necessary only for instruments that measure CO on a wet basis. This correction factor for humidity would initially be determined during the trial burn and annually thereafter unless specified otherwise in the permit. The oxygen correction factor must be determined at intervals specified in the permit (not less frequently than annually). The oxygen and humidity correction factors would be applied continuously. (The basis for the 7 percent oxygen correction factor is discussed in section IV, C.4 below.)

The existing regulations already require that the hazardous waste feed must be cutoff automatically when the permitted CO limits are exceeded. Today's proposal adds a requirement that hazardous waste burning may be resumed when CO levels are brought within the permitted limits. When the hazardous waste feed is cut off, combustion chamber temperatures specified in the permit and the air pollution control equipment functions must be maintained as long as any waste remains in the combustion chamber. For incinerators with a secondary combustion chamber, we request comment on whether temperatures should be maintained in both the primary and secondary chambers to control organic emissions when the waste feed is cutoff. Auxiliary fuels used to maintain temperatures must not contain hazardous waste other than waste exempt from the substantive requirements of subpart O under provisions of § 264.340(b).

EPA specifically requests comment on how to apply the requirement to maintain temperature following a waste feed cutoff, as well as other standards proposed today, to batch incinerators.

2. *Use of CO Limits to Ensure Good Combustion Conditions.* By definition, low CO flue gas levels are indicative of an incinerator (or any combustion device) operating at high combustion efficiency. Operating at high combustion efficiency helps ensure minimum emissions of unburned (or incompletely burned) organics.[56] In a simplified view of combustion of hazardous waste, the first stage is immediate thermal decomposition of the POHCs in the flame to form other, usually smaller, compounds, also referred to as PICs. These PICs are generally rapidly decomposed to form CO.

The second stage of combustion involves the oxidation of CO to CO_2 (carbon dioxide). The CO to CO_2 step is the slowest (rate controlling) step in the combustion process because CO is considered to be more thermally stable (difficult to oxidize) than other intermediate products of combustion of hazardous waste constituents. Since fuel is being fired continuously, both combustion stages are occurring simultaneously.

[55] An hourly rolling average is the arithmetic mean of the 60 most recent 1-minute average values recorded by the continuous monitoring system.

[56] Given that CO is a gross indicator of combustion performance, limiting CO may not absolutely minimize PIC emissions. This is because PICs can result from small pockets within the combustion zone where adequate time, temperature, and turbulence have not been provided to oxidize completely the combustion products of the POHCs. Available data, however, indicate that PIC emissions do not pose significant risk when combustion devices are operated at high combustion efficiency. EPA is conducting additional field and pilot scale testing to address this issue.

Using this view of waste combustion, CO flue gas levels cannot be correlated to DRE for POHCs and may not correlate well with PIC destruction. As discussed below, test data show no correlation between CO and DRE, but do show a slight apparent correlation between CO and chlorinated PICs, and a fair correlation between CO and total unburned hydrocarbons. Low CO is an indicator of the status of the CO to CO_2 conversion process, the last, rate-limiting oxidation process. Since oxidation of CO to CO_2 occurs after destruction of the POHC and its (other) intermediates (PICs), the absence of CO is a useful indication of POHC and PIC destruction. The presence of high levels of CO in the flue gas is a useful indication of inefficient combustion and, at some level of elevated CO flue gas concentration, an indication of failure of the PIC and POHC destruction process. We believe it is necessary to limit CO levels to levels indicative of high combustion efficiency because we do not know the precise CO level that is indicative of significant failure of the PIC and POHC destruction process. It is possible that the critical CO level may be dependent on site-specific and event-specific factors (e.g., fuel type, air-to-fuel ratios, rate and extent of change of these and other factors that affect combustion efficiency). We believe limiting CO levels is prudent because: (1) it is a widely practiced approach to improving and monitoring combustion efficiency; and (2) most well designed and operated incinerators can easily be operated in conformance with the proposed Tier I CO limits of 100 ppmv.

The Tier I CO limit proposed today specifies a 100 ppmv CO limit in the permit even though the CO level during the trial burn will be lower (i.e., by definition, under Tier I). EPA considered this issue carefully and the proposal is based on three considerations. First, DRE will not be reduced below the levels specified in § 264.343(a)(1) for POHCs by the proposed CO limits. Second, many incinerators run very efficiently during a trial burn and indicate less than 10 ppmv of CO emissions. It may not be possible to achieve that high degree of efficiency on a consisent basis and specifying such low trial burn CO values may result in numerous hazardous waste feed cut-offs due to CO exceedances. Third, the emission of PICs from incinerators has not been shown to increase linearly at such low CO levels. In fact, the trial burn data indicate that total organic emissions are consistently low (i.e., at levels that pose acceptable health risk) when CO emission levels are less than 100 ppmv. Two studies show that no measurable change in DRE is likely to occur for CO levels up to 100 ppmv. The first study generated data from combustion of a 12 component mixture in a bench scale facility.[57] The CO levels ranged from 15 to 522 ppmv without a significant correlation to the destruction efficiency for the compounds investigated. The second study was conducted on a pilot scale combustor.[58] Test runs were conducted with average CO concentrations ranging from 30 to 700 ppmv. When the concentration was less than 220 ppmv no apparent decrease in DRE was noticed, but higher CO concentrations showed a definite decrease in DRE. EPA specifically invites comments on whether the permit should limit CO according to trial burn values in lieu of the limits specified here.

3. *Supporting Information on CO as a Surrogate for PICs.* Substantial information is available that indicate CO emissions may relate to PIC emissions.

Combustion efficiency is directly related to CO by the following equation:

$$\text{Combustion Efficiency (CE)} = \frac{\text{percent } CO_2}{\text{percent } CO_2 + \text{percent CO}} \quad (100)$$

CE has been used as a measure of completeness of combustion.[59] EPA's regulations for incineration of waste PCBs at 40 CFR 761.70 require that combustion efficiency be maintained above 99.9 percent. As combination becomes less efficient or less complete, at some point, the emission of total organics will increase and smoke will eventually result. It is probable that some quantity of toxic organic compounds will be present in these organic emissions. Thus, CE or CO levels provide an indication of the potential for total organic emissions and possibly toxic PICs. Data are not available, however, to correlate these variables quantitatively with PICs in combustion processes.

Several studies have been conducted to evaluate CO monitoring as a method to measure the performance of hazardous waste combustion. Though correlations with destruction efficiency of POHCs have not been found, the data from these studies generally show that as combustion conditions deteriorate, both CO and total hydrocarbon emissions increase. These data support the relation between CO and increased organic emissions discussed above. In one of these studies,[60] an attempt was made to correlate the concentrations of CO with the concentrations of four common PICs (benzene, toluene, carbon tetrachloride, and trichloroethylene) in stack gases of full scale incinerators. For a plot of CO versus benzene, one of the most common PICs, there is considerable scatter in the data indicating that parameters other than CO affect the benzene levels. However, there is a trend in the data that suggests that when benzene levels are high, CO levels also are high. The converse has not been found to be true; when benzene levels are low, CO levels are not always low. Similar trends were observed for toluene and carbon tetrachloride, but not for trichloroethylene. In the pilot-scale study by Waterland cited earlier, similar trends were observed for chlorobenzene and methylene chloride and in another study [61] similar trends were observed for total chlorinated PICs. These data support the conclusion that when the emission rates of some commonly identified PICs are sufficiently high, it is likely that CO emissions will also be higher than typical levels.

More importantly, however, available data indicate that when CO emissions

[57] Hall D.L. et al. "Thermal Decomposition Properties of a Twelve Component Organic Mixture", Hazardous Wastes & Hazardous Materials, Vol. 3, No. 4 pp 4431–449, 1986.

[58] Waterland, L.R. "Pilot-scale Investigation of Surrogate Means of Determining POHC Destruction" Final Report for the Chemcial Manufacturers' Association, ACUREX Corporation, Mountain View, California, July 1983.

[59] We specifically request comments on whether combustion efficiency, as defined above in the text (i.e., considering both CO and CO_2 emissions) should be used to control THC emissions rather than CO alone.

[60] Trenholm, A., P. Gorman, and G. Jungclaus, "Performance Evaluation of Full-Scale Hazardous Waste Incinerators, Vol. 2—Incinerator Performance Results." EPA-600/2-84-181b, NTIS No. PB 85-129518, November 1984.

[61] Chang, D.P. et al., "Evaluation of a Pilot-Scale Circulating Bed Combustor as a Potenial Hazardous Waste Incinerator," APCA Journal, Vol. 37, No. 3, pp. 266–274, March 1987.

are low (e.g., under 100 ppmv), PIC emissions are always low (i.e., at levels that pose acceptable health risk). The converse may not be true: when CO is high, PIC levels may or may not be high. Thus, the Agency believes that CO is a conservative indicator of potential PIC emissions and, given that CO monitoring is already required in the present regulations, the emission levels should be limited to low levels indicative of high combustion efficiency. (For those facilities where CO emissions may be high but PIC emissions low, we are providing an opportunity under Tier II of the proposed rule to demonstrate that, in fact, PIC emissions pose acceptable health risks at elevated CO levels.)

D. Derivation of the Tier I CO Limit.

The proposed Tier I *de minimis* CO limit of 100 ppmv was selected for a number of reasons: (1) it is within the range of CO levels that represent high combustion efficiency; (2) available field test data indicate that PICs are not emitted at levels that pose unacceptable risks when CO does not exceed 100 ppmv; (3) the 100 ppmv level is consistent with the combustion efficiency of 99.9 percent currently required by EPA's PCB incineration regulations codified at 40 CFR 761.70; (4) it is the CO limit proposed for boilers and furnaces burning hazardous waste (see 52 FR 16997 (May 6, 1987), and 54 FR 43718 (October 26, 1989)); and (5) it is a level that the majority of well designed and operated incinerators can meet. These reasons are discussed below.

EPA regulations referred to above (40 CFR part 761) under the authority of the Toxic Substance Control Act (TSCA) for the incineration of PCB-laden wastes require a minimum combustion efficiency (CE) of 99.9 percent. Combustion efficiency of 99.9 percent, calculated as $CO_2/(CO_2+CO)$, translates to CO emissions levels of 80 to 125 ppmv corrected to 7 percent O_2, depending on the fuel C/H ratio. The intent of the PCB combustion efficiency rule is to minimize emissions of potentially toxic organics. Therefore, the proposed 100 ppmv CO level for hazardous wastes destruction is consistent with the intent of the regulations governing the incineration of PCB wastes.

CO emission data from hazardous waste incineration research and trial burn tests also confirm the relationship between CE greater than 99.9 percent and CO levels less than 100 ppmv. The combustion efficiencies in all cases where data were available were calculated to exceed 99.9 percent, except for the test runs where CO exceeded the proposed CO limit.

The data from the research tests of eight incinerators cited earlier [62] showed that most incinerators easily complied with the 100 ppmv proposed limit with two exceptions. The first exception was a maximum hourly average of 120 ppmv which came from one test run out of four at a test site. Information was not available to evaluate why CO levels were higher for this test run; however, all the other three runs at this site showed routine compliance with the proposed limits. The second exception came from data for a rotary kiln that was fed containers of volatile waste. All three runs at this site showed CO levels clearly higher than the proposed limits. This incinerator operated at a relatively higher baseline CO level and also exhibited frequent CO spikes as drums of volatile waste were fed to the rotary kiln.

Another data set on CO is contained in the results of trial burn tests conducted during permitting of hazardous waste incinerators.[63] Based on an evaluation of these data, we estimate that some incinerators could fail the proposed CO limits. (Under today's proposal, owners and operators of these incinerators would be required to demonstrate that their HC emissions are acceptable). But, in general, the data reviewed suggests that most hazardous waste incinerators can easily achieve the recommended CO limits. Information was not available to evaluate why the CO levels were higher at some incinerators and not at others. Reduction of these higher CO levels may involve relatively simple change in some cases, but may require significant changes in operating conditions in other cases. Comments by incinerator operators have indicated that certain incinerator operators may have difficulty achieving the proposed limits without a substantial reduction in capacity. The type of operations specifically referred to are rotary kiln incinerators that feed containers of volatile waste, and fluidized bed incinerators. Volatile hazardous waste when batch fed in containers can volatilize and burn rapidly creating a momentary oxygen deficiency in the primary combustion chamber. A CO spike generally occurs every time a container in fed in the system and the cumulative spikes could increase the average CO level to go above 100 ppmv. The average CO level is also affected by the volatility of the waste, the quantity of waste fed in one batch, the frequency at which batches are fed, and the volume of the combustion chamber. EPA specifically requests comments from incinerator operators about the achievability of the Tier I CO limit. Comments should include supporting documentation or data on any of the above issues, including information demonstrating how the device is designed and operated to achieve high combustion efficiency but nonetheless has CO levels exceeding 100 ppmv.

Low flue gas CO concentration is widely used as an indicator of "good combustion practices" for waste-to-energy systems. Combustion of municipal waste and refuse derived fuel (RDF) in modern design municipal waste combustors (MWCs) requires sufficient oxygen and mixing at uniformly high furance temperature to ensure complete combustion of toxic organics, including polychlorinated dibenzo-p-dioxins and furans (PCDD/PCDF). Although, by most technical accounts, CO is not considered directly relatable to PCDD/PCDF emissions from MWCs, the Agency has recently proposed to limit CO levels from MWCs to ensure high combustion efficienty.[64] Limits on CO combined with other requirements are designed to minimize emissions of PCDD/PCDF emissions. The proposed MWC CO limits vary from 50 ppmv to 150 ppmv depending on the type of device, and are calculated on a 4-hr average basis, dry-corrected to 12 percent CO_2. The limits are technology-based—they represent levels readily achievable by well-designed and well-operated units. EPA does not believe that the proposed limits of 50 ppmv to 150 ppmv for MWCs presents a conflict with today's proposed 100 ppmv *de minimis* CO emission limit for hazardous waste incinerators. The 100 ppmv limit proposed in today's rule for hazardous waste incinerators can be waived to allow higher CO levels provided that HC levels to not exceed acceptable levels. We did not propose to limit CO to a level lower than 100 ppmv, although readily achievable by many hazardous waste incinerators, because available data indicate that PIC emissions do not pose significant health risk when the CO concentration is 100 ppmv.

[62] Trenholm, A., P. Gorman, G. Jungclaus, "Performance Evaluation of Full-Scale Hazardous Waste Incinerators, Vol. 2—Incinerator Performance Results," EPA-600/2-84-181b, NTIS No. PB 85-129518, November 1984.

[63] PEI Associates and JACA Corporation. "Permit Writer's Guide to Test Burn Data—Hazardous Waste Incineration," USEPA Handbook, EPA/625/6-86/012, September 1986.

[64] See 54 FR 52251 (December 20, 1989).

E. Derivation of the Tier II Controls

If the highest hourly average CO level during the trial burn exceeds the Tier I limit of 100 ppmv, a higher CO level would be allowed if emissions of hydrocarbons (HC) are considered acceptable under two alternative approaches: a health-based approach, or a technology-based approach. We prefer the technology-based approach for reasons discussed below. One of the alternatives will be selected for the final rule based on public comment and Agency evaluation, including a critique by the Agency's Science Advisory Board (SAB).[65]

1. *Health-Based Approach.* Under the health-based approach to waive the 100 ppmv CO limit, the applicant would be allowed to demonstrate that PIC emissions from the combustion device pose an acceptable risk (i.e., less than 10^{-5}[66]) to the maximum exposed individual (MEI). Under this approach, we would require the applicant to quantify total hydrocarbon (THC) emissions during the trial burn and to assume that all hydrocarbons are carcinogenic compounds with a unit risk that has been calculated based on available data. The THC unit risk value would be 1.0 x 10−5 $m^3/\mu g$ and represents the adjusted, 95th percentile weighted (i.e., by emission concentration) average unit risk of all the hydrocarbon emissions data in our data base of field testing of boilers, industrial furnaces, and incinerators burning hazardous waste. The weighted unit risk value for THC considers, emissions data for carcinogenic PICs (e.g., chlorinated dioxins and furans, benzene, chloroform, carbon tetrachloride) as well as data for PICs that are not suspected carcinogens and are considered to be relatively nontoxic (e.g., methane, and other C_1 as well as C_2 pure hydrocarbons, i.e., containing only carbon and hydrogen). We adjusted the data base as follows to increase the conservatism of the calculated THC unit risk value: (1) we assumed that the carcinogen formaldehyde is emitted from hazardous waste combustion devices at the 95th percentile levels found to be emitted from municipal waste combustors; [67] and (2) we assumed that every carcinogenic compound in appendix VIII of part 261 for which we have health effects data but no emissions data is actually emitted at the level of detection of the test methods, 0.1 ηg/1. Finally, we assigned a unit risk of zero to noncarcinogenic compounds (e.g., C_1–C_2 hydrocarbons such as methane, acetylene). The calculated unit risk value for THC is 1 x 10^{-5} $m^3/\mu g$, comparable to the value for carbon tetrachloride.[68]

To implement the health-based approach with minimum burden on permit writers and applicants, we have established conservative THC emission Screening Limits as a function of effective stack height, terrain, and land use. See Appendix B of the October 26, 1989, supplemental notice for boilers/furnaces (54 FR 43739). These Screening Limits were back-calculated from the acceptable ambient level for THC, 1.0 $\mu g/m^3$ (based on the unit risk value discussed above and an acceptable MEI risk of 10^{-5}), using conservative dispersion coefficients. (We also used those dispersion coefficients to develop alternative emissions and feed rate limits for metals and HCl, as discussed elsewhere. The basis for those dispersion coefficients is also discussed elsewhere.) If THC emissions measured during the trial burn do not exceed the THC emissions Screening Limits, the risk posed by THC emissions would be considered acceptable. If the Screening Limits are exceeded, the applicant would be required to conduct site-specific dispersion modeling using EPA's "Guideline on Air Quality Models (Revised)" to demonstrate that the (potential) MEI exposure level (i.e., the maximum annual average ground level concentration) does not exceed the acceptable THC ambient level.

2. *Technology-Based Approach.* Under this Tier II approach, the Tier I CO limit of 100 ppmv would be waived if HC levels in the stack gas do not exceed a good operating practice-based limit of 20 ppmv.

We have developed this technology-based approach because of concern about current scientific limitations of the risk-based approach. In addition, the risk-based approach could allow THC levels of several hundred ppmv—levels that are clearly indicative of upset combustion conditions.

The Agency believes that risk assessment can and should be used to limit the application of technology-based controls—that is, to demonstrate that additional technological controls, even though available, may not be needed. However, we are sufficiently concerned that our proposed to THC risk assessment methodology may have limitations, particularly when applied to THC emitted during poor combustion conditions (i.e., situations where CO exceeds 100 ppmv), that we are considering a cap on HC emissions. Although we believe the development of risk-based approach is a positive step, we are concerned whether the risk-based approach is adequately protective given our limited data base on PIC emissions and understanding of what fraction of organic emissions would be detected by the HC monitoring system. Notwithstanding the limitations of the THC risk assessment methodology, however, we believe it is reasonable to use the methodology to predict whether a technology-based limit appears to be protective. We have used the risk assessment methodology to show that a 20 ppmv HC limit appears to be protective of public health.

We discuss below our concerns with the proposed THC risk-based approach and the basis for tenatively selecting 20 ppmv as the recommended HC limit (measured with a conditioned gas monitoring system, recorded on an hourly average basis, reported as propane, and corrected to 7% oxygen).

a. *Concerns with the THC Risk Assessment Methodology.* Our primary concern with the risk assessment methodology is that, although it may be a reasonable approach for evaluating PIC emissions under good combustion conditions, it may not be adequate for poor combustion conditions—when CO exceeds 100 ppmv. The vast majority of our data on the types and concentrations of PIC emissions from incinerators, boilers, and industrial furnaces burning hazardous waste were obtained during test burns when the devices were operated under good combustion conditions. CO levels were often below 50 ppmv. Under Tier II applications, CO levels can be 500 to 10,000 ppmv or higher (there is no upper limit on CO).[69] The concern is that we do not know whether the types and concentrations of PICs at these elevated CO levels, indicative of combustion upset conditions, are similar to the types and concentrations of PICs in our data base. It could be hypotesized that as

[65] Report of the Products of Incomplete Combustion Subcommittee, Science Advisory Board, U.S. EPA, "Review of the Office of Solid Waste Proposed Controls for Hazardous Waste Incinerators: Products of Incomplete Combustion", October 24, 1989.

[66] In selecting a risk threshold of 10^{-5} for these rules, EDA considered risk thresholds in the range of 10^{-4} to 10^{-6}. As discussed in section I.D. of Part Three of the text, the Agency requests comment on alternative risk thresholds.

[67] Because of its extremely high volatility, special task sampling and analysis procedures are required to measure formaldehyde emissions. Such testing has not been successfully conducted during EPA's field testing of hazardous waste combustion devices.

[68] For additional technical support, see U.S. EPA, "Background Information Document for the Development of Regulations for PIC Emissions from Hazardous Waste Incinerators," October 1989 (Draft Final Report).

[69] Hazardous waste incenerators have operated at CO levels exceeding 13,000 ppmv during trial burns that achieved 99.99% distributed and removal efficiency.

combustion conditions deteriorate, the ratio of semi-and nonvolatile compounds to volatile compounds may increase. If so, this could have serious impacts on the proposed risk assessment methodology. First, the proposed generic unit risk value for THC may be understated when applied to THC emitted under poor combustion conditions. This is because semi- and nonvolatile compounds comprise only 1% of the mass of THC in our data base, but pose 80% of the estimated cancer risk. Thus, if the fraction of semi- and nonvolatile compounds increases under poor combustion conditions, the cancer risk posed by the compounds may also increase.

To put this concern in perspective, we note that the proposed THC risk value calculated from available data is 1 X 10^{-5} m3/μg. This unit risk is 100 times greater (i.e., more potent) than the unit risk for the quantified PICs with the lowest unit risk (e.g., tetrachloroethylene), but 1000 times lower than the risk for PICs such as dibenzoanthracene, and 10,000 to 1,000,000 times lower than the unit risk for various chlorinated dioxins and furans.

Second, if the fraction of semi- and nonvolatile THC increases under poor combustion conditions, the fraction of THC in the vapor phase when entering the THC detector may be lower than the 75% assumed when operating under good combustion conditions.[70] If so, the correction factor for the so-called missing mass would be greater than the 1.33 factor proposed.

The Agency is currently conducting emissions testing to improve the data base in support of the proposed risk-based approach. We are concerned, however, that the testing that is underway and planned may not provide enough information to support the risk-based approach. In particular, we are concerned that our stack sampling and analysis procedures and our health effects data base are not adequate to satisfactorily characterize the health effects posed by PICs emitted under poor combustion conditions.

A final concern with the risk assessment methodology is that it does not consider health impacts resulting from indirect exposure. As explained above, the risk-based standards proposed today consider human health impacts only from direct inhalation. Indirect exposure via uptake through the food chain, for example, has not been considered because the Agency has not yet developed site-specific procedures for quantifying indirect exposure impacts for purposes of establishing regulatory emission limits.

b. *Basis for the HC Limit.* We request comment on a HC limit of 20 ppmv as representative of a HC level distinguishing between good and poor combustion conditions. Under this alternative approach, HC would be monitored continuously during the trial burn, recorded on an hourly average basis, reported as ppmv propane, and corrected to 7% oxygen. (See discussion below regarding performance specifications of the HC monitoring system.) We have tentatively selected a level of 20 ppmv because: (1) it is within the range of values reported in our data base for hazardous waste incinerators and boilers and industrial furnaces burning hazardous waste; and (2) the level appears to be protective of human health based on risk assessments using the proposed methodology for 30 incinerators.[71]

The available data appear to indicate that the majority of devices can meet a HC limit of 20 ppmv when operating under good conditions (i.e., when CO is less than 100 ppmv). It appears, in fact, that many hazardous waste incinerators can typically achieve HC levels of 5 to 10 ppmv when operating generally at low CO levels. When incinerators emit higher HC levels typically exceed 100 ppmv, indicative of poor combustion conditions. As discussed in the October 26, 1989, supplemental notice to the boiler/furnace proposed rules, the available information on boilers and industrial furnaces is not quite as clear, however. Athough the data base indicates that boilers burning hazardous waste can easily meet a HC limit of 20 ppmv, the Agency has obtained data on various types of boilers burning various types of fossil fuels (not hazardous waste) that indicate that HC levels can exceed 20 ppmv when CO levels are less than 100 ppmv. See footnote 70. We are reviewing that data and obtaining additional information to determine if an alternative limit may be more appropriate for boilers. We specifically request comment on whether a HC concentration of 20 ppmv in fact represents good operating practice for boilers burning hazardous waste as the sole fuel or in combination with other fuels.

We also request comment on whether a HC concentration of 20 ppmv represents good operating practice for industrial furnaces. Preheater and precalciner cement kilns, for example, may not be able to readily achieve such a low HC concentration for the same reason that they typically cannot achieve CO levels below 100 ppmv. Normal raw materials such as limestone can contain trace levels of organic materials that oxidize incompletely as the raw material moves down the kiln from the feed end to the hot end where fuels are normally fired. Clearly, any HC (or CO) resulting from this phenomenon has nothing to do with combustion of hazardous waste fuel. Thus, an incinerator and a preheater or precalciner cement kiln with exactly the same quality of combustion conditions may have very different HC (and CO) levels. We request comment on: (1) the types of industrial furnaces for which a HC level 20 ppmv is representative of good combustion conditions; (2) whether alternative HC limits may be more appropriate for certain industrial furnaces; and (3) whether an approach to identify a site-specific HC limit representative of good operating practices may be feasible (e.g., where HC levels when burning hazardous waste would be limited to baseline HC levels without burning hazardous waste). In support of comments, we request data on emissions of CO and HC under baseline and hazardous waste burning conditions, including characterization of the type and concentration of individual organic compounds emitted.

As mentioned previously, some data on CO and HC levels from industrial boilers burning fossil fuels (not hazardous waste) appear to indicate that HC levels can far exceed levels considered to be representative of good combustion conditions (20 ppmv) even though CO levels are less than 100 ppmv. See footnote 70. If it appears that this situation can, in fact, occur for particular devices burning particular fuels, we would consider requiring both CO and HC monitoring for all such facilities irrespective of whether CO levels were less than 100 ppmv during the trial burn. Thus, under this scenario, the two-tiered CO controls proposed today would be replaced with a requirement to continuously monitor CO and HC for those particular facilities. We specifically request information on the types of facilities where HC levels may exceed 20 ppmv even though CO levels are less than 100 ppmv, and the need to continuously monitor HC for those facilities irrespective of the CO level achieved during the trial burn.

[70] See discussions in US EPA, "Background Information Document for the Development of Regulations for PIC Emissions from Hazardous Waste Incinerators," October 1989. (Draft Final Report)

[71] Memorandum from Shiva Garg, EPA, to the Docket, entitled "Supporting Information for a GOP-Based THC Limit", dated October 20, 1988.

F. Implementation of Tier I and Tier II PIC Controls

1. *Oxygen and Moisture Correction.* The CO limits for either format are on a dry gas basis and corrected to 7 percent oxygen. The oxygen correction normalizes the CO data to a common base, recognizing the variation among the different technologies as well as modes of operation using different quantities of excess air. In-system leakage, the size of the facility and the type of waste feed are other factors that cause oxygen concentration to vary widely in incinerator flue gases. Seven percent oxygen was selected as the reference oxygen level because it is in the middle of the range of normal oxygen levels for hazardous waste incinerators and it also is the reference level for the existing particulate standard under § 264.343(c). The correction for humidity normalizes the CO data from the different types of CO monitors (e.g., extractive vs. in situ). Our evaluation indicates that the above two corrections, when applied, could change the measured CO levels by a factor of two in some cases.

Measured CO levels should be corrected continuously for the amount of oxygen in the stack gas according to the formula:

$$CO_c = CO_m \times \frac{14}{21 - Y}$$

where CO_c is this corrected concentration of CO in the stack gas, CO_m is the measured CO concentration according to guidelines specified in Appendix C, and Y is the measured oxygen concentration on a dry basis in the stack. Oxygen should be measured at the same stack location that CO is measured.

2. *Formats of the CO Limit.* The CO limits under Tier I and Tier II would be implemented under two alternative formats. The applicant would select the preferred approach on a case-by-case basis. Under Format A, CO would be measured and recorded as an hourly rolling average. Under Format B, called the time-above-a-limit format, three parameters would be specified—a never-to-be-exceeded CO limit, and a base CO limit not to be exceeded for more than a specified time in each hour.

In developing these alternative formats, EPA considered three alternative methods:

- A level never to be exceeded;
- A level to be exceeded for an accumulated specified time within a determined time frame; and
- An average level over a specified time that is never to be exceeded.

The first alternative is the simplest and requires immediate shutdown of an incinerator when the limit is exceeded, regardless of how long the CO levels remain high. Short-term CO excursions or peaks (a few minutes duration) are typical of incenerator operation and can occur during routine operations; e.g., when a burner is adjusted. It is possible that during shutdown and start-up, the incinerator may momentarily have high CO emissions. Since the total mass emissions under such momentary CO excursions is not high, a never-to-exceed limit would impede incinerator operation while providing little reduction in health risk.

The second alternative, allowing the CO level to exceed the limit for a specified accumulative time within a determined time frame (e.g., x minutes in an hour), solves the problem associated with the first alternative. Incinerators would not be shut down by a single CO peak of high intensity yet they would be restricted from operation with several short interval CO peaks, or a single long duration peak.

The third alternative, allowing the CO level never to exceed an average level determined over a specified time, also avoids the problem of shutting off the waste feed each time an instantaneous CO peak occurs. A time-weighted average value (i.e., integrated area under the CO peaks over a given time period) also provides a direct quantitative measure of mass emissions of CO. For this reason, the use of a rolling average is EPA's preferred format. A combination of the first and second alternatives, with provisions to limit mass CO emissions per unit time, is also proposed as an alternative format. This alternative CO format has been proposed to reduce the cost of instrumentation from that required to provide continuous rolling average CO values corrected for oxygen. This format may be particularly attractive to operators of small or intermittently operated incinerators. The CO monitoring system needed for the first alternative requires continuous measurement and adjustment of the oxygen correction factor and continuous computation of hourly rolling averages. The instrumentation costs of such a system, consisting of continuous CO and oxygen monitors with back-up systems, a data logger and microprocessor, could be up to $91,000 and would require increased sophistication and operating costs over simpler systems. The only instrumentation needed for the alternative time-above-the-limit format is a CO monitor and a timer that can indicate cumulative time of exceedances in every clock hour, at the end of which it is recalibrated (manually or electronically) to restart afresh. Oxygen also would not have to be measured continuously in this format; instead, an oxygen correction value can be determined from operating data collected during the trial burn. Subsequently, oxygen correction values would be determined annually or at more frequent intervals specified in the facility permit.[12] We have not limited the use of this alternative CO format to any size or to any type or class of incinerators since we consider that this alternative format provides an equal degree of control of CO emissions to the rolling average format.

The alternative format would require dual CO levels to be established by the permit writer, the first as a never to exceed limit and the second a lower limit for cumulative exceedances of no more than a specified time in an hour. These limits and the time duration of exceedance shall be established on a case-by-case basis by equating the mass emissions (peak areas) in both the formats so that the regulation is equally stringent in both cases. The Background Document [13] provides the methodology and mathematical formulae showing how this can be done.

3. *Monitoring CO and Oxygen.* Compliance with the Tier I CO limit would require: (1) continuous monitoring of CO during the trial burn and after the facility is permitted; (2) continuous monitoring of oxygen during the trial burn and, under the 60-minute rolling average format, after the facility is permitted; and (3) measurement of moisture during the trial burn and annually (or as specified in the permit) thereafter. Compliance with the Tier II CO limits would require all the Tier I measurements and measurement of HC during the trial burn. Methods for measurements of CO and oxygen, (and THC) must be in accordance with the 3rd edition of SW-846, as amended. The methods are summarized in appendix C of the October 26, 1989, boiler/furnace supplemental notice (see 54 FR 43739-45), and are discussed in more detail in "Proposed Methods for Stack Emissions

[12] We believe that annual determinations of the oxygen correction factor will be appropriate in most cases because the concern is whether duct in-leakage has substantially changed over time. The fact that excess oxygen levels also change with waste type and feed rate should be considered in establishing the correction factor initially.

[13] US EPA, "Background Information Document for the Development of Regulations for PIC Emissions from Hazardous Waste Incinerators," October 1989 (Draft Final Report).

Measurements of CO, O_2, THC, HCl, and Metals at Hazardous Waste Incinerators", U.S. EPA, July, 1989 (Draft Final Report). If compliance with the CO standard is not demonstrated during the DRE trial burn, the CO test burn must be under conditions identical to the DRE trial burn.

4. *Monitoring HC.* Under Tier II, hydrocarbons (HC) would be monitored during the trial burn to ensure that the highest hourly average level does not exceed 20 ppmv. We believe that continuous HC monitoring should also be required over the life of the permit and an exceedance of the HC limit should be linked to automatic waste feed cutoff. This is because at high CO levels (e.g., greater than 100 ppmv) HC levels may or may not be high (e.g., greater than 20 ppmv). The concern is that, although HC levels during the trial burn may be less than 20 ppmv when CO exceeds 100 ppmv, operations over the life of the permit within the envelope allowed by the permit conditions may result in HC levels exceeding 20 ppmv. This concern was expressed by EPA's Science Advisory Board during its critique of the proposed PIC controls in the spring of 1989.[74] EPA specifically requests comments over whether continuous monitoring of HC should be required over the life of the permit under Tier II.

EPA had developed specifications for HC monitoring (see Appendix D of the October 26, 1989 boiler/furnace supplemental notice (54 FR 43743–45)) that would have required heated gas sampling lines and a heated flame ionization detector (FID) to keep as much of the HC in the vapor phase as possible. EPA reasoned that heated sampling lines were needed because the FID can detect HC only in the vapor phase—condensed organic compounds are not measured. Preliminary results of field testing of a hazardous waste incinerator conducted in July 1988 indicate that detected HC levels were 3 to 27 times greater with a heated FID system compared to an unheated system when CO levels ranged from 100 ppmv to 2760 ppmv.[75] The total mass of volatile, semivolatile, and nonvolatile organic compounds was also quantified during those tests using the Level I screening procedure.[76] The results indicate that the HC levels detected by an unheated FID were much lower than the levels determined by the Level I screening procedure.

Based on cursor discussions in October of 1988 with several hazardous waste incinerator operators, we had believed that such heated systems were in use at some facilities. A follow-up written survey [77] indicated, however, that all of the six incinerator facilities surveyed that use a FID to monitor HC used a system that incorporated gas conditioning—condensate traps accompanying gas cooling systems. Thus, the Agency has not been able to document operating experiences with a heated (i.e., not conditioned) gas sampling system. Further, we understand that, based on EPA tests using a heated FID at an incinerator (see footnote 66) and comments made during the SAB review of the PIC controls, a heated FID system can pose a number of problems: (1) the sample extraction lines may plug due to heavy particulate loadings and condensate organic compounds; and (2) semi and nonvolatile compounds may adsorb on the inside of the extraction lines causing unknown effects on measurements.

Given these concerns about the technical feasibility of requiring the use of heated FIDs at this time, we are proposing that gas conditioning be allowed. Such conditioning could involve gas cooling at the condensate trap to a level between 40 and 64 °F to reduce the moisture content of the sample gas entering the FID to less than 2 percent. To reduce operation and maintenance problems, the sampling lines and FID should probably still be heated. The sample gas cannot, however, be "bubbled" through a water column because this could remove water-soluble hydrocarbons. We specifically request comments on performance specifications for gas conditioning systems.

Allowing gas conditioning in the interim until unconditioned systems can be shown to be practicable virtually precludes the use of the health-based alternative to assess HC emissions under the Tier II controls. This is because a large, undetermined fraction of hydrocarbon emissions will be condensed to the trap and will not be reported by the FID. This is another reason that the Agency prefers the technology-based, 20 ppmv limit on hydrocarbons as the Tier II standard.

Although a FID system monitoring a conditioned gas will detect only the volatile fraction of organic compounds,[78] the Agency believes this is adequate for the purpose of determining whether the facility is operating under good operating conditions.[79] Available data indicate that when emissions of semi and nonvolatile organic compounds increase, volatile compounds also increase.[80] Thus, volatile compounds appear to be a good indicator for the semi and nonvolatile compounds that are often of greater concern because of their health effects. Given, however, that the good operating practice-based hydrocarbon limit of 20 ppmv was based primarily on test burn data using heated (i.e., unconditioned gas) FID systems,[81] the Agency considered whether to lower the recommended hydrocarbon limit when an unheated system is used for compliance monitoring. As discussed above, limited available field test data indicated that a heated system would detect two to four times the mass of organic compounds than a conditioned system. We believe, however, that the 20 ppmv hydrocarbon limit is still appropriate when a conditioned system is used because: (1) the data correlating heated vs conditioned systems are very limited; (2) the data on HC emissions are limited (and there apparently is confusion in some cases as to whether the data were taken with a heated or conditioned system); and (3) the risk methodology is not sophisticated enough to demonstrate that a HC limit of 5 or 10 ppmv using a conditioned system rather

[74] Report of the Products of Incomplete Combustion Subcommittee, Science Advisory Board, U.S. EPA, "Review of the Office of Solid Waste Proposed Controls for Hazardous Waste Incinerators: Products of Incomplete Combustion", October 24, 1989.

[75] U.S. EPA, "Measurement of Particulates, Metals, and Organics at a Hazardous Waste Incinerator", November, 1988, (Draft Final Report). NTIS order number: PB 89–230668.

[76] The Level of Screening procedure is described in *IERL–RTP Procedure Manual: Level I—Environmental Assessment*, 2nd Edition, October 1978 (EPA 600/7–78–201). That procedure uses gravimetric and total chromatographical organic procedures to quantify the mass of semi and nonvolatile organic compounds.

[77] U.S. EPA, "THC Monitor Survey", June, 1989 (Draft Final Report).

[78] We also note that some of the water-soluble hydrocarbons may also be removed by the gas conditioning system.

[79] We request comment on whether it would be practicable to develop a site-specific correction factor for monitoring with a conditioned gas system by monitoring with an unconditioned system as well during the trial burn. The ratio of the unconditioned system THC level to the conditioned system THC level could then be used to correct the conditioned system THC values over the life of the permit. This approach may not be practicable, however, for reasons including the fact that the waste burned during the trial burn for some facilities (e.g., facilities handling multiple wastes) may not represent, with respect to THC emissions, the waste that will be burned over the life of the permit.

[80] U.S. EPA, *Measurement of Particulates, Metals, and Organics at a Hazardous Waste Incinerator*, November, 1988 (Draft Final Report). NTIS Order No. PB89–230668.

[81] Heated systems were often used during trial burns with acceptable results given the short duration of the tests and the test personnel available to handle operational problems.

than a limit of 20 ppmv is needed to adequately protect public health.

The HC monitoring method proposed in appendix D of the boiler/furnace supplemental notice (54 FR 43743) will be modified to allow an unheated, conditioned system and use of condensate trap(s) and other conditioning methods. Performance specifications for the gas conditioning system would be discussed above.

5. *Compliance with Tier I CO Limit.* There are a number of alternative approaches to evaluate CO readings during the trial burn to determine compliance with the 100 ppmv limit including: (1) the time-weighted average CO level (or the average of the hourly rolling averages); (2) the average of the highest hourly rolling averages for all trial burn runs; or (3) the highest hourly rolling average. The time-weighted average alternative provides the lowest CO level that could reasonably be used to determine compliance, and the highest hourly rolling average alternative provides the highest CO level that could reasonably be used. There may be other reasonable alternatives between these two extremes in addition to the one listed above.

We are proposing to use the most conservative approach to interpret trial burn CO emissions for compliance wtih the 100 ppmv Tier 1 limit—the highest hourly rolling average. (This approach is conservative because we are comparing the trial burn CO level to the maximum CO allowed under Tier I—100 ppmv.) We believe this conservative approach is reasonable given that compliance with Tier I allows the applicant to avoid the Tier II requirement to evaluate HC emissions to provide the additional assurance (or confirmation) that HC emissions do not exceed levels representative of good operating practice.

6. *Establishing Permit Limits for CO under Tier II.* The alternatives discussed above for interpreting CO trial burn data also apply to specifying the permit limit for CO under Tier II. For purposes of specifying a Tier II CO limit, however, the time-weighted average approach would be more conservative than the highest hourly average approach because it would result in a lower CO limit. We are proposing the conservative, time-weighted average approach for Tier II compliance because we are concerned that the highest hourly average approach may not be adequately protective. Although the highest hourly average (HHA) approach would be protective in theory because the applicant must demonstrate that the highest hourly average HC emissions do not exceed good operating practice-based levels, the HHA approach would allow the facility to operate continuously over the life of the permit at the highest CO levels that occurred during one hour of the trial burn.

We specifically request comments on how to interpret trial burn CO data to establish Tier II CO limits.

7. *Compliance with HC Limit of 20 ppmv.* The alternative approaches for determining compliance with the 20 ppmv HC limit under Tier II are identical to those discussed above for compliance with the Tier I CO limit. Again, we are proposing the most conservative approach—the highest hourly rolling average HC level during the (at a minimum) three test burns must not exceed 20 ppmv.

8. *Waste Feed Cutoff Requirements.* Today's proposal would require cutoff of the waste feed if the CO limit is exceeded. In addition, we are requesting comment on requiring continuous monitoring of HC. If continuous monitoring of HC is required, cut off of the waste feed would also be required if the HC limit is exceeded.

The regulations proposed today require that minimum permitted combustion temperatures be maintained after waste feed cutoff for the duration that the wastes remain in the combustion chamber. To comply with this requirement, the permit must specify the minimum combustion chamber temperature occurring during the trial burn for devices that may leave a waste residue in the combustion chamber after waste feed cutoff (e.g., devices burning wastes that are solids). We believe that PIC emissions from "smoldering" waste remaining in the combustion chamber should not pose unacceptable health risks provided that system temperatures are maintained.

An uninterruptible auxiliary burner of adequate capacity may be needed to maintain the temperature in the combustion chamber(s) and allow destruction of the waste materials and associated combustion gases left in the incineration system after the waste feed is cutoff due to an upset. The safe start-up of the burners using auxiliary fuel require approved burner safety management systems for prepurge, post-purge, pilot lights and induced draft fan starts. If these safety requirements preclude immediate start-up of auxiliary fuel burners and such start-up is needed to maintain temperatures (i.e., if the combustion chamber temperatures drop precipitously after waste feed is cut-off), the auxiliary fuel may have to be burned continuously on low fire during non-upset conditions. After cutoff, hazardous waste may not be used as auxiliary fuel unless the waste is exempt under existing § 264.340 (b) or (c) from the emissions standards because the waste is ignitable, corrosive, or reactive and contains insignificant levels of toxic constituents.

There is some concern that this requirement to maintain temperature in the combustion chamber after a waste feed cutoff may not be feasible in all cases (e.g., where the burner cannot be maintained in close proximity to the combustible vapor generation point because of an explosion hazard). EPA specifically requests comments on this issue, and what alternate approach should be used to reduce the possibility of PIC emissions from waste remaining in the chamber after a waste feed cutoff.

We request comment on several alternative approaches to allow restart of the waste feed: (1) restart after the hourly rolling average no longer exceeds the permit limit; (2) restart after an arbitrary 10 minute time period to enable the operator to stabilize combustion conditions; or (3) restart after the *instantaneous* CO level meets the hourly rolling average limit. This third alternative (i.e., basing restarts on the instantaneous CO levels) may be appropriate because it may take quite a while for the hourly rolling average to come within the permit limit while the event that caused the exceedance may well be over even before the CO monitor reports the exceedance. Under this alternative, the rolling average could be "re-set" when the hazardous waste feed is restarted either by: (1) basing the hourly rolling average on the CO level for the first minute after the restart (the same approach that would be used any time the waste feed is restarted for reasons other than a CO exceedance); or (2) assuming more conservatively given that CO levels may exceed the permit limit after the waste feed cutoff while residues continue to burn, that the hourly rolling average is equivalent to the permit limit (e.g., 100 ppmv) prior to the waste feed restart. A final refinement to this third alternative of allowing restarts after instantaneous CO levels fall below the permit limit would be not to reset the rolling average CO level and to require that the instantaneous CO level not exceed the (rolling average) permit limit (e.g., 100 ppmv) for the period after the restart and until the rolling average falls below the permit limit. Again, we specifically request comment on these alternative approaches to allow waste feed restarts.

When the automatic waste feed cutoff is triggered by a HC exceedance (i.e., if the final rule limits HC levels beyond the trial burn and requires continuous

HC monitoring), we propose to allow a restart only after the hourly rolling average HC level has been reduced to 20 ppmv or less. We are not considering the options discussed above for restarts after a CO exceedance given that HC is a better surrogate for toxic organic emissions than CO. Thus, we believe that a more conservative waste feed restart policy is appropriate after a HC exceedance.

G. Request for Comment on Limiting APCD Inlet Temperatures

We are requesting comment on whether to limit the temperature of stack gas entering a dry emissions control device (e.g., bag house, electrostatic precipitator (ESP)) to minimize formation of chlorinated dibenzodioxin and dibenzofurans (CDD/CDF). The same discussion is presented above in the section requesting comment on additional regulatory issues pertaining to boilers and industrial furnaces burning hazardous waste.

After conducting extensive emissions testing of municipal waste combustors (MWCs), the Agency has concluded that CDD/CDF can form on MWC flyash in the presence of excess oxygen at temperatures in the range of 480 to 750 °F.[82] Cooling the flue gases and operating the air pollution control device (APCD) at temperatures below 450 °F helps minimize the formation of CDD/CDF in the flue gas. Thus, the Agency has recently proposed to limit MWC stack gas temperatures at the inlet to the APCD to 450 °F. See 54 FR 52251 (December 20, 1989).

Given that some hazardous waste incinerators and boilers and industrial furnaces burning hazardous waste are equipped with dry particulate control devices, we request comment on the need to control gas temperatures to 450 °F to minimize CDD/CDF formation. Although available data indicate that CDD/CDF emissions from hazardous waste combustion devices are much lower than can be emitted from MWCs,[83] it may be prudent to limit temperatures in hazardous waste combustion devices as well.

PART FOUR; PERMIT PROCEDURES AND OTHER ISSUES

I. Impact on Existing Permits

Upon promulgation of today's proposed rule, EPA will use its authority to reopen existing permits to include conditions necessary to comply with these rules. This authority is found in 40 CFR 270.41(a)(3) (see 52 FR 45799 (December 1, 1987)), which allows EPA to initiate modifications to a permit without first receiving a request from the permittee, in cases where new regulatory standards affect the basis of the permit.

In addition, permit writers will be expected to continue to implement the appropriate controls on metals, HCl, and PIC emissions proposed here on a permit-by-permit basis without waiting for promulgation of the final rule. Because many incinerators are scheduled to be permitted in the interim and due consideration of the risk posed by metals, HCl, and PIC emissions is needed, this case-specific implementation will ensure adequate protection of public health. Permit writers can implement appropriate controls under the omnibus authority of section 3005(c)(3) of HSWA and codified at § 270.32(b)(2). The omnibus provision gives the permit writer the authority to establish permit conditions as necessary to protect human health and the environment. Like the proposed rule, the Agency's current guidance documents[84] Screening Limits for metals and HCl to demonstrate that emissions are acceptable, and if the Screening Limits are exceeded, the applicant must demonstrate by site-specific dispersion modeling that emissions will not result in exceedances of acceptable ambient levels. The PIC guidance document also uses the two-tiered approach proposed in today's rule to limit CO and HC concentrations in stack gas.

II. Waste Analysis Plans and Trial Burn Procedures

The proposed metals controls will impose added sampling and analyses requirements at hazardous waste incinerators burning wastes with levels of metals that are likely to exceed emission limits, or related metal feed rates. EPA anticipates that existing waste analysis plans, and trial burn procedures at many, if not all, facilities will need to be reviewed and modified.

A. Waste Analysis Plans

Existing rules require the owner or operator to conduct sufficient waste analysis to verify that waste feed to the incinerator is within the physical and chemical composition limits specified in his permit (see § 264.341(b)).

Compliance with the metals controls will probably require many operators to conduct additional analyses for Appendix VIII metals or to require the generator of the waste to provide information on the metal content of waste sent to the incinerator. There would be a requirement to keep records of such analyses. To show compliance with the feed rate limit requirements, there would be a need for sampling of blended wastes as fed to the incinerator, or for recordkeeping to show, by calculation, the amount of metals in wastes that are blended. Comments on the practicality of compliance with metals sampling, analysis, and recordkeeping are requested.[85]

EPA's best determination of appropriate metals sampling and analyses procedures are given in Appendix A. Matrix effects have been shown to be important in the analysis of metals in oils and solids. Accordingly, recommended sample preparation methods are given in Appendix A. Standardized protocols are not yet widely available, but EPA's experience indicates that published EPA Methods for individual metals and particulate matter work well. It is likely that any protocol will require metal analysis of waste feeds, residual streams (both solid and liquid), and flue gas. Operators may wish to sample flue gas both before and after air pollution control devices. EPA's present rules allow the use of equivalent methods of analyses upon a showing of substantial scientific validity.

B. Trial Burn Procedures

All samples must be analyzed according to the appropriate methods specified in "Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods," EPA publication SW-846, as incorporated by reference in 40 CFR 260.11. Sampling for metals must be done using the Multiple Metals train summarized in Appendix A. The Multiple Metals train and the methods to monitor CO, HCl, and THC are

[82] See US EPA, "Municipal Waste Combustion Study: Combustion Control of Organic Emissions", EPA/530-SW-87-021C, NTIS Order No. PB87-206090, US EPA, "Municipal Waste Combustion Study: Flue Gas Cleaning Technology", EPA/530-SW-87-021D, NTIS Order No. PB87-206108, and 54 FR 52251 (December 20, 1989).

[83] See discussions in US EPA, "Background Information Document for the Development of Regulations for PIC Emissions from Hazardous Waste Incinerators", October 1989. (Draft Final Report), and Engineering Sciences, "Background Information Document for the Development of Regulations to Control the Burning of Hazardous Waste in Boilers and Industrial Furnaces, Volume III: Risk Assessment", February 1987. (Available from the National Technical Information Service, Springfield, VA, Order No. PB 87 173845.)

[84] U.S. EPA, "Guidance on Metals and Hydrogen Chloride Controls for Hazardous Waste Incinerators," August 1989, and U.S. EPA, "Guidance on PIC Controls for Hazardous Waste Incinerators," April 1989.

[85] We note that we have requested comment earlier in the text on approaches other than waste analysis combined with feed rate limits to implement the controls on metals emissions. See also 54 FR 43760 c.3.

discussed in more detail in "Proposed Methods for Stack Emissions Measurement of Carbon Monoxide, Oxygen, Total Hydrocarbons, HCl, and Metals at Hazardous Waste Incinerators," as referenced above.

The analysis procedure consists of two steps: Preparation (called digestion) and the analysis itself. The digestion process is dependent on both the analysis procedure and the waste matrix. Appendix A lists the digestion methods and the proper analysis technique and waste matrix of each one. The analysis procedures are metal specific. For some metals, up to three methods are applicable depending on the precision of the detection limit desired. See Appendix A for the proper analysis methods to be used for each metal. In some cases, the analysis method includes its own digestion step and the listed digestion methods are not necessary.

Analysis for matrix effects (interference) should be performed by the Method of Standard Addition or other appropriate procedures.

III. Emergency Release Stacks

EPA is clarifying today that no emergency release stack openings are allowed while hazardous waste is in the incinerator unless the applicant has demonstrated during the trial burn that the performance standards of § 264.343 will be met while a dump stack is being used. When such "dump" stacks are used, combustion gases bypass the emissions control equipment, and this would cause violation of the permit requirements to operate the control equipment. Therefore, the use of emergency release stack openings while hazardous wastes remain in the combustion chamber would be a violation of the permit and subject to enforcement action as deemed appropriate by the Agency. During the opening of a dump stack, emissions of metals and HCl could pose unacceptable health risk. In addition, if temperatures at the inlet to the dump stack are not maintained at permit levels, HC emissions could also pose substantial health risk. While it is understood that there can be mitigating circumstances which require the use of emergency relief stacks, these instances should be minimized. Under the Preparedness and Prevention and Contingency Plan requirements of Subparts C and D, the applicant should address what they will do to prevent the use of the dump stack and the release of hazardous waste constituents into the air, and what they will do to minimize the hazard from such releases (such as backup systems, maintaining flame, temperature and combustion air to combust organics). See proposed § 270.62(b)(2)(vii).

IV. POHC Selection

One of the criteria for POHC selection for demonstration of DRE is degree of difficulty to incinerate the compound. There are a number of "incinerability indices" that could be used, but heat of combustion has been considered by many to be the best index currently available. EPA studies [86] indicate, however, that a ranking based on thermal stability under low oxygen (substoichiometric) conditions may correlate with field test data on DRE better than heat of combustion. The ranking was developed using lab-scale reactors to determine the temperature required to destroy 99 percent of a given POHC in two seconds under substoichiometric (⅓ stoichiometric oxygen) conditions. Mixtures of POHCs were tested together to ensure that adequate OH and H radicals were available for compounds that undergo biomoleculcar reactions. Modeling indicates that thermal decomposition in the flame gases is essentially complete. Thus, any unburned POHCs are most likely the result of small fractions of the waste escaping flame temperatures by several potential failure mechanisms (e.g., poor atomization). Once in the post-flame zone, the gas phase thermal decomposition kinetics controls the rate of POHC destruction. This would explain why the low oxygen thermal stability index ($TSLoO_2$) which simulates post-flame conditions, appears to correlate better with field test DRE data than heat of combustion, autoignition temperature, and thermal stability under excess oxygen conditions.

Although the $TSLoO_2$ has not been field validated, EPA believes it is a promising approach to predicting the relative stability of POHCs in the combustion environment likely to result in unburned POHCs (and low DRE). The $TSLoO_2$ index is presented in U.S. EPA, "Guidance on Setting Permit Conditions and Reporting Trial Burn Results: Volume II of Hazardous Waste Incineration Guidance Series", EPA/625/6-89/019, January 1989. Thermal stability values have been determined by actual testing for approximately 80 Appendix VIII compounds. These thermal stability values have been used to predict the thermal stability values for the remaining Appendix VIII organic compounds based on assumed reactions considering structural relationships of the compounds.

We note that some compounds that rank high on the heat of combustion index rank do not rank high on the $TSLoO_2$. For example, carbon tetrachloride ranks very high on the heat of combustion index but near the middle of the $TSLoO_2$. Given the current uncertainty about which index better represents incinerability, we recommend that the permit writer and applicant consider the $TSLoO_2$ as well as other indices when selecting POHCs and identifying compounds in the permit that an incinerator is allowed to burn. In fact, the $TSLoO_2$ index has been available to permit writers for over a year. Many permit writers have used the index to help select POHCs for trial burns needed to support permits issued by the RCRA-mandated deadline of November 1989 for existing facilities.

The Agency is continuing to validate the $TSLoO_2$ and to address other questions (e.g., are there sampling and analysis procedures for those compounds high on the $TSLoO_2$) and hopes to be able to be more definitive about a preferred index when today's proposed rule is promulgated. We specifically request comment on the use of the $TSLoO_2$ index for the purpose of POHC selection.

V. POHC Surrogates

A number of lab scale, pilot scale, and field tests have investigated the use of nontoxic tracer surrogates (one example is sulfur hexafluoride (SF_6)) for POHCs selected from appendix VIII of part 261. Sulfur hexafluoride, in particular, shows promise as a conservative tracer surrogate. It is readily available commercially, inexpensive, and nontoxic. Appendix VIII POHCs, especially when spiking is required to increase concentrations in the waste for DRE testing, are often difficult to obtain, expensive, and a health hazard to operators. Sampling and analysis techniques for SF_6 are well documented because it has been used for years as a tracer for monitoring ambient air. Sampling techniques for appendix VIII compounds (i.e., VOST and MM5) are complicated, expensive, and even for those with years of experience, prove to produce substantial numbers of measurements that do not meet QA/QC standards.

Given the substantial benefits of using SF_6 as a tracer compound, the Agency is conducting additional testing and analysis to answer remaining questions. For example, the DRE of SF_6 has been correlated to the DRE of only a few appendix VIII compounds, and

[86] Taylor, P., and Dellinger, R., "Development of a Thermal Stability Based Index of Hazardous Waste Incinerability", UDRI FY 88 Status Report for CR 813938, November 1988.

sometimes, under conditions that may not be representative of typical incineration operations. In addition, standard procedures are needed for feeding and stack sampling the tracer. The Agency hopes to be able to publish a Notice of Data Availability in the **Federal Register** later this year to present the results of the testing and to propose categorically that SF_6 is an acceptable surrogate for appendix VIII POHCs. Ideally, the proposal would be promulgated with the rest of today's proposal.

We note that we are proposing today to revise § 264.342(b)(1) and § 270.62 (b)(4), (b)(4)(i), and (b)(4)(ii) to delete the requirement that a POHC must be listed in Appendix VIII. We are proposing this change now to give permit writers and applicants the option of using nontoxic tracers for DRE testing where the applicant provides sufficient data to demonstrate that the tracer is an adequate surrogate.

We specifically request information pertaining to the use of SF_6 and other nontoxic tracer compounds as POHC surrogates.

VI. Information Requirements

Information requirements may be imposed on a case-by-case basis depending upon the complexity of risk analysis and dispersion analysis needed at a particular location. The added burden will be significantly increased over existing part B requirements only for facilities in unusually complex terrain situations or where representative meterological data are not available. All facilities intending to combust hazardous waste with amounts of metals that may exceed emission limits will be required to submit information needed for determining the terrain and urban/rural classification of the facility. Because the determination is based in part on using the concept of terrain-adjusted effective stack height, site specific parameters will be needed for all sites. Information needs are outlined below.

If available meterological data are not considered representative of the site, a screening model that does not require the use of site-specific meterological data cam be used. We have developed a screening model that may be appropriate in such situations. See appendix V of the "Guidance on Metals and Hydrogen Chloride Controls for Hazardous Waste Incinerators." We note, however, that a screening model that does not use site-specific meterological data is designed to be more conservative (i.e., predict higher ambient concentrations) than a "regulatory" model recommended by EPA's "Guideline on Air Quality Models (Revised)".

Reference information needed includes facility name, address, telephone number, and the number of hazardous waste combustion sources on site. Site information includes stack parameters and terrain parameters. The stack parameters consist of physical stack height, exhaust temperaturre, inner stack diameter, exit velocity, flow rate, latitude/longitude or UTM coordinates. Terrain parameters consist of maximum terrain rise (in meters for three distance ranges, 0–0.5 km, and 0–5 km). and shortest distance to fenceline. Waste firing information needed includes stack release identifications by incinerator, a number of incinerators, maximum waste feed rate by input location (nozzle, lance, ram, etc.), and metal feed rate for liquid wastes, solid wastes, and organometals. Additional parameters needed are the dimensions for all buildings within 5 building heights or the maximum projected building width of the stack. For these buildings, the following data are needed; the distance from the stack, distance from the nearest fenceline, building height, building length, and building width.

EPA requests comment on the recordkeeping and reporting burden associated with these information requirements.

VII. Miscellaneous Issues

EPA today proposes to amend § 264.345(a) to clarify that the incinerator must operate in accordance with the operating requirements specified in the permit whenever there is hazardous waste in the incinerator.

In addition, we propose to amend § 270.62(b)(8) to require that all data collected during any trial burn must be submitted within 90 days of completion of trial burn. This requirement is to ensure timely submission of trial burn data. Section 270.62(b)(10) would be revised to require that three runs must be passed for each set of permit conditions. This is to clarify that the runs are not to be averaged, but must be passed each time for all standards. Section 270.62(b)(10) does allow for one of the three runs to be disregarded if the Director believes there is sufficient reason. EPA's criteria for disregarding a run are discussed in U.S. EPA, "Guidance on Setting Permit Conditions and Reporting Trial Burn Results: Volume II of Hazardous Waste Incineration Guidance Series", EPA/625/6–89/019, January 1989.

EPA today clarifies § 264.340(c) which provides an exemption from all requirements other than waste analysis and closure for ignitable, corrosive or reactive waste containing insignificant concentrations of the hazardous constituents listed in appendix VIII, part 261. In the past, this has been interpreted to mean organics in appendix VIII. Now that EPA is proposing to control metals emissions and has a method to determine risks from metals, metals in appendix VIII should also be considered when granting this exemption. Insignificant concentrations can be taken from the feed rate screening levels that would be used to implement the metals controls. See appendix D of the October 26, 1989, boiler/furnace supplemental notice. Further, it is possible for a waste to be exempted for one type of appendix VIII constituent and not the other. For example, if the waste contains insignificant concentrations of metals but significant concentrations of organics, then the waste could be exempt from the requirement for metals, but not for organics (e.g., DRE, CO/HC limits).

Finally, we propose to note minor revisions to the following sections to conform with today's proposed controls: Specific part B information requirements for incinerators § 270.19 (a), (c)(1)(iii), (c)(3), (c)(6)(ii), (c)(7)(i), (c)(7)(ii), (c)(7)(iii), (c)(9)(i), (c)(9)(ii), (e), (f); Hazardous waste incinerator permits § 270.62 (b)(2)(i)(c), (b)(2)(i)(D), (b)(2)(i)(E), (b)(6)(i), (b)(6)(ii), (b)(6)(iii), (b)(6)(v), (b)(6)(viii), (b)(6)(ix), (c), (c)(1).

All of today's proposed amendments would be effective immediately upon promulgation of the final rule. Given that we believe that all of the substantive provisions are necessary to adequately protect public health and the environment and will, thus, be subject to implementation under the omnibus provision during the permitting process *before* promulgation, applicants should have ample time to comply. For example, permits under development when the final rule is promulgated should already incorporate the new controls under the omnibus provision.

VIII. Halogen Acid Furnaces

In the May 6, 1987, proposed rule (52 FR 17018–9), EPA proposed to add halogen acid furnaces (HAFs) to the list of industrial furnaces under § 260.10. We are today requesting comment on revisions we are considering to the HAF definition, and proposing under § 261.2(d) to list inherently waste-like materials that are fed to a HAF as hazardous waste.

HAFs burn halogenated secondary materials as an ingredient to produce halogen acid product, EPA proposed to

list HAFs as industrial furnaces for reasons discussed in the May 6, 1987, proposal. To ensure that the device was involved in *bona fide* production of acid as an integral component of a manufacturing process, the proposed definition required that: (1) The furnace must be located on-site at a chemical production facility; (2) the waste feed must be halogenated; and (3) the acid product must have at least 6% acid content. Based on comments on the proposal and further consideration by the Agency, we are considering revising the definition to better distinguish between HAFs and halogenated waste incinerators equipped with wet scrubbers to control halogen acid emissions and to better reflect industry practice.

To ensure that the device is an integral component of a chemical manufacturing process, we have proposed that a substantial fraction of the acid product be used on-site. Thus, we would add to the definition that at least 50% of the acid product be used on-site. In addition, we would require that any off-site waste fed to the HAF must be indigenous to the chemical production industry. Thus, the waste must be generated by a SIC 281 (inorganic chemicals) or SIC 286 (organic chemicals) process.

To ensure that the waste is burned as a *bona fide* ingredient to produce a halogen acid product, we would require that any waste fed to the HAF must have an as-generated halogen content of at least 20%.

To better reflect industry practice, we would require that the acid product have an halogen acid content of 3% rather than 6%. We believe that this would still clearly distinguish an incinerator halogen acid scrubber water from the acid product of an HAF because incinerator scrubber water has an acid content well below 1%.

Finally, we are proposing pursuant to § 261.2(d)(2) to list hazardous waste fed to a HAF as inherently waste-like material. Materials fed to the HAFs are usually the residual still bottoms no longer suitable for use as feedstock to make new chemical products. Many are listed wastes, for example the generically listed F024. These materials contain dozens of appendix VIII constituents not ordinarily found in the raw materials that are normally used to produce chlorine. See the various listing background documents for the listed wastes from chlorinated organic production, as well as appendix VII of part 261 for these listings. Other than for their chlorine content, these organic toxicants do not contribute to hydrochloric acid production; they are destroyed (assuming the HAF operates efficiently). Thus, these toxicants (which by volume comprise the greater part of these wastes) are discarded by thermal combustion. Second, inefficient combustion of the halogenated organic compounds in wastes fed to a HAF can pose the same risks to human health and the environment as combustion of those wastes in an incinerator, boiler, or other industrial furnace. We thus believe that the hazardous materials burned in these devices are inherently wastelike.

We note, that to the best of EPA's knowledge, all of these materials are presently regulated as hazardous wastes, because the devices in which they are burned are either classified as incinerators or burn partially for energy recovery. Given, however, that the wastes are used as an ingredient to produce the acid product, the HAF would not be subject to regulation if the wastes were not burned partially for energy (or materials) recovery. Halogenated wastes with a heating value of less than 5,000 Btu/lb could be considered to be burned solely as an ingredient in a HAF. Thus, we propose to list as inherently wastelike material any secondary material that is identified or exhibits a characteristc of a hazardous waste provided in subparts C or D of part 261. See proposed § 261.2(d)(2).

PART FIVE: ADMINISTRATIVE, ECONOMIC AND ENVIRONMENTAL IMPACTS

I. State Authority

A. Applicability of Rules in Authorized States

Under section 3006 of RCRA, EPA may authorize qualified States to administer and enforce the RCRA program within the State. (See 40 CFR part 271 for the standards and requirements for authorization.) Following authorization, EPA retains enforcement authority under sections 3008, 7003, and 3013 of RCRA, although authorized States have primary enforcement responsibility.

Prior to the Hazardous and Solid Waste Amendments of 1984 (HSWA), a State with final authorization administered its hazardous waste program entirely in lieu of EPA administering the Federal program in that State. The Federal requirements no longer applied in the authorized State, and EPA could not issue permits for any facilities in the State which the State was authorized to permit. When new, more stringent Federal requirements were promulgated or enacted, the State was obliged to enact equivalent authority within specified time frames. New Federal requirements did not take effect in an authorized State until the State adopted the requirements as State law.

In contrast, under section 3006(g) of RCRA, 42 U.S.C. 6926(g), new requirements and prohibitions imposed by HSWA take effect in authorized States at the same time that they take effect in nonauthorized States. EPA is directed to carry out those requirements and prohibitions in authorized States, including the issuance of permits, until the State is granted authorization to do so. While States must still adopt HSWA-related provisions as State law to achieve or retain final authorization, the HSWA applies in authorized States in the interim.

Today's rule is proposed pursuant to sections 3004 and 3005 of RCRA. Thus, as a non-HSWA rule, it is not effective in authorized States until such time as the State is authorized to implement them. However, the EPA has authority under section 3005(c)(3), the HSWA omnibus provision codifed at 40 CFR 270.32(b)(2), to impose any permit condition deemed necessary to protect human health and the environment. This provision can be invoked whenever a federal RCRA permit is issued (including federal permits implementing HSWA provisions that are issued concurrently with permits issued by an authorized State for the same unit). Thus, all federal permits—including those incorporating the HSWA corrective action requirements—could include conditions based on EPA's omnibus authority. The EPA has decided that the requirements in today's rule relate to permit conditions deemed necessary to protect human health and the environment and that such conditions are needed for all future permits to minimize risks from toxic emissions of PICs, metals, and acid gases. So, until such time as the authorized States are able to impose these new requirements in permits they issue, EPA can impose them under the direct authority of § 270.32(b)(2) in authorized and unauthorized States, effective the date of promulgation of this rule, whenever a Federal RCRA permit (or Federal portion of a RCRA permit) is issued with respect to the facility. Prior to the effective date of these regulations, permit writers may impose these same conditions (or others) at their discretion, in Federal permits pursuant to the same authority. (See part Four, I. Impact on Existing Permits. The metals/HCl and PIC guidance documents can be used to implement these requirements prior to promulgation of the rule).

B. Effect on State Authorizations

As noted above, today's rule proposes standards that would be effective via omnibus authority in all States regardless of their authorization status. Nonetheless, the authorized States must also revise their program and adopt equivalent requirements under their State law by the deadlines set forth in § 270.21(e).

Section 271.21(e)(2) requires that States that have final authorization must modify their programs to reflect Federal program changes and must subsequently submit the modifications to EPA for approval. The deadline by which the State must modify its program to adopt this proposed regulation will be determined by the date of promulgation of the final rule in accordance with § 271.21(e). These deadlines can be extended in certain cases (40 CFR 271.21(e)(3)). Once EPA approves the modifications, the State requirements become subtitle Cv RCRA requirements.

States with authorized RCRA programs may already have requirements similar to those in today's rule. These State regulations have not been assessed against the Federal regulations being proposed today to determine whether they meet the tests for authorization. Thus, a State is not authorized to carry out these requirements in lieu of EPA until the State program modification is submitted to EPA and approved. Of course, States with existing standards may continue to administer and enforce their standards as a matter of State law. In fact, EPA encourages States with similar standards or with their own omnibus authority to impose these new requirements as soon as possible.

States that submit their official application for final authorization less than 12 months after the effective date of these standards are not required to include standards equivalent to these standards in their application. However the State must modify its program by the deadlines set forth in § 271.21(e). States that submit official applications for final authorization 12 months or more after the effective date of those standards must include standards equivalent to these standards in their application. Section 271.3 sets forth the requirements a State must meet when submitting its final authorization application.

II. Regulatory Impact Analysis

A. Purpose and Scope

EPA has determined that today's proposed rule is not a major rule as defined by Executive Order 12291. This section of the preamble discusses the results of the cost impacts and risk analyses of the proposed rule. EPA has also assessed small business impacts resulting from the proposed rule, as required under the Regulatory Flexibility Act.

The costing analysis and risk assessment were constrained by data availability. The major limitations that should be considered when reviewing the results are summarized below:

- The main focus of the Regulatory Impact Analysis (RIA) was the analysis of the proposed 1×10^{-5} [87] risk standard; however, a less detailed analysis of an alternative (1×10^{-6}) *de minimis* risk standard was also performed.
- Because of data limitations, the RIA evaluated only seven of the ten toxic metals covered by today's proposed rule. Waste characterization data by RCRA code could not be located for thallium, antimony, and silver.
- At this time, EPA was unable to complete a detailed analysis of the chlorine content in diffemt wastes currently being incinerated. As a surrogate, EPA calculated an average chlorine concentration in all hazardous waste combusted using available test burn data.
- The RIA estimated only the incremental costs of the proposed CO monitoring that includes a continuous oxygen monitor and a data-logger for continuous oxygen corrections. Because of time and resource constraints, the analysis did not consider the proposed alternative requirement (a CO monitor and a timer) which could be less costly.
- There was insufficient information to quantify the potential human risks posed by PICs or total residual hydrocarbons at the present time.
- EPA did not perform an extensive economic impact analysis. A prelimary estimate of economic impact was made by completing a financial ratio test.

B. Affected Population

Currently available information in EPA's Hazardous Waste Data Management System (HWDMS) lists 227 active hazardous waste incinerators (approximately 207 noncommercial and 20 commercial) that will be subject to the proposed requirements.[88] These incinerators are widely dispersed throughout the country (41 states plus Puerto Rico). Texas has the most incinerators with 27 facilities (12 percent), followed by Louisiana and Ohio, each with 17 facilities (7 percent), and California with 15 facilities (7 percent). Thirty-eight states, each with between 1 and 12 incinerators, together account for 67 percent of the total.

Information on the characteristics of each incinerator (e.g., type of combustor, existing air pollution controls, and description of the type and quantity of waste combusted) was not readily available. As a result, EPA relied on data reported in the 1982 Hazardous Waste Incinerator Mail Survey, which contains information (from 1981) on a sample of 110 nonconfidential facilities comprising 152 units.[89] The survey responses for these incinerators were examined for completeness regarding necessary information and for deletion of facilities no longer active. Based on this evaluation, a *subset* of these facilities—82 facilities (74 noncommercial and 8 commercial), 112 units—were selected as the sample database for this analysis. The results of the sample were then extrapolated to the total population of 227 hazardous waste incinerator sites (310 estimated units). Implicit in the extrapolation is the assumption that the distribution of incinerators and waste characteristics (e.g., number of units, type of combustor, wastes combusted, current controls, and stack data) is the same in the sample as it is in the population.

According to the Mail Survey data for the 112 incinerator units evaluated, most hazardous waste incinerators are liquid injectors (54 percent). The remaining incinerator units are classified as multiple chamber (12 percent), rotary kiln (8 percent), controlled air (8 percent), and other (19 percent).

The Mail Survey data for the sample facilities/units show that approximately 42 percent of the hazardous waste incinerators did not have air pollution control devices (APCDs) in place in 1981. Most of the remaining incinerator units (48 percent) had treatment trains that included a wet scrubber. Very few (approximately 29 percent) had other technologies, such as electrostatic precipitators (ESPs), venturi scrubbers, and fabric filters, used to capture particulates.

The facilities evaluated fall into 40 different industrial categories, as defined by the four-digit Standard Industrial Classification (SIC) codes (see table 4). Most industrial SIC codes account for less than 2 percent of the facilities. The SICs with the largest percentage fractions of hazardous waste incinerators are:

[87] In selecting a risk threshold of 10^{-5} for these rules, EPA considered risk thresholds in the range of 10^{-4} to 10^{-6}. As discussed in section I.D. of part three of the text, the Agency requests comment on alternative risk thresholds.

[88] USEPA, HWDMS, Version 6.5, October 9, 1987.

[89] The Mail Survey also contains data for an additional 15 confidential facilities (18 units), but this information was not used in this analysis.

- 2821 Plastics Material (10 percent).
- 2869 Industrial Organic Chemicals (10 percent).
- 4953 Refuse (Waste Management) Systems (8 percent).
- 7391 Research and Development Laboratories (7 percent).
- 2865 Cyclic Crudes and Intermediates (5 percent).
- 2879 Agricultural Chemicals (5 percent).

An estimated 1.0 million kkg of hazardous waste were combusted in incinerators in 1986.[90] As shown in Table 4, the majority of the waste burned by hazardous waste incinerators is concentrated in six industrial SIC codes:

- 2819 Industrial Inorganic Chemicals (46 percent).
- 2879 Agricultural Chemicals (13 percent).
- 2833 Medicinal Products (7 percent).
- 2865 Cyclic Crudes and Intermediates (6 percent).
- 2869 Industrial Organic Chemicals (6 percent).
- 2834 Pharmaceutical Preparations (5 percent).

The hazardous waste analyzed is characterized by almost 60 different RCRA codes. Two waste codes account for the majority (71 percent) of hazardous waste combusted: D001 (ignitable wastes) and X182 (a mixture of U008—acrylic acid, U112—ethyl acetate, U113—ethyl acrylate, and P003—acrolein). This analysis determined that approximately 44 percent of the hazardous waste combusted contains the metals of concern for today's rule and roughly 37 percent of the hazardous waste contains chlorine.

C. Costing Analysis

Today's rule proposes limits for emissions of toxic metals, hydrogen chloride (HCl), and carbon monoxide (CO) as a means of controlling total unburned hydrocarbons (THCs) from hazardous waste incinerators. The incremental costs of compliance can be grouped into two major categories: costs to demonstrate compliance with the proposed standards and costs to reduce emissions if a facility cannot show compliance with the pollutant-specific limits. The methodology and engineering unit costs used by EPA to estimate the incremental compliance costs attributable to each of the three standards are discussed below, followed by a presentation of results. The costing analysis was performed for the subset of 82 facilities selected from the Mail Survey; results were extrapolated to the population of 227 facilities.

As a sensitivity analysis, EPA also completed a preliminary assessment of the incremental compliance costs associated with an alternative *de minimis* cancer risk level of 1×10^{-6}. This section also presents the unit cost estimates used in the sensitivity analysis and the total predicted compliance costs under this alternative scenario.

TABLE 4.—DISTRIBUTION OF HAZARDOUS WASTE INCINERATORS AND HAZARDOUS WASTE COMBUSTED BY SIC

SIC	Description	Facilities		Quantity of hazardous waste combusted	
		No.	Percentage	(KKG/Year)	Percentage
2231	Broad woven fabric mills	3	1	1	0
2282	Yarn texturizing mills	3	1	14	0
2421	Sawmills and planing mills	3	1	3	0
2491	Wood preserving	3	1	105	0
2511	Wood household furniture	6	2	388	0
2661	Building paper/board mills	3	1	268	0
2813	Industrial gases	3	1	7,177	1
2819	Industrial inorganic chem.	8	4	493,167	48
2821	Plastic material	22	10	28,847	3
2822	Synthetic rubber	3	1	408	0
2824	Synthetic org. fibers	6	2	190	0
2833	Medicinal products	3	1	69,375	7
2834	Pharmaceut. preparations	3	1	47,392	5
2844	Perfumes/cosmetics	3	1	1,177	0
2851	Paints/allied products	3	1	4,491	0
2861	Gum and wood chemicals	3	1	2,001	0
2865	Cyclic crudes, org. pigments	11	5	69,227	7
2869	Ind. organic chemicals	22	10	66,409	6
2873	Nitrogenous fertilizers	6	2	26,956	3
2879	Pesticides/agric. chem.	11	5	141,640	14
2891	Adhesives/sealants	3	1	242	0
2892	Explosives	3	1	1,459	0
2899	Chemical preparations	6	2	60	0
2911	Petroleum refining	6	2	2,897	0
3079	Misc. plastics	3	1	242	0
3229	Pressed/blown glass	3	1	4,493	0
3339	Prim. smelting nonferrous	3	1	651	0
3412	Metal shipping barrels, etc.	3	1	20	0
3433	Heating equipment	3	1	9	0
3466	Crowns and closures	6	2	79	0
3483	Ammunition	3	1	788	0
3531	Construc. machinery equip.	3	1	5,041	0
3672	Cathode ray TV tubes	3	1	3,877	0
3721	Aircraft	3	1	99	0
4953	Refuse systems	18	8	34,596	3

[90] EPA developed this estimate based on the Mail Survey data for the subset of facilities analyzed. Because capacity conditions have changed dramatically since 1981, the waste figures were scaled up to 1986 (the baseline for this analysis) using different factors for commercial (1.27) and noncommercial (1.13) incinerators. The commercial scaling factor was based on an annual survey of commercial capacity conducted by EPA (USEPA, Office of Policy Analysis, "Survey of Selected Firms in the Commercial Hazardous Waste Management Industry"). Because a similar type of annual survey could not be located for noncommercial facilities, the ratio of industrial production in 1986 versus 1981 was used as a scaling factor. (Source: Board of Governors of the Federal Reserve System, total industrial index).

TABLE 4.—DISTRIBUTION OF HAZARDOUS WASTE INCINERATORS AND HAZARDOUS WASTE COMBUSTED BY SIC—Continued

SIC	Description	Facilities		Quantity of hazardous waste combusted	
		No.	Percentage	(KKG/Year)	Percentage
7391	Research/develop. labs	17	7	1,333	0
8062	Gen. med./surg. hospitals	3	1	42	0
8221	Colleges, universities	6	2	120	0
9661	Space research & technology	3	1	364	0
9999	Nonclassifiable establish.	8	4	19,716	2
Total [1]		227	100	1,035,362	100

[1] Numbers may not total because of rounding.

1. Costing Methodology and Unit Costs of Control

Toxic Metals Limits. As discussed, EPA is proposing a site-specific risk analysis to ensure that emissions of metals do not pose unacceptable increased risks to human health. EPA is also proposing to allow permit writers and applicants to demonstrate compliance with the proposed risk-based standards using a conservative screening analysis for feed rates and emissions. In conducting this costing analysis, EPA assumed that each facility would attempt to show compliance in a sequential fashion, as shown in Figure 1.

EPA assumed that all hazardous waste incinerator operators would first attempt to demonstrate compliance with the proposed standards using the Feed Rate Screening Limits. Prior to the Feed Rate Screening analysis, EPA assumed that all incinerator operators would incur costs to analyze the toxic metal constituents as part of the Waste Analysis Plan for the permit. In addition, the Feed Rate Screen would require incremental analysis of metals in the waste feed as part of a trial burn. For both the waste characterization and the feed analysis, the facilities will not incur additional costs for sampling, which is already conducted under existing regulations.

EPA assumed that all facilities passing the Feed Rate Screen would be awarded a permit and would not incur additional permitting expenditures. The failing facilities would then attempt to demonstrate compliance using the Emissions Screening test. The Emissions Screen would require sampling and analysis of metals in the stack exhaust gas.

In the event that a facility would fail to satisfy the requirements of the Emissions Screen, the facility would conduct a Site-Specific Risk Assessment. If the risk assessment predicted that the facility would pose an aggregate lifetime cancer risk to the maximum exposed individual (MEI) in excess of 1×10^{-5} [91] (summed across all carcinogens emitted by the facility) or an increased likelihood of adverse (noncancer) health effects, the costing analysis assumed that the incremental emission reductions would be achieved using APCDs.[92] This latter assumption may result in an overestimate of compliance costs because incinerator operators in some situations may be able to modify their combustion practices (e.g., blending) at little or no incremental cost to meet the standards.

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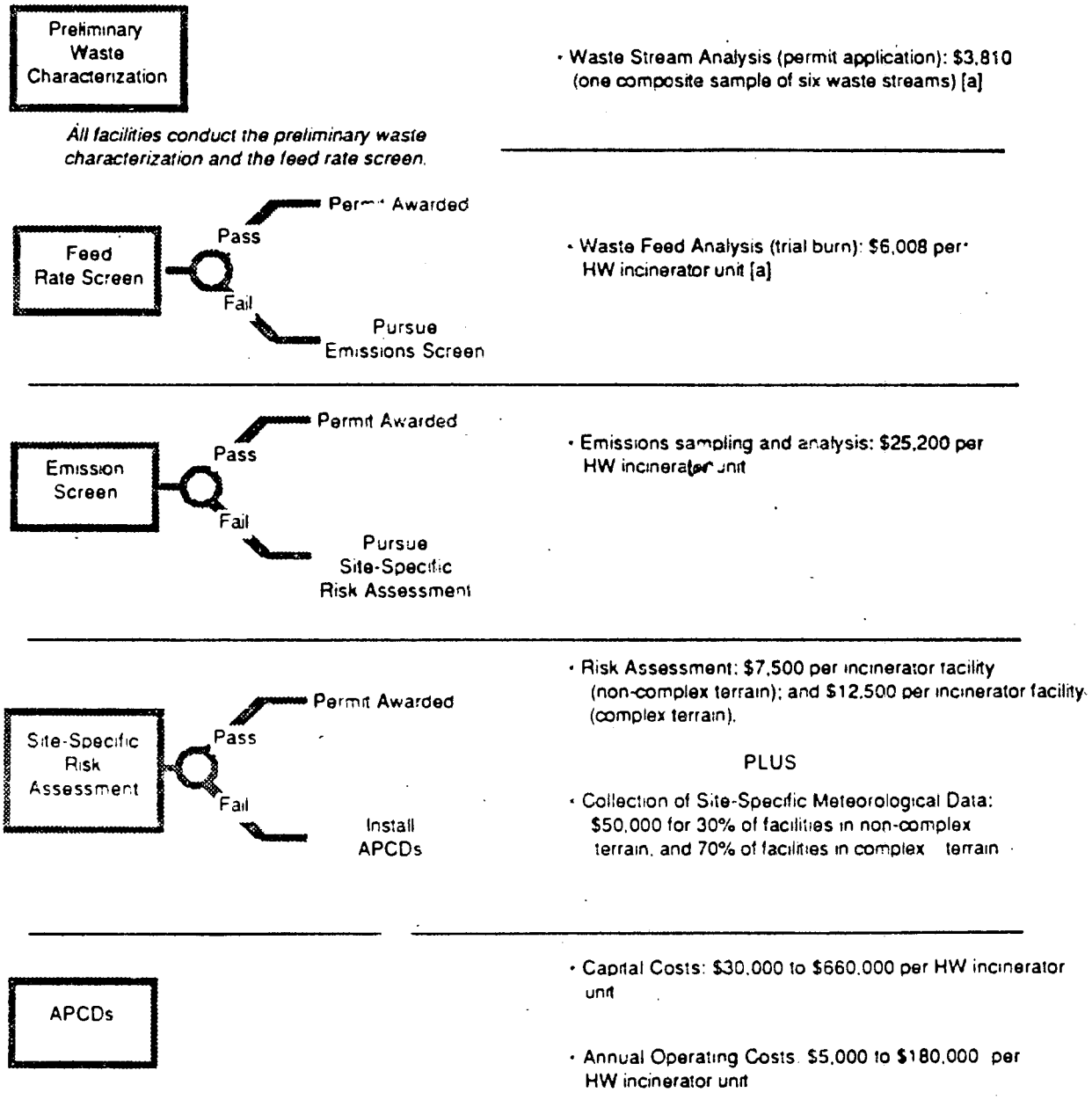
[91] In selecting a risk threshold of 10^{-5} for these rules, EPA considered risk thresholds in the range of 10^{-4} to 10^{-6}. As discussed in Section I.D. of Part Three of the text, the Agency requests comment on alternative risk thresholds.

[92] In this analysis, EPA assumed that a cumulative lifetime cancer risk of 9.5×10^{-6} or greater was equivalent to 1×10^{-5} through rounding and other uncertainties. Similarly, a ratio of 0.95 or greater calculated as part of screening analyses or the analysis of noncancer risks (i.e., the ratio of the predicted ambient concentration divided by the RAC) was assumed equivalent to 1.0.

Figure 1

Overview of Costing Approach: Proposed Metals Limits



[a] Samples are already collected under existing regulations; therefore, there is no incremental cost associated with sampling

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Figure 1 has also summarized the unit costs associated with the metals costing analysis. As shown, the estimated incremental unit cost of completing the preliminary waste characterization analysis as part of the permit for six blended waste streams is $3,810.[93] [94] The additional analysis costs for the Feed Rate Screen are approximately $6,000 per hazardous waste incinerator unit; the incremental sampling and analysis costs for the Emissions Screen are $25,200 per hazardous waste incinerator unit.[95] The risk assessment costs range from $7,500 for a facility in noncomplex terrain to $12,500 for a facility in complex terrain.[96] In addition, EPA assumed that 30 percent of the hazardous waste incinerators in noncomplex terrain and 70 percent of the hazardous waste incinerators in complex terrain would need to gather site-specific meteorological data at a cost of $50,000.[97] EPA requests comment on the reasonableness of the risk assessment cost estimates.

Because the collection of site-specific data could take as long as one year, EPA recommends that the nearest STAR data be used until the site-specific data can be gathered. At that time, the permit could be reported, and the site-specific data used.

For each hazardous waste incinerator that was esimated to pose an aggregate lifetime cancer risk to the MEI in excess of 1×10^{-5} and/or an increased likelihood of noncancer effects, a best engineering estimate was developed for a treatment train and the associated costs needed to meet the estimated risk reduction level. The APCD capital costs ranged from $30,000 to $660,000 per incinerator unit ($40,000 to $660,000 per incinerator facility), depending on the facility type, size, existing equipment, and the amount of risk reduction required; annual operating costs ranged from $5,000 to $180,000 per incinerator unit ($10,000 to $180,000 per incinerator facility).[98]

EPA assigned the costs for the preliminary waste characterization and completion of the Feed Rate Screen to all hazardous waste incinerators combusting wastes containing metals. The allocation of subsequent costs depended on the success with which each incinerator passed or failed each of the screens and the risk assessment. The costs of gathering additional meteorological data were randomly assigned among those facilities performing a risk assessment.

The decision rules discussed in part Three of today's proposed rule were used to predict which facilities would fail the Feed Rate, Emissions, Site-Specific Risk Assessment tests for carcinogenic and noncarcinogenic metals. The allowable screening limits were selected for each facility as a function of terrain (complex and noncomplex), terrain adjusted effective stack height, and land usage (rural versus urban). EPA identified the terrain for each incinerator analyzed. Effective stack height was calculated using information from the Mail Survey. Information on land usage was not readily available; therefore, the more conservative screening limits were used, as directed by today's proposed rule.

To complete the screening analyses and the risk assessment for the selected toxic metals, facility-specific information in the following parameters was needed: metal constituent concentrations in the waste; quantity of each metal emitted; a point estimate of the maximum ambient air concentration outside of the fenceline of the incinerator, and health risk factors (either unit cancer risk numbers or acceptable Reference Air Concentration levels (RACs) for noncancer effects). The analytical approaches used to gather these data are discussed later in the Risk Assessment section.

HCl Limits. Identical to the proposed approach for regulating metals, EPA is proposing a site-specific risk analysis to ensure that HCl emissions do not pose unacceptable risks. Again, EPA is proposing conservative Feed Rate and Emissions Screening Limits for HCl to simplify the permitting process. These HCl limits differ from those established for metals only in that they provide standards relating to both short-term and long-term human health effects.

The costing analysis assumed, as it did for metals, that all hazardous incinerator facilities would first attempt to demonstrate compliance with the proposed HCl standard by performing the Feed Rate Screen; all facilities failing the first screen would then opt for the Emissions Screen and any facilities failing the second screen would undertake the Site-Specific Risk Assessment (see Figure 2). If the risk assessment predicted risks to human health above the acceptable levels, the costing analysis assumed that APCDs would be installed to reduce HCl emissions. For some facilities this may be a conservative (high cost) option because there may exist lower cost options (e.g., pretreatment and waste blending) that the Agency was not able to consider within the scope of this analysis.

EPA believes that there would be no incremental costs attributable to the preliminary waste characterization, the Feed Rate Screen or the Emissions Screen for HCl, because the sampling and analysis of chlorine required for each of these tests is already performed under the permitting conditions of existing subpart O of the Subtitle C regulations for hazardous waste incinerators. The incremental costs for performing a Site-Specific Risk Assessment for HCl are equivalent in magnitude to costs for a metals risk assessment; however, facilities conducting a metals risk assessment were not expected to incur additional cost.

For each incinerator that failed to meet the baseline HCl emission standards, considering both short-term and long-term effects, the cost analysis developed a best engineering estimate of the treatment train and the associated costs needed to meet the estimated risk reduction.[99] A detailed facility-specific analysis was not performed. The APCD capital costs for HCl ranged from $17,000 to $430,000 per incinerator unit; depending on the type of combustor, size, existing control equipment, and the amount of risk reduction required; annual operating costs ranged from $1,000 to $154,000 per incinerator unit (see Figure 2).

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[93] In assigning the costs for the waste characterization, it was assumed that ten waste streams are blended to one. This decision rule is limited because the 10-to-1 blending assumption will not necessarily be representative for all incinerators. After blending has been assumed, the waste characterization unit costs were then allocated as follows: 0 to 6 blended streams (unit costs remain the same); 7 to 12 blended streams (unit costs are multiplied by two); 13 to 16 blended streams (unit costs are multiplied by three). Information on the number of waste streams combusted at each HW incinerator was found in the Mail Survey.

[94] Memorandum to Frank Smith, USEPA, from Bruce Boomer, MRI, "Sampling and Analysis Cost Impact of Draft Proposed Incineration Regulations for Metals; MRI Project No. 9029-L-12," July 31, 1987.

[95] Ibid.

[96] Versar Inc., "Air Dispersion Modeling as Applied to Hazardous Waste Incinerator Evaluations: Draft Report," May 13, 1987.

[97] Ibid. Estimates of the percentage of facilities requiring additional meteorological data estimated by Versar Inc.

[98] Memorandum to Temple, Barker, & Sloane, Inc. from Doucet & Mainka, P.C., "Hazardous Waste Incenerator Mini-RIA: APCD Cost Increments for One Percent Chrome VI Scenario," September 28, 1987.

[99] Ibid.

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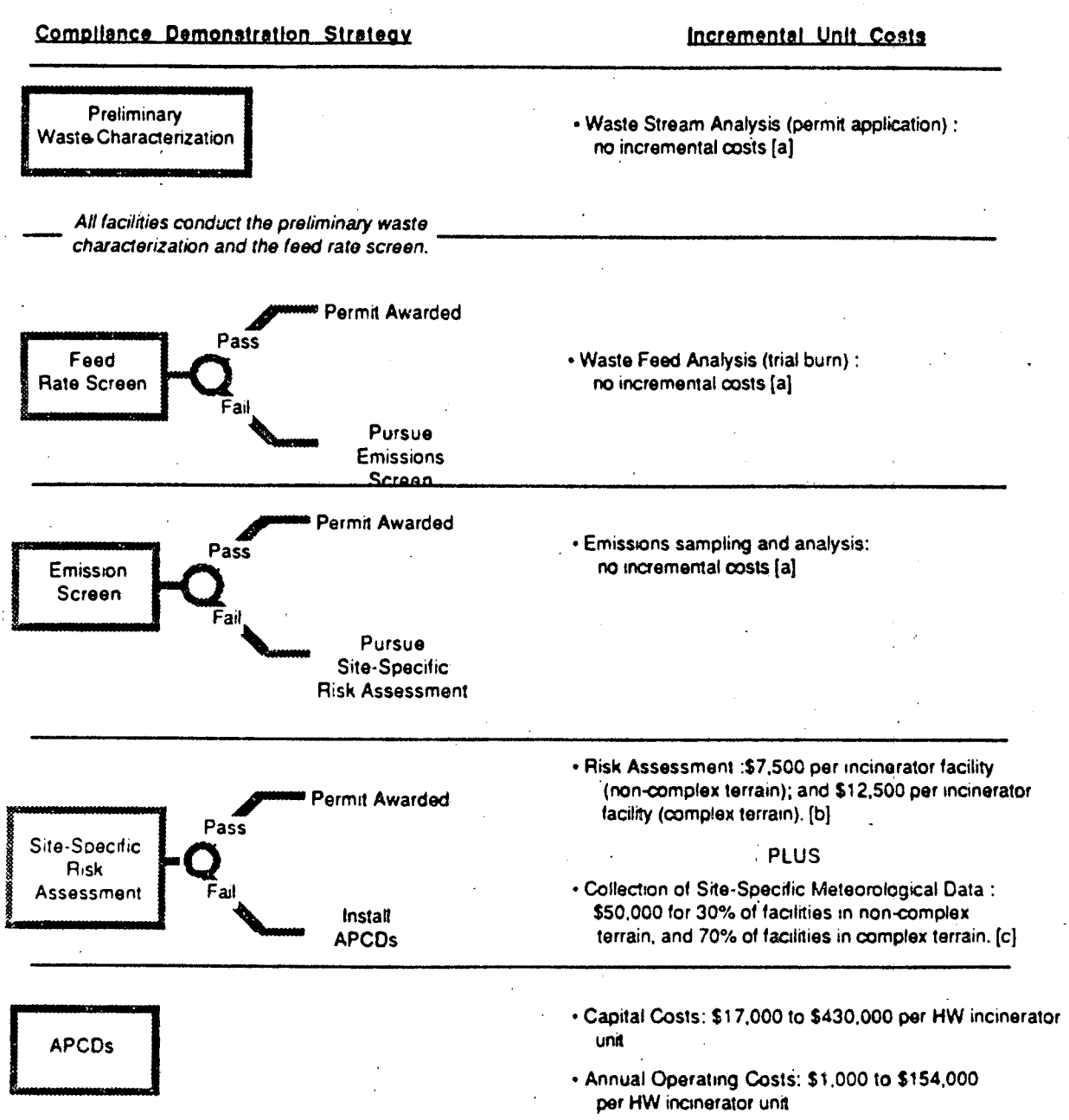
Figure 2

Overview of Costing Approach: Proposed HCl Limits



[a] Sampling and analysis of chlorine is already conducted under the permitting conditions of existing Subpart O of the Subtitle C regulations for HW incinerators.

[b] No additional risk assessment costs were assigned to a facility in the costing analysis if it was already conducting a risk assessment for metals.

[c] No additional data gathering costs were assigned to a facility if it was already performing this work for the metals risk assessment.

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The decision rules discussed in part Three of today's rule were used to predict which facilities would fail the Feed Rate, Emission, and Site-Specific Risk Assessment tests. The Risk Assessment section below provides more detail on the information needed to complete these tests, specifically: the quantity of chlorine emitted; a point estimate of the maximum short- and long-term ambient concentration outside the fenceline of the incinerator, and health risk factors (short-term and long-term RACs).

CO Limits. EPA believes that hazardous waste incinerators should operate at a high combustion efficiency to ensure that HCs do not pose an unacceptable risk to human health. Because CO is one of the best available indicators of combustion efficiency, EPA is proposing limits on CO emissions. In particular, EPA is proposing a CO limit of 100 ppmv. If a facility cannot meet the proposed CO limit, higher limits will be acceptable provided that HC emissions are not associated with unacceptable human health risks or do not exceed a good operating practice-based limit. EPA is proposing a tiered approach for determining how HC are regulated. This approach is similar to that being proposed for metals and HCl. Accordingly, the costing methodology for PICS also resembles the analysis completed for metals and HCl (see Figure 3).

Tier I is a 100 ppmv CO limit. If a facility can demonstrate compliance with this standard, this will be the permit limit. There is no incremental cost associated with this demonstration because emissions information is already generated as part of the trial burn.

If a higher CO limit is sought as a permitting condition, the facility must demonstrate that HC levels are acceptable under Tier II. Although the Agency is proposing a health-based approach to limit HC, it is requesting comment on limiting HC to a technology-based level of 20 ppmv. As discussed previously in today's notice, the Agency now prefers the technology-based approach. Nonetheless, we have projected implementation costs for the health-based alternative because the costs would be higher. Under the health-based approach, the facility would be required to demonstrate that HC emissions do not pose a cancer risk greater than 1×10^{-5} [100]. The facility can compare HC emissions with Screening Limits that the Agency has established or it can conduct site specific dispersion modeling. The incremental cost of performing the Tier II analysis is the sampling and analysis required to determine emissions of THCs. The Agency has estimated a typical incremental cost for this test at $6,500 per incinerator unit.[101]

If, under the risk-based alternative to assessing HC emissions, a facility fails Tier II using the decision rules discussed in part three of today's proposed rule, a Site-Specific Risk Assessment would be performed. The cost of the risk assessment is the same as that for metals and HCl. However, no incremental cost was assigned to a facility in this analysis if it was already incurring risk assessment costs for either chlorine or metals.

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[100] In selecting a risk threshold of 10^{-5} for these rules, EPA considered risk thresholds in the range of 10^{-4} to 10^{-6}. As discussed in Section I.D. of part three of the text, the Agency requests comment on alternative risk thresholds.

[101] USEPA, Office of Solid Waste, Internal analysis.

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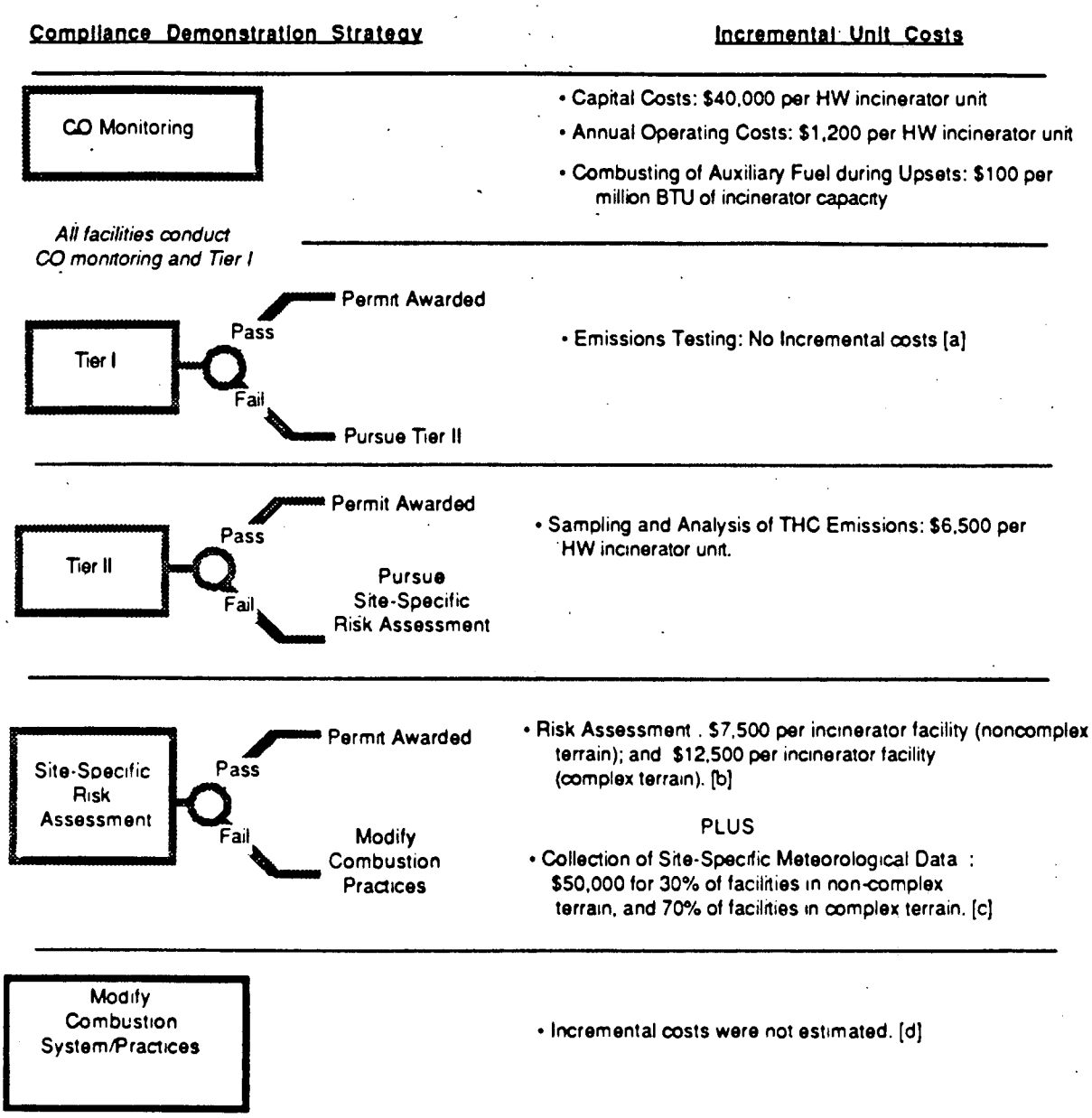
Figure 3

Overview of Costing Approach: Proposed CO Limits



[a] Emissions testing for CO is already performed under the permitting conditions of existing Subpart O of the Subtitle C regulations for HW incinerators.

[b] No additional risk assessment costs were assigned to a facility in the costing analysis if it was already conducting a risk assessment for metals and/or chlorine.

[c] No additional data gathering costs were assigned to a facility if it was already performing this work for the metals and/or chlorine risk assessment.

[d] Incremental costs were not estimated because (1) there was insufficient information on the technical response, and (2) a small number of facilities (approximately five) were expected to incur costs.

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For those facilities with HC concentrations higher than allowed, EPA assumed that the incinerator operator would modify the combustion system and/or practices to reduce CO (and HC) levels. EPA did not develop estimates of the costs associated with combustion modification because (1) there was insufficient available information to estimate the appropriate technical response, (2) very few facilities were expected to incur costs (approximately five facilities), and thus, (3) the incremental compliance costs were not anticipated to be significant at either the national or individual industry sector level.

To demonstrate compliance with the final permitted CO levels, this analysis assigned additional monitoring costs to each incinerator. The CO monitoring program included a continuous oxygen monitor and a data-logger for continuous oxygen correction. The capital costs were estimated at approximately $40,000 per incinerator unit; annual operating costs were estimated at roughly $1,200 per incinerator unit.[102] Because of time and resource constraints, this analysis did not include the proposed alternative CO format described in today's proposed rule, although it is expected to provide a lower-cost alternative.

The costing analysis also included the incremental expenses associated with combustion of auxiliary fuel during periods of upset, as required in today's proposed rule. The annual incremental cost of the auxiliary fuel was estimated at roughly $100 per 10^6 Btu of incinerator capacity based on 50 upsets of one-hour duration per year.[103] This cost was assigned to all incinerator units.

Because of data limitations, this analysis was unable to estimate emissions of CO and THCs for the facilities analyzed in the Mail Survey. As a result, it was not possible to quantify the number of facilities that would pass Tier I, Tier II, and the Site-Specific Risk Assessment using the methods employed in the metals and HCl analysis. Alternatively, a decision tree analysis was used to obtain approximate estimates regarding the numbers of facilities that might be subject to incremental impacts and costs associated with the proposed CO standards.

Figure 4 illustrates the decision tree. Based on available engineering opinion, the Agency believes that the only facilities that would be unable to meet the proposed CO limits would be fluid bed incinerators and incinerators feeding 10 percent or more of their waste in large containers. The Agency estimates that a subset of 19 facilities (6 fluid bed and 13 burning containerized wastes) would be in this category and assumed to pursue Tier II.

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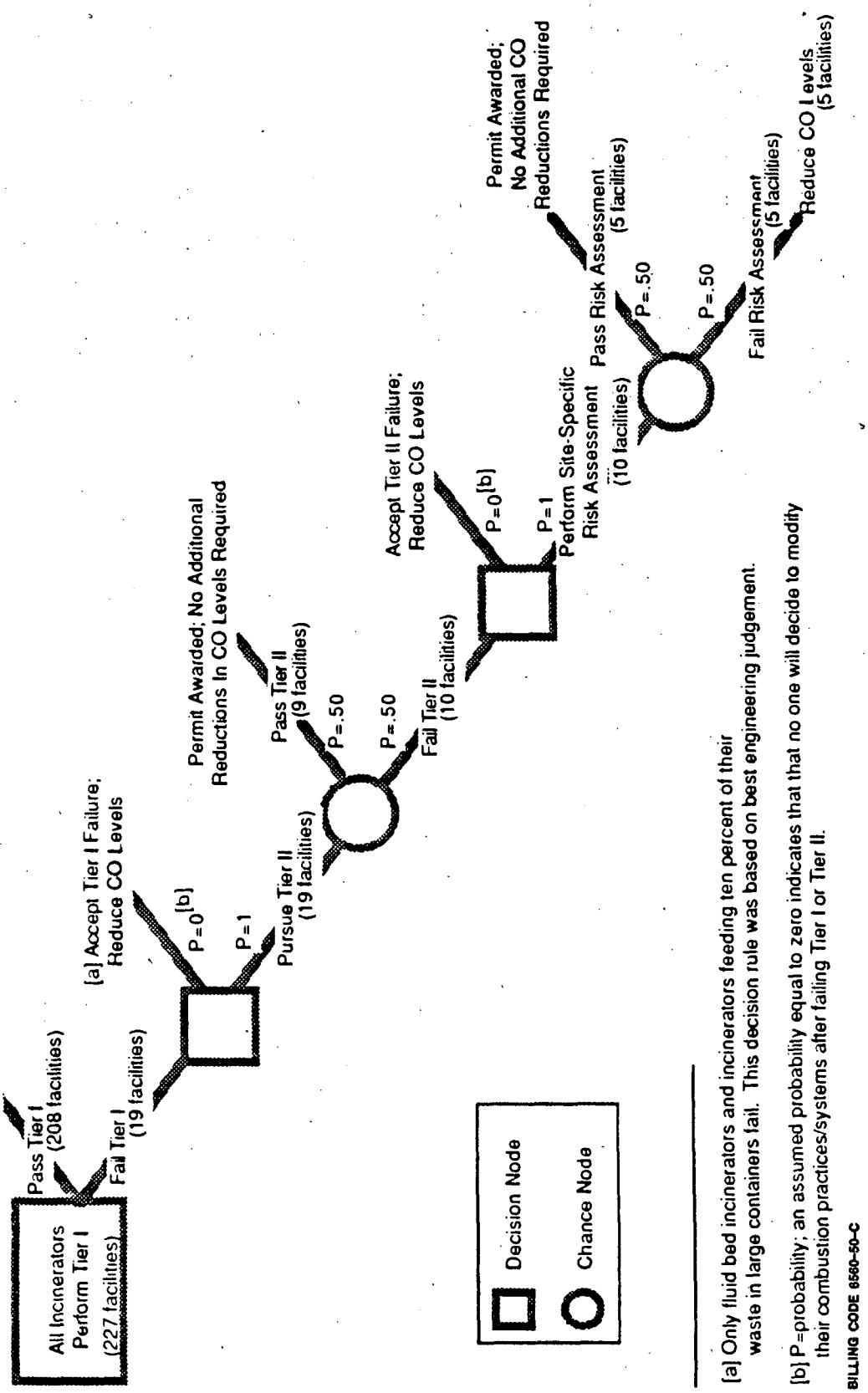
[102] Doucet & Mainka analysis of "Guideline for Continuing Monitoring of Carbon Monoxide at Hazardous Waste Incinerators," January 13, 1987 prepared by Pacific Environmental Services for USEPA.

[103] Memorandum to Temple, Barker & Sloane, Inc. from Doucet & Mainka, P.C., "Hazardous Waste Incinerator Mini-RIA Supplemental Information to Unit Costing Methodology (draft)," August 18, 1987.

Figure 4

Decision Tree for Determining Compliance with the CO Standards



[a] Only fluid bed incinerators and incinerators feeding ten percent of their waste in large containers fail. This decision rule was based on best engineering judgement.

[b] P=probability; an assumed probability equal to zero indicates that that no one will decide to modify their combustion practices/systems after failing Tier I or Tier II.

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For purposes of determining order-of-magnitude costs, EPA subjectively determined that half of these facilities, randomly assigned, would pass Tier II (i.e., would be permitted without further costs). The remaining half would perform the Site-Specific Risk Assessment to determine whether emission control would be required. The risk assessment costs were assigned to these facilities (randomly) only if they were not already conducting a risk assessment to demonstrate compliance with either the metals or HCl standards.

The decision tree analysis continued by assuming that half of the facilities performing the Site-Specific Risk Assessment would pass; the other half would be subject to expenditures to meet the *de minimis* risk levels. As discussed above, this analysis did not estimate the costs of emissions controls for THCs, although the Agency believes the number of facilities that would be required to do so is small, probably less than ten.

Sensitivity Analysis

As an alternative to the proposed *de minimis* cancer risk level of, 1×10^{-5} EPA completed a very preliminary analysis of the cost impacts of establishing a *de minimis* cancer risk level of 1×10^{-6}. A change in the proposed *de minimis* cancer risk level would change the compliance costs for meeting the proposed metals and CO standards. The methodology used to estimate the incremental compliance costs associated with each of these standards is discussed below.

Metals Standards. The metals standards in today's proposed rule would necessitate expenditures in five areas: preliminary waste characterization; the Feed Rate Screen; the Emissions Screen; the Site-Specific Risk Assessment; and APCDs. The cost analysis assumed that all facilities would perform the preliminary waste characterization and the Feed Rate Screen; therefore, the alternative *de minimis* standard would not change these costs. A more stringent risk-based standard would, however, increase compliance costs in the other two areas.

To identify the additional facilities that would fail the Feed Rate and Emission Screens under a more stringent *de minimis* risk level, the risk-based Screening Limits developed by EPA were used with one adjustment. The Screening Limits for the carcinogenic metals were reduced by an order of magnitude to reflect the 1×10^{-6} standard. Additional facilities predicted to fail the Site-Specific Risk Assessment were identified by comparing the estimated lifetime cancer risk to the MEI for each incinerator facility against the alternative risk level of 1×10^{-6}.

The incremental compliance costs associated with more facilities conducting the Emission Screen and the Site-Specific Risk Assessment were estimated using the unit cost estimates described above. An engineering analysis to identify the appropriate APCD at each hazardous waste incinerator facility failing the risk assessment has not been completed at this time. As a result, EPA approximated the incremental APCD costs for two groups of incinerator facilities:

- *Facilities already failing the risk assessment at 1×10^{-5}.* The costing analysis assumed that to meet the 1×10^{-6} standard these facilities would incur APCD costs at least twice the estimated costs to meet the 1×10^{-5}.
- *Facilities failing only the 1×10^{-6} standard.* The costing analysis assumed that these additional facilities would experience APCD costs similar to those estimated for the facilities failing the 1×10^{-5} standard. The average APCD expenditure for the proposed 1×10^{-5} standard was calculated and applied to those facilities failing only the alternative 1×10^{-6} standard.

There are limitations to the APCD cost calculations. For example, the costing analysis assumes that the control requirements for the new facilities in the analysis are identical to those in the 1×10^{-5} analysis. In addition, the facilities already failing the risk assessment at the proposed standard may incur much higher APCD costs to achieve the 1×10^{-6} risk standard.

CO Standards. Under the health-based alternative for assessing THC emissions, a more stringent *de minimis* risk standard would increase compliance costs for facilities attempting to demonstrate that CO emissions in excess of 100 ppm (the proposed standard) are not associated with unacceptable human health risks. In particular, a more stringent risk standard would increase the number of facilities needing to complete the Site-Specific Risk Assessment (i.e., more facilities failing Tier II) and modify combusion practices to reduce CO emissions to an acceptable level (i.e., more facilities failing the risk assessment).

As discussed above, a decision tree analysis was used to estimate the number of facilities that would be subject to incremental costs and impacts associated with the proposed CO standards. The decision tree was modified to reflect the 1×10^{-6} standard by increasing the probability of failing Tier II and the risk assessment from P=0.50 to P=0.75 (See Figure 3). The incremental compliance costs associated with more facilities conducting the Site-Specific Risk Assessment, as well as more facilities needing to modify their combustion practices, were estimated using the unit costs described above.

2. Results

Proposed standards. The Agency estimates the total annualized compliance costs associated with today's proposed requirements for existing hazardous waste incinerators at approximately $6.2 million. Total incremental capital costs are approximately $34 million; the total incremental annual operating and maintenance costs are roughly $3 million. These nationwide costs were extrapolated from the subset of 82 facilities analyzed to the current population of 227 hazardous waste incinerators. Capital costs were annualized at a (historical) real discount rate of 3.7 percent over a period of 15 years; one-time costs (e.g., preliminary waste characterization costs) were annualized over the assumed life of the permit (ten years).

The total estimated compliance costs for today's proposed rule are summarized in Table 5. As shown, the potential need for APCDs to reduce chlorine and metal emissions accounts for half of the estimated costs. An additional 27 percent is explained by the proposed requirements for CO monitoring and combustion of auxiliary fuel during periods of combustion upset. The Feed Rate and Emissions Screens account for 17 percent of the total costs. The remining cost components contribute 3 percent or less to the estimated incremental compliance.

Because of substantial uncertainties inherent in the accuracy of available data and the general nature of the engineering costing and risk assessment approaches utilized, the Agency urges caution in the interpretation and application of these results.

Sensitivity analysis. Table 6 summarizes the estimated total and incremental annual compliance costs associated with the alternative *de minimis* cancer risk of 1×10^{-6}. The incremental costs are presented against the baseline (i.e., before regulation) and the proposed *de minimis* risk level of 1×10^{-5}.[104]

[104] In selecting a risk threshold of 10^{-5} for these rules, EPA considered risk thresholds in the range of 10^{-4} to 10^{-6}. As discussed in section I.D. of Part Three of the text, the Agency requests comment on alternative risk thresholds.

As indicated in Table 6, the more stringent risk-based standards for carcinogens results in a higher total annual compliance cost of approximately $9.7 million. This is an increase of roughly $3.4 million over the proposed 1×10^{-5} risk standard. Almost all of the increase in cost (approximately 97 percent) can be attributed to more facilities needing to control further emissions of carcinogenic metals. In the sensitivity analysis, an estimated total of 53 existing hazardous waste incinerator facilities (or an increase of 22 facilities over the estimated 31 facilities requiring APCDs to meet the 1×10^{-5} standard) would need to reduce metal emissions below current conditions.

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Table ~~4~~ 5

SUMMARY OF INCREMENTAL COMPLIANCE COSTS: PROPOSED STANDARDS

(thousands of 1986 dollars)

Compliance Cost Component	Capital and One-Time Costs	Operating and Maintenance Costs	Annualized Costs[1]	Percentage of Total Annualized Costs	Number of Facilities Performing Analysis[2]
Metal Standards					
Preliminary Waste Characterization	$ 717	N/A	$ 87	1%	167
Feed Rate Screen	1,440	N/A	175	3	167
Emission Screen	4,913	N/A	596	10	131
APCDs	5,980	$1,401	1,928	31	31
Subtotal	$13,050	$1,401	$2,786	45%	
HCL Standards					
Preliminary Waste Characterization[3]	$ 0	N/A	$ 0	0%	199
Feed Rate Screen[3]	0	N/A	0	0	199
Emission Screen[3]	0	N/A	0	0	166
APCDs	4,378	$ 811	1,197	19	45
Subtotal	$ 4,378	$ 811	$1,197	19%	
CO Standards					
Tier I[4]	$ 0	N/A	$ 0	0%	19
Tier II	198	N/A	24	<1	10
Modify Combustion[5]	N.A.	N.A.	N.A.	N.A.	5
CO Monitoring (including auxiliary fuel costs)	12,000	$ 620	1,657	27	227
Subtotal	$12,198	$ 620	$1,699	27%	
Site-Specific Risk Assessment[6]	$ 3,958	N/A	$ 481	8%	98
Total	$33,584	$2,832	$6,163	100%	

N/A = Not applicable.
N.A. = Not available.

[1]Capital costs were annualized at a (historical) real discount rate of 3.7 percent over the estimated life of the equipment (15 years). One-time costs (e.g., preliminary waste characterization) were annualized over the assumed life of the permit (10 years).
[2]Based on recent information provided by HWDMS, there are currently 227 HW incinerators nationwide.
[3]There are no incremental costs because these tasks are already performed as part of the trial burn.
[4]There are no incremental cots for Tier I, which is already performed as part of the trial burn.
[5]A costing analysis was not completed for this category at the present time because (1) there was no available information on the technical response, (2) few facilities (five) were expected to incur costs, and (3) this proposed requirement was not expected to result in significant national expenditures.
[6]These costs may apply to one or all three of the proposed standards.

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SENSITIVITY ANALYSIS: SUMMARY OF TOTAL AND INCREMENTAL COMPLIANCE COSTS FOR 1 x 10^{-6} DE MINIMIS RISK

(thousands of 1986 dollars)

Compliance Cost Component	Annualized Cost[1]		Number of Facilities Performing Analysis[2]	
	Total[3]	Increment Over 1 x 10^{-5} Proposed Standard	Total	Increment Over 1 x 10^{-5} Proposed Standard
Metal Standards				
Preliminary Waste Characterization	$ 87	$ 0	167	0
Feed Rate Screen	175	0	167	0
Emission Screen	657	61	153	22
APCDs	5,259	3,334	53	22
Subtotal	$6,178	$3,395		
HCl Standards				
Preliminary Waste Characterization[4]	$ 0	$ 0	199	0
Feed Rate Screen[4]	0	0	199	0
Emission Screen[4]	0	0	166	0
APCDs	1,197	0	45	0
Subtotal	$1,197	$ 0		
CO Standards				
Tier I[5]	$ 0	$ 0	227	0
Tier II	24	10	19	9
Modify Combustion[6]	N.A.	N.A.	11	6
CO Monitoring (including auxiliary fuel costs)	1,676	0	227	0
Subtotal	$1,702	$ 10		
Site-Specific Risk Assessment[7]	$ 572	$ 92	134	36
TOTAL	$9,650	$3,487		

N.A. = Not available.

[1] Includes annual O&M costs, if any, plus annualized capital or other one-time cost(s). Capital costs were annualized at a (historical) real discount rate of 3.7 percent over the estimated life of the equipment (15 years). One-time costs (e.g., preliminary waste characterization) were annualized over the assumed life of the permit (10 years).

[2] Based on recent information provided by HWDMS, there are currently 227 facilities with one or more HW incinerators nationwide including Puerto Rico.

[3] Total capital costs for all requirements in the sensitivity analysis were approximately $45 million (roughly $11 million more than the total capital costs estimated for compliance with a 1 x 10^{-5} de minimis risk standard). Total O&M costs were approximately $5.3 million (roughly $1.5 million more than the total O&M costs estimated for compliance with a 1 x 10^{-5} de minimis risk standard).

[4] There are no incremental costs because these tests are already performed as part of the trial burn.

[5] There are no incremental costs for Tier I, which is already performed as part of the trial burn.

[6] A costing analysis was not completed for this category at the present time because (1) there was no available information on the technical response, (2) few facilities (five) were expected to incur costs, and (3) this proposed requirement was not expected to result in significant national expenditures.

[7] These costs may apply to one or all three of the proposed standards.

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D. Economic Impact Analysis

A preliminary economic impact analysis was conducted for the subset of facilities evaluated from the Mail Survey based on the compliance costs for the proposed and alternative (sensitivity analysis) standards described above. Results were also extrapolated to the population of existing hazardous waste incinerators. The methodology and results of this analysis are detailed below.

1. Methodology

Based on a review of alternative analytical approaches and available financial data, first order economic impacts were approximated by calculating (1) the ratio of annual incremental compliance costs to average gross profit before tax and (2) the ratio of annual incremental compliance costs to the average cost of production for affected facilities at the four-digit industry level of the standard industrial classification (SIC) system. These ratios were used to identify the potential increase in production price and the reduction in gross profitability for affected industries resulting from compliance with the proposed requirements.

Implicit in the ratio calculations is the assumption that each facility absorbs the costs of compliance. Although the decision to pass through costs is a function of market response (i.e., the price elasticity of demand for the facility's product), this effect could not be quantified because of time and resource constraints. However, the assumption that all costs would be absorbed will provide, in general, a conservative estimate of predicted impact. This is particularly conservative for commercial hazardous waste incinerators which, given the seemingly extreme inelastic demand for incineration capacity in recent years, will probably be able to pass the incremental compliance costs through to the customer.

The average cost of production and gross profit at the four-digit SIC code level were calculated using data from the 1984 U.S. County Business Patterns and the 1984 Annual Survey of Manufacturers. In particular, these sources were used to derive an estimate of average net cash flow from operations (CFO), taken as a crude measure of gross profit, and average cost of production (COP) at the four-digit SIC level.

The financial ratio analysis was performed on a facility basis using only average industry financial data. It was impossible to consider variability in financial impact by plant size, productivity or other measure of impact because the necessary data were not available within the scope of this effort. The use of average industry data could substantially understate adverse impact for some individual facilities.

Using the annualized compliance costs estimated for each facility and the average industry financial data, the two financial ratios described above were calculated to assess impact. Adverse economic impact was indicated if either (1) the compliance costs increased production costs by more than 1 percent or (2) compliance costs accounted for more than 1 percent of net cash flow from operations. These thresholds are more conservative than those used in many recent EPA analyses. Generally, EPA has identified significant impact when either the ratio of compliance costs to COP or the ratio of compliance costs to CFO is greater than 5 percent.

2. Results

Proposed standards. Table 7 summarizes the distribution of economic impact for each of the financial ratios calculated. As shown, the proposed regulations will not impose an undue economic burden on the majority of all hazardous waste incinerator facilities. Based on the COP ratio, 6 percent of all hazardous waste incinerator may experience adverse economic impacts because of predicted average increases in production costs between 1 percent and 2 percent. The CFO ratio indicates that approximately 12 percent of hazardous waste incinerators may witness decreases in their gross profitability ranging between 1 percent and 4 percent. None of the calculated financial ratios exceeds 4 percent or the 5 percent hurdle rate generally used by EPA to determine significant impact.

TABLE 7.—DISTRIBUTION OF ECONOMIC IMPACT: PROPOSED STANDARDS

Number of Affected Entities with Hazardous Waste Incinerators

Impact ratio	0–0.99 percent	1–1.99 percent	2–2.99 percent	3–3.99 percent	4–4.99 percent	Total (/*/)
Cost of compliance/cash flow from operations	199 (88%)	11 (5%)	14 (6%)	3 (1%)	0	227 (100%)
Cost of compliance/cost of production	213 (94%)	14 (6%)	0	0	0	227 (100%)

* Numbers may not sum because of rounding.

Table 8 presents the distribution of economic impact by SIC for those facilities exceeding the 1 percent threshold. The COP ratio shows potential significant impact for 14 facilities in four SIC categories. The CFO ratio indicates impact for almost twice as many facilities distributed among nine different SIC codes. No one SIC category appears to dominate, although there are higher predicted impacts for SIC 2873 (Fertilizers, Nitrogenous).

TABLE 8.—Distribution of Economic Impact by SIC: Proposed Standards [1]

Number of Affected Facilities

SIC	Cost of compliance/cash flow from operations			Cost of compliance/cost of production
	1–1.99 percent	2–2.99 percent	3–3.99 percent	1–1.99 percent
2421 (Saw mills and planing mills)			3	
2511 (Wood household furniture)	3			

TABLE 8.—Distribution of Economic Impact by SIC: Proposed Standards [1]—Continued

Number of Affected Facilities

SIC	Cost of compliance/cash flow from operations			Cost of compliance/cost of production
	1–1.99 percent	2–2.99 percent	3–3.99 percent	1–1.99 percent
2813 (Industrial gases)		3		3
2821 (Plastics material)	3			
2851 (Paints and allied products)		3		3
2873 (Fertilizers, nitrogeneous)		6		6
3229 (Gases)	3			
3672 (Cathode ray picture tubes TV)		3		3
9999 (Nonclassifiable establishments)	3			
Total facilities [2]	11	14	3	14

[1] Results are summarized only for those facilities exceeding the 1 percent threshold for each calculated financial ratio.
[2] Numbers may not sum because of rounding.

Sensitivity analysis. The results of the financial ratio tests for the sensitivity analysis are summarized in table 9. Similar to the results for the proposed standards, the majority of facilities are not predicted to incur adverse economic impact. Based on the COP ratio results, an estimated 20 facilities (approximately 9 percent of the total population) would face incremental compliance costs representing between 1 percent and 4 percent of production costs. The CFO ratio calculations indicate a larger fraction of facilities (39 facilities or roughly 17 percent of the total population) that could be subject to adverse financial conditions if the proposed requirements are enacted. Although most of these 39 facilities are not predicted to incur compliance costs representing more than 4 percent of either net cash flow or production costs, an estimated 6 facilities could face compliance costs that are greater than 6 percent of net cash flow. Table 10 presents the distribution of economic impact by SIC for those facilities exceeding the 1 percent threshold.

TABLE 9.—Distribution of Economic Impact: Sensitivity Analysis

Number of Affected Entities with Hazardous Waste Incinerators (percent of total)

Impact ratio	0–0.99 percent	1–1.99 percent	2–2.99 percent	3–3.99 percent	4–4.99 percent	5–5.99 percent	6–6.99 percent	Total [1]
Cost of compliance/cash flow from operations	188	22	0	11	0	0	6	227
Cost of compliance/cost of production	207	11	6	3	0	0	0	227

[1] Numbers may not sum because of rounding.

TABLE 10.—Distribution of Economic Impact by SIC: Sensitivity Analysis [1]

Number of Affected Facilities

SIC	Cost of compliance cash flow from operations						Cost of Compliance Cost of Production		
	1–1.99 percent	2–2.99 percent	3–3.99 percent	4–4.99 percent	5–5.99 percent	6–6.99 percent	1–1.99 percent	2–2.99 percent	3–3.99 percent
2421 (Saw mills and planing mills)		3							
2511 (Wood household furniture)	6								
2813 (Industrial gases)			3						3
2819 (Inorganic chemicals)	3								
2821 (Plastics material)	3								
2851 (Paints and allied products)		3					3		
2873 (Fertilizers nitrogeneous)						6		6	
2879 (Pesticides)	3						3		
3229 (Gases)	3						3		
3339 (Primary smelting)	3								
3672 (Cathode Ray picture tubes TV)			3				3		
9999 (Nonclassifiable establishments)	3								
Total facilities	22	0	11	0	0	6	11	6	3

[1] Results are summarized only for those facilities exceeding the 1 percent threshold for each calculated financial ratio.
[2] Numbers may not sum because of rounding.

F. Risk Assessment

1. Methodology

A comparative risk assessment was performed under existing baseline and post-compliance conditions for the 82 hazardous waste incinerator facilities evaluated from the Mail Survey, and results were assessed considering both the proposed *de minimis* cancer risk standard of $1 \times 10-5$ [105] and the alternative standard of $1 \times 10-6$ evaluated in the sensitivity analysis. The risk assessment was performed for both metals and HCl, but there was insufficient information to quantify either the baseline or controlled human health risks posed by total residual hydrocarbons at the present time.

For the carcinogenic metals analyzed (arsenic, cadmium, and hexavalent chromium), two measures to risk were estimated: lifetime cancer risk to the maximum exposed individual (MEI) and the annual cancer incidence attributable to all metals at each facility. For the noncarcinogens evaluated (HCl, lead, barium, and mercury), the Agency identified which facilities may present an increased likelihood of noncancer effects by exceedances of health threshold limits, but the total number of cases could not be calculated for these pollutants. Throughout, EPA's risk estimates considered exposure through inhalation only; other exposures (e.g., ingestion) were not evaluated.

To estimate the lifetime MEI cancer risks and any exceedances of acceptable Reference Air Concentrations (RACs), data were needed on the following: the quantity of HCl and metals emitted by each hazardous waste incinerator facility; a point estimate of the *maximum* ambient air concentration outside the fenceline of the incinerator facility; and pollutant-specific health risk factor (either unit cancer risk numbers developed by EPA's Carcinogen Assessment Group or the RACs for noncancer effects). These data were also used in the various screening analyses described above to demonstrate compliance with the proposed HCl and metals standards. To predict the incidence of cancer, two additional pieces of information were required: estimates of the ambient air concentrations over a 50 km fallout radius from the facility, and estimates of the number of exposed persons at the various emission concentrations throughout the fallout area. The steps taken to gather the necessary data for the risk assessment are detailed below.

Emissions (metals). EPA approximated metals emissions by facility utilizing estimates of (1) the quantity of hazardous waste combusted by RCRA code, (2) the estimated fraction of metals in each RCRA code, (3) the fraction of each metal segregated as bottom ash and stack emissions, and (4) metal removal efficiencies for in-place APCDs.

EPA obtained data on the quantity of hazardous waste combusted by RCRA code from the Mail Survey. The toxic constituent profiles for each RCRA code were developed by EPA using readily available information from several sources, including the W-E-T model and various sampling efforts conducted by the Agency to develop the toxic constituent profiles.[106] Waste characterization data by RCRA code could not be located for thallium, antimony, and silver, therefore, these pollutants could not be addressed in this analysis. In addition, this analysis could characterize only the fractions of *total* chromium by RCRA code. Based on available results from recent and ongoing analyses of combustion sources, EPA assumed for the present that 1 percent of total chromium waste feed and stack emissions would be of the hexavalent (carcinogenic) species and that the remaining 99 percent would be trivalent.[107] It was assumed that all waste streams are combusted simultaneously on an annual average basis because of limited data on this topic.

To quantify total annual toxic metals emissions for each facility, EPA combined the estimated quantities of each metal combusted annually at each incinerator analyzed in the Mail Survey and engineering estimates on partitioning and removal efficiencies of in-place APCDs by metal. The APCD removal efficiencies were quantified by pollutant for each hazardous waste incinerator using the best engineering judgement and information on inplace controls from the Mail Survey. Partitioning coefficients were developed by pollutant for solid waste incinerators to estimate the proportion of metals segregated as bottom ash and stack emissions. The analysis assumed that there is no partitioning in liquid injectors (i.e., all metals are vaporized).

Emissions (HCl). To estimate HCl emissions, EPA collected information on the same critical elements used in the assessment of metals emission rates (i.e., quantity of hazardous waste combusted by RCRA code, partitioning, and removal efficiencies of inplace (APCDs). The waste data by RCRA code were obtained from the Mail Survey.

To approximate the quantity of chlorine incinerated, EPA first identified RCRA codes that could potentially contain chlorine. This list of RCRA codes was compiled by (1) reviewing waste sampling data (by RCRA code) in a supporting document to the existing RCRA regulations for hazardous waste incinerators and (2) identifying additional RCRA codes that could contain chlorine based on their waste characteristics.[108]

To determine the chlorine content, EPA calculated the average (arithmetic) chlorine concentration in all waste combusted in hazardous waste incinerators using available test burn data (89 data points) for 23 incinerators units located throughout the United States.[109] The total quantity of chlorine being combusted was calculated by multiplying the quantity combusted of RCRA codes potentially containing chlorine at each incinerator by the estimated average chlorine level (roughly 8 percent). A more detailed analysis of chlorine was not performed in this analysis because of time and resource constraints.

HCl emissions were calculated assuming that all chlorine converts to HCl. In addition, the removal efficiencies afforded by in-place controls were considered. The analysis assumed that no partitioning would occur for HCl (i.e., all HCl formed during the combustion process would be emitted as a gas). The analysis calculated emissions by assuming conservatively that all waste types reported in the Mail Survey would be

[105] In selecting a risk threshold of 10^{-5} for these rules, EPA considered risk thresholds in the range of 10^{-4} to 10^{-6}. As discussed in section I.D. of Part Three of the text, the Agency requests comment on alternative risk thresholds.

[106] The sampling efforts included: Versar, "Hazardous Waste and Virgin Oil Assessment of Baseline Metal Content," April 1986; Mitre, "Hazardous Waste Stream Trace Metal Concentrations and Emissions," 1983; and Environ, "Characterization of Waste Streams Listed in 40 CFR Section 261," 1983. These particular studies were selected because they reported pollutant concentrations by RCRA code.

[107] Analysis conducted by EPA's Office of Air Quality Planning and Standards (coal-fired boilers) and Office of Water (sludge incineration). However, more recent tests of hazardous waste combustion indicate that hexavalent chromium may represent as much as 10% of the total chromium emissions (see Part Three, II.B. of today's preamble).

[108] USEPA, Waste Treatment Branch, Office of Solid Waste and Emergency Response, "Supporting Documentation for the RCRA Incinerator Regulations, 40 CFR 264, Subpart O Incinerators," Peer Consultants, Inc. for the Office of Solid Waste and Emergency Response, October 1984. (NTIS order No. PB86-110293)

[109] USEPA, Office of Research and Development, Center for Environmental Research Information, "Handbook Permit Writer's Guide to Test Burn Data, Hazardous Incineration," EPA-625/6-86/012.

combusted simultaneously on an annual average basis. This assumption could result in an underestimate of the potential risks from short-term exposures, as well as compliance costs.

Ambient Concentrations (Metals and HCl). EPA predicted maximum and area-wide ambient concentrations of the metals and HCl emitted from each facility using dispersion modeling. It was outside the scope of this analysis to estimate maximum ambient concentration performing site-specific dispersion modeling. As a result, this analysis used the predicted ambient concentrations generated from 10 hypothetical facilities evaluated at each of 24 sites, which were located in widely varying terrain (see the discussion in Part Three of today's proposed rule).[110] EPA performed the dispersion modeling using 16 wind directions and 15 ring distances, ranging from 0.2 km to 50 km. Ambient concentrations were estimated separately for long-term and short-term exposures.

Health Risk Factors. The unit cancer risk values were provided by EPA's Carcinogen Assessment Group and are listed in Appendix B of today's proposed rule. The RAC's for the noncarcinogens were provided by EPA's Office of Solid Waste and are also summarized in Appendix B of today's proposed rule. The RACs represent 25 percent of the Reference Doses (RfDs) for all pollutants except lead; existing background levels are assumed to account for the remaining 75 percent of the RfD. The lead RAC is defined as 10 percent of the National Ambient air Quality Standard (ANAQS) that has been promulgated for lead under the Clean Air Act; background exposures take up the remaining 90 percent of the NAAQS standard. These risk factors consider only long-term effects and incorporate standard EPA exposure assumptions (e.g., the average exposed individual will weigh 70 kg, will inhale 20 cubic meters of air each day, and will be exposed continuously to the estimated ambient pollutant concentration for 70 years).

Population Exposed. Data on the number of exposed individuals in the vicinity of each facility analyzed was obtained from U.S. Census data available from the Office of Toxic Substances' Graphical Exposure Modeling System (GEMS). The population data were first obtained in the block grid/enumeration district level and then summed to correspond with the geographic segments used in the dispersion modeling.

2. Results

Proposed Standards. Table 11 shows the Agency's estimates of the effect of today's proposed rule on MEI cancer risk levels for metals at metal-burning incinerators. The highest lifetime cancer risk estimated in the baseline is roughly 5.0×10^{-5}, with approximately 22 sites (13 percent of all facilities burning metals) posing risks within this 10^{-5} range under baseline conditions. The remaining 87 percent are estimated to be currently operating under conditions posing less than a one in 100,000 lifetime risk of causing cancer to the maximum exposed individual. The principal effect of today's rule as it relates to carcinogenic metals would be to cause an estimated 22 facilities to reduce their emission rates to levels at or below the 1×10^{-5} risk level.

The estimated annual baseline cancer incidence for the three carcinogenic metals, aggregated across all 167 sites at which EPA estimates such metals are burned, is approximately 0.03 or roughly two cases in 70 years nationwide. The incidence results in a given year are summarized in Table 12 by pollutant. As shown, hexavalent chromium accounts for over half of the predicted annual cancer incidence, with cadmium and arsenic contributing approximately 34 percent and 13 percent, respectively.

TABLE 11.—DISTRIBUTION OF INCINERATOR FACILITIES BY ESTIMATED LIFETIME MEI CANCER RISKS FOR INCINERATORS BURNING METAL-BEARING WASTES: BEFORE AND AFTER COMPLIANCE [1]

Lifetime MEI cancer risks	Number of HW incinerator facilities (percentage of total) [2]	
	Baseline	After compliance
1.00E-02	0	0
1.00E-03	0	0
1.00E-04	0	0
1.00E-05	22 (13%)	0
1.00E-06	28 (17%)	50 (30%)
1.00E-07	47 (28%)	47 (28%)
1.00E-08	36 (22%)	36 (22%)
1.00E-09	20 (12%)	20 (12%)
1.00E-10	8 (5%)	8 (5%)
1.00E-11	3 (2%)	3 (2%)
1.00E-12	3 (2%)	3 (2%)
Total facilities burning metals [3]	167—(100%)	167—(100%)

[1] Results for three metals: arsenic, cadmium, and hexavalent chromium. Compliance based on meeting a 1.00E-05 MEI cancer risk level.
[2] Based on available information, EPA estimates that 167 or about 75 percent of the 227 facilities burn metal-bearing wastes.
[3] Numbers may not sum to total because of rounding.

TABLE 12.—ESTIMATED EXCESS ANNUAL AND LIFETIME CANCER INCIDENCE FOR INCINERATORS BURNING METAL-BEARING WASTES: BEFORE AND AFTER COMPLIANCE [1]

Pollutant	Number of cases per year (percentage of total)		Cases per 70 years	
	Baseline (percent)	After compliance [1]	Baseline	After compliance
Arsenic	0.005 (13)	0.003	0.318	0.184
Cadmium	0.012 (35)	0.007	0.824	0.509
Chromium (VI)	0.018 (52)	0.009	1.248	0.603
Total [2]	0.034	0.019	2.39	1.297

[1] Compliance based on meeting a 1.00E-05 MEI cancer risk level.
[2] Numbers may not sum because of rounding.

After compliance with the proposed 1×10^{-5} *de minimis* cancer risk level for individual sites, EPA conservatively estimates that the annual cancer incidence for these incinerated metals could be reduced from 0.03 to 0.02, or a reduction from approximately two lifetime cancer cases to one lifetime cancer case nationwide in a 70-year period. These calculations were based on the risk reduction needed to meet the proposed risk-based standards and may have been understated. The actual environmental protection afforded by the recommended control technologies at each affected facility could be higher.

The risk assessment also estimated exceedances of the RACs for lead and HCl (short-term and long-term). The predicted ambient air concentrations of the other noncarcinogenic pollutants analyzed (barium and mercury) did not exceed the RACs for these two pollutants at any of the sample facilities modeled. Table 13 summarizes the number of incinerator facilities for which exceedances of the lead and HCl RACs are estimated. It also slows the range of estimated percent reductions in emissions necessary for these facilities to meet the RACs. The number of exceedances is highest for HCl (short-term effects), followed by lead. There is also overlap among the facilities failing the lead or HCl RACs. Approximately 22

[110] Detailed information on the dispersion coefficients used in the risk assessment can be found in: Memorandum from Versar to TBS, "Modeling Summary of Flat and Rolling Terrian Incinerator Sites," May 20, 1987; Memorandum from Versar to TBS, "Modeling Summary of the High Terrain Incinerator Site," June 12, 1987; Memorandum from Versar to TBS, "Modeling Results of Short-Term MEI Concentrations for Hazardous Waste Incinerators", July 15, 1987.

of the 48 facilities are exceeding both the lead and short-term HCl RACs. All of the facilities not complying with the long-term HCl RAC are also exceeding the lead RAC. Under 100 percent compliance with the proposed risk-based standards for lead and HCl, there will be no exceedances of the RACs.

TABLE 13.—ESTIMATED INCREASED LIKELIHOOD OF NONCANCER EFFECTS: EXCEEDANCES OF THE LEAD AND HCL RACS BEFORE AND AFTER COMPLIANCE

Pollutant	Number of HW incinerator facilities exceeding the RAC		Percent reduction in emissions necessary to comply with RAC
	Baseline	After compliance	
Lead	31	0	19–91
HCl (short-term)[1]	48	0	5–78
HCl (long-term)[2]	18	0	20–99

[1] 22 of the 48 facilities do not comply with either the lead or the short-term HCl standard.
[2] All of the facilities unable to comply with HCl standard also do not comply with the lead standard.

Sensitivity Analysis. The alternative *de minimis* risk standard evaluated in the sensitivity analysis (1×10^{-6}) will have an impact only on the cancer risk estimates for metals. Table 14 shows the Agency's estimate of the effect of the alternative standard on MEI cancer risk levels for metals at metal-burning incinerators. The more stringent standard would cause an estimated 50 facilities to reduce their emission rates for carcinogenic metals to levels at or below a 1×10^{-6} risk level. This is an increase of 28 additional facilities above the proposed standard; however, six of these facilities are already predicted to need controls to reduce emissions of noncarcinogenic metals.

As discussed above, the estimated annual baseline cancer incidence for the three carcinogenic metals, aggregated across all 167 sites at which EPA estimates metals are burned, is approximately 0.03 or roughly two cases nationwide in 70 years (see Table 15). A more stringent *de minimis* risk standard of 1×10^{-6} would lower the estimated annual cancer incidence to approximately 0.01 or about one case nationwide in 70 years. These after compliance calculations were based on the percent reduction in emissions needed to meet the alternative risk-based standard.

TABLE 14.—DISTRIBUTION OF INCINERATOR FACILITIES BY ESTIMATED LIFETIME MEI CANCER RISK FOR INCINERATORS BURNING METAL-BEARING WASTES: BEFORE AND AFTER COMPLIANCE [1]

Aggregate lifetime MEI cancer risks	Number of HW incinerator facilities (percentage of total)[2]	
	Baseline (percent)	After compliance (percent)
1.00E-02	0	0
1.00E-03	0	0
1.00E-04	0	0
1.00E-05	22 (13)	0
1.00E-06	28 (17)	0
1.00E-07	47 (28)	97 (58)
1.00E-08	36 (22)	36 (22)
1.00E-09	20 (12)	20 (12)
1.00E-10	8 (5)	8 (5)
1.00E-11	3 (2)	3 (3)
1.00E-12	3 (2)	3 (3)
Total facilities burning metals [3]	167 (100)	167 (100)

[1] Results for three metals: arsenic, cadmium, and hexavalent chromium. Compliance with a 1.00E-06 risk standard (sensitivity analysis).
[2] Based on available information, EPA estimates that 167 or about 75 percent of the 227 facilities burn metal-burning wastes.
[3] Numbers may not sum to total becauseof rounding.

TABLE 15.—ESTIMATED EXCESS ANNUAL AND LIFETIME CANCER INCIDENCE FOR INCINERATORS BURNING METAL-BEARING WASTES: BEFORE AND AFTER COMPLIANCE [1]

Pollutant	Number of cases per year (percentage of total)		Cases per 70 years	
	Baseline (percent)	After compliance	Baseline	After Compliance
Arsenic	0.005 (13)	0.001	0.318	0.103
Cadmium	0.012 (35)	0.004	0.824	0.299
Chromium (VI)	0.018 (52)	0.005	1.248	0.368
Total [2]	0.034 (100)	0.011	2.39	0.771

[1] Compliance based on meeting a 1×10^{-6} MEI cancer risk level.
[2] Numbers may not sum because of rounding.

G. Regulatory Flexibility Analysis

The Regulatory Flexibility Act (RFA) requires Federal regulatory agencies to evaluate the impacts of regulations on small entities. This section summarizes EPA's methodology for conducting a preliminary RFA analysis and the results of that analysis. Based on the results, EPA has determined that today's proposed rule will not have a significant impact on a substantial number of small entities. For the purpose of this analysis, EPA assumed that all facilities were single-established businesses/entities.

1. Methodology

The results of the economic impact analysis were used as the basis for the RFA analysis. Those facilities exceeding the 1 percent threshold for both financial ratios calculated (COP and CFO) were the primary focus of the RFA. The analysis was performed for the subset of 82 facilities selected from the Mail Survey; the results were extrapolated to the population of 227 entities operating hazardous waste incinerators.

EPA first identified which of the 82 hazardous waste incinerator facilities evaluated in the Mail Survey could be designated as small business entities. In particular, EPA used the sales data in Ward's Business Directory to determine which hazardous waste incinerators were owned by entities that could reasonably be classified as large. Ward's lists all companies with annual revenues greater than $10 million. EPA subjectively identified all entities listed by Ward's as "large." In addition, EPA determined whether an entity could reasonably be classified as "large" in the absence of financial data, e.g., a university. If an entity could not be classified as "large" on the basis of either Ward's or by inspection, EPA assumed it was a "small" entity.

EPA then identified whether the potentially affected "small" entities accounted for a significant percentage of all small entities owning hazardous waste incinerators, or a significant percentage of all small entities within a given SIC code (i.e., industry). The total number of entities identified as "small" for each SIC code was determined using the SBA small plant employee size cut-offs and information from the U.S. Census on the distribution of facilities by employee size within each SIC category. As a general criterion, the EPA considers a proposed rule to have a significant impact on a substantial number of small entities if 20 percent of small entities covered by the rule are significantly affected by today's proposed rule.

2. Results

The majority of entities owning hazardous waste incinerators (202 facilities, or 89 percent of all facilities) were designated as "large," as shown in Tables 16 and 17. The entities owning the remaining 25 facilities were identified as "small." The "large" entities were predicted to incur approximately 87 percent of the estimated annualized compliance costs (roughly $5.4 million) associated with the proposed standards, and approximately 90 percent of the estimated annualized costs (roughly $8.6 million) associated with the alternative standards evaluated in the sensitivity

analysis. It is important to note that the designation of a facility as a "small entity" was based on a preliminary review of readily available information. However, this outcome appears plausible from the standpoint that only larger industrial operations would find it economically feasible to construct and operate on-size hazardous waste incinerators.

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VI-11

Table ~~VI-6~~ /6

DISTRIBUTION OF COMPLIANCE COSTS BY FACILITY SIZE AND SIC

SIC Code	Large Entities		Small Entities	
	Number of Facilities	Compliance Costs	Number of Facilities	Compliance Costs
2231	3	$ 15,069		
2282			3	$ 15,685
2421	3	34,184		
2491	3	13,285		
2511	6	68,202		
2661	3	28,567		
2813	3	139,624		
2819	8	235,860		
2821	20	324,298	3	576,640
2822	3	27,930		
2824	3	30,992	3	15,069
2833	3	82,272		
2834	3	258,781		
2844	3	131,017		
2851	3	163,805		
2861	3	30,139		
2865	8	210,607	3	91,961
2869	20	223,480	3	12,893
2873	6	1,609,572		
2879	11	218,067		
2891	3	25,463		
2892	3	18,405		
2899	6	52,337		
2911	6	90,874		
3079			3	15,989
3229	3	127,033		
3339	3	137,803		
3412			3	13,525
3433	3	27,904		
3466	3	49,776	3	25,301
3483	3	97,646		
3531	3	82,562		
3672	3	170,465		
3721	3	17,006		
4953	18	196,612		
7391	14	134,785	3	38,434
8062	3	27,438		
8221	6	34,987		
9661	3	16,131		
9999	8	207,004		
Total[1]	202	$5,359,981	25	$805,498

[1]Sums may not total because of rounding.

Table ~~VI-7~~ / 7

DISTRIBUTION OF COMPLIANCE COSTS BY FACILITY SIZE AND SIC: SENSITIVITY ANALYSIS

SIC Code	Large Entities: Number of Facilities	Large Entities: Compliance Costs	Small Entities: Number of Facilities	Small Entities: Compliance Costs
2231	3	$ 15,069		
2282			3	$ 15,685
2421	3	34,184		
2491	3	13,285		
2511	6	76,766		
2661	3	31,115		
2813	3	224,901		
2819	8	390,758		
2821	20	538,639	3	576,640
2822	3	36,493		
2824	3	50,667	3	15,069
2833	3	82,272		
2834	3	322,577		
2844	3	197,452		
2851	3	282,212		
2861	3	30,139		
2865	8	219,170	3	267,244
2869	20	424,244	3	12,893
2873	6	2,884,366		
2879	11	395,898		
2891	3	25,463		
2892	3	18,405		
2899	6	76,968		
2911	6	257,594		
3079			3	15,989
3229	3	215,004		
3339	3	292,701		
3412			3	13,525
3433	3	27,904		
3466	3	49,776	3	48,234
3483	3	121,486		
3531	3	86,809		
3672	3	296,262		
3721	3	25,570		
4953	18	217,108		
7391	14	312,616	3	38,434
8062	3	27,438		
8221	6	52,113		
9661	3	16,131		
9999	8	274,389		
Total[1]	202	$8,643,945	25	$1,003,714

[1] Sums may not total because of rounding.

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The COP ratios did not exceed the 1 percent threshold for any of the entities identified as "small" considering either the proposed or alternative standards (see Table 18). The CFO ratio was in excess of 1 percent for only three "small" entities in SIC 2821 (with none exceeding 2 percent) for the proposed standards. These three entities represent approximately 12 percent of all "small" entities owning and operating hazardous waste incinerators and 1 percent of all designated small entities within the 2821 SIC Code.[111]

TABLE 18.—SMALL PLANT IMPACTS: FINANCIAL RATIO TESTS

Analytical scenario	Estimated nationwide small entities operating hazardous waste incinertors (1)	
	Cost of compliance/ COP>1%	Cost of compliance/ CFO>1%
A. Proposed Standards:		
SIC 2821	0	3 (1.6%)
Total	0	3
B. Sensitivity Analysis:		
SIC 2821	0	3 (1.6%)
SIC 2865	0	3 (1.0%)
Total	0	6

COP=Cost of Production.
CFO=Cash flow from operations.
(1) There is an estimated total of 25 small entities operating hazardous waste incinerators.

In the sensitivity analysis, an estimated six small entities were predicated to face incremental costs representing between 1 percent and 2 percent of net cash flow. These six small entities account for approximately 24 percent of all small entities operating hazardous waste incinerators. While this appears to represent a substantial number of small entities (i.e., greater than 20 percent), it is important to recall that the CFO ratios for these small entities never exceed 2 percent.

Based on these results, EPA concludes that the today's proposed rule will probably not pose a significant adverse economic impact on a substantial number of small entities.

H. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act*, 44 U.S.C. 3501 *et seq.* Reporting and recordkeeping burden on the public for this collection is estimated to average 628 hours per responser for reporting and 20 hours per response for recordkeeping.

If you wish to submit comments regarding any aspect of this collection of information, including suggestions for reducing the burden, or if you would like a copy of the information collection request (please reference ICR #1559), contact Rick Westlund, Information Policy Branch, PM-223, U.S. Environmental Protection Agency, 401 M St., SW., Washington, DC 20460 (202-382-2745); and Marcus Peacock, Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

III. Pollution Prevention Impacts

These amendments would provide an incentive to reduce the generation of metal and chlorine-bearing hazardous waste at the source given that the proposed metals and HCl emissions controls would be implemented by additional requirements attendant to the disposal of those wastes, i.e., incinerator feed rate limits for individual metals and total chlorine. These requirements are, in essence, tied to the economics of disposing of given volumes of waste since feed rates depend, in part, on the volume of waste the incinerator operator needs to burn. Thus, the metals and HCl controls proposed in this rule do not simply require a percent reduction in emissions, irrespective of the volume and rate of incoming waste streams. Rather, the controls are health-based and, thus, provide limits on emissions rates of metals and HCl that would be implemented by feed rate limits.

Waste generators who send their waste to commercial incinerators would have the incentive to reduce the generation of metal and chlorine-bearing wastes because incineration fees are likely to increase for such waste given that the incinerator has a fixed metal and chlorine feed rate allotment (due to prescribed feed rates and incinerator operating conditions). Wastes with extremely high metals content may no longer be acceptable for incineration in many cases unless the waste generator reduces the metals content of the waste. Any alternative for the disposal of such wastes may be unavailable or the costs of such treatment may be high enough to create the incentive to reduce waste generation rates at the source. This is a typical scenario for pollution prevention measures to be undertaken by waste generators.

Similarly, generators who incinerate their wastes on site also have the incentive to reduce the generation of metal and chlorine-bearing wastes given that the proposed rule would provide a fixed feed rate allotment for their incinerator.

List of Subjects in 40 CFR Parts 260, 264, and 270

Hazardous material, Incorporation by reference, Packaging and containers, Reporting and record keeping requirements, Security measures, Surety bonds, Waste treatment and disposal, Administrative practice and procedure, Confidential business information, Harzardous materials transportation, Hazardous waste, Water pollution control, Water supply.

Dated: April 9, 1990.

William K. Reilly,

Administrator.

Appendix A—Measurement of Metals and Hydrogen Chloride

A-1: *Metals Measurement Methods*

General considerations of sampling wastes for metals, the digestion of the collected samples, and the analysis of the resulting solution are described in Chapter 3, Volume 1A of "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW-846 (incorporated by reference in § 260.11). The current methods are summarized below in Tables A-1 and A-2.

TABLE A-1.—SAMPLE PREPARATION METHODS

Methods	Analysis procedure	Waste matrix
3010	ICP, FLAA	Aqueous only.
3020	GFAA	Aqueous only.
3050	FLAA, ICP or GFAA.	Sediment, sludge, soil, filter particulate material, and filter from stack sampling train.
[1] 3040	ICP or FLAA	Oils, greases or waxes.

[1] Method 3040 is only recommended for virgin oil or clean used oils. It is not recommended for oil that contain emulsions and particulates. Until EPA's microwave digestion technique is available, use the HNO_3/H_2O_2 combination and procedure from Method 3050 in a condenser rig similar to that used in the old Method 3030 for used or dirty oils. Methods 3010 and 3020 can be used for volatile solvents if the solvent is first carefully evaporated, the volume replaced with water, before completing the procedure.

ICP=Inducitively Coupled Plasma Emission Spectroscopy.
GFAA=Graphite Furnace Atomic Absorption.
FLAA=Flame Atomic Absorption.
Source: EPA 1986.

[111] It is important to note that the percentage of small entities in SIC 2821 and 2865 affected by today's proposed rule could be underestimated. Many of the entities in each SIC assumed to be small based on employee size may have large annual revenues or be owned by large holding companies. This determination could not be made using available data.

TABLE A–2.—ANALYSIS METHODS

Sample	Sampling procedure	Constituent	Analysis method
Flue Gas	EPA Method 5	Particulates	
	Multiple Metals Train	Total Metals	See Methods Listed Below.
		Antimony	7041
	EPA Method 108	Arsenic	7060,[b] 7061.[b]
		Barium	6010, 7080.
	EPA Method 104	Beryllium	6010, 7090, 7091.
		Cadmium	6010, 7130, 7131.
		Chromium(Total)	6010, 7190, 7191.
		Chromium(VI)	7195–7198.[a]
		Lead	6010, 7420, 7421.
	EPA Method 101A	Mercury	7470,[b] 7471.[c]
		Silver	6010, 7760.[c]
		Thallium	6010, 7841.
Other Samples[d]	Composite	Antimony	7040.
		Arsenic	7060,[b] 7061.[b]
		Barium	6010, 7080.
		Beryllium	6010, 7090, 7091.
		Cadmium	6010, 7130, 7131.
		Chromium(Total)	6010, 7190, 7191.
		Chromium(VI)	7195–7198.[a]
		Lead	6010, 7420, 7421.
		Mercury	7470,[b] 7471.[c]
		Silver	6010, 7760.[c]
		Thallium	6010, 7841.

[a] These chromium (VI) methods are for aqueous matrices only. EPA has nearly completed validation of a stack sampling methodology for hexavalent chromium. See Knoll J.E., US EPA, and Carver, A.C., Entropy Environmentalists, Inc., "Sampling and Analytical Methodology for Measurement of Low Levels of Hexavalent Chromium from Stationary Sources", Paper presented at EPA/AWMA Symposium at Raleigh, N.C., May 1989, as revised by draft dated November 10, 1989, entitled "Method Cr^{+6}—Determination of Hexavalent Chromium Emissions from Stationary Sources".

[b] This method includes digestion for aqueous matrices (no digestion method from Table III–12 is necessary.

[c] This method include digestion for all matrices (no digestion method from Table III–12 is necessary).

[d] Includes waste feed, bottom ash and scrubber liquor.

The Multiple Metals Method identified in Table A–2 is a method EPA is proposing to determine emissions of the 10 metals that would be regulated by the proposed rule: antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, silver, and thallium. The proposed method is described in U.S. EPA, "Proposed Methods for Stack Emissions Measurement of CO, O2, THC, HCl, and Metals at Hazardous Waste Incinerators, Vol. VI of the Hazardous Waste Incineration Guidance Series", November 1989. The method uses a Method 5 train (40 CFR Part 60, Appendix A) modified to include the following impingers:

(1) empty (used for condensate collection; may be omitted for a dry source);

(2) 5 percent HNO_3 and 10 percent H_2O_2;

(3) same as 2;

(4) 4 percent $KMnO_4$ and 10 percent H_2SO_4;

(5) same as 4; and

(6) silica gel (to protect pump and meter).

The document also provides alternate methods and conditions under which only a single metal analysis can be performed.

A–2: *Hydrogen Chloride Measurement Methods*

Methods of sampling and analysis of the waste feed for chloride and stack gas for HCl are described in detail in EPA Publication No. SW–846, with additional information provided in the OSW Methods Manual. The latter document discusses the acceptable methods of sampling and analysis of stack gases for hydrogen chloride. Briefly, the sampling may be performed using one of several trains. The EPA Method 5 train (40 CFR part 60, appendix A), or the semivolatile train based on Method 0010 of EPA Publication No. SW–846, may be used by incorporating a collection solution in the second and third impingers. The stack gas may also be sampled using a specific HCl train incorporating the same solution impingers.

Analysis of the gas sample may be performed using Method 9251 Colorimetric Automated Ferricyanide or 9252 Titimetric Mercuric Nitrate as described in Volume IC, Chapter 5 of EPA Publication No. SW–846, or the Ion Chromatography Method 300.0 as described in "Method for Chemical Analysis of Water and Waste," EPA Publication No. EPA600/4–79–020 (NTIS No. PB84–128677). Special considerations including interferences, cost, reliability, etc., that should be considered in selecting the method to be used are described in the Proposed Methods Manual.

For the reasons set forth in the preamble, it is proposed to amend title 40 of the Code of Federal Regulations as follows:

PART 260—HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

I. In part 260:

1. The authority citation for part 260 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6921 Through 6927, 6930, 6934, 6935, 6937, 6938, 6939, and 6974.

2. In § 260.10, it is proposed to revise the definition of "incinerator" and the introductory text of "industrial furnace", and add in alphabetical order, definitions for "carbon regeneration unit," "infrared incinerator", and "plasma arc incinerator" to read as follows:

§ 260.10 Definitions.

* * * * *

Carbon regeneration unit means any enclosed thermal treatment device used to regenerate spent activated carbon.

Incinerator means any enclosed device that:

(1) Uses controlled flame combustion and neither meets the criteria for classification as a boiler or carbon

regeneration unit, nor is listed as an industrial furnace; or

(2) Meets the definition of infrared incinerator or plasma arc incinerator.

Industrial furnace means any of the following enclosed devices that are integral components of manufacturing processes and that use thermal treatment to accomplish recovery of materials or energy: * * *

Infrared incinerator means any enclosed device that uses electric powered resistance heaters as a source of radiant heat and which is not listed as an industrial furnace.

Plasma arc incinerator means any enclosed device using a high intensity electrical discharge or arc as a source of heat and which is not listed as an industrial furnace.

* * * * *

3. It is proposed to amend paragraph (a) of § 260.11 by adding the following reference in alphabetical order:

§ 260.11 References.

(a) * * *

"Risk Assessment Guideline for Permitting Hazardous Waste Thermal Treatment Devices (RAG)."

* * * * *

PART 261—IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

II. In part 261:

1. The authority citation for part 261 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6921, 6922, and 6937.

2. It is proposed to amend § 261.2 by redesignating paragraph (d)(2) as (d)(3) and adding a new paragraph (d)(2).

§ 261.2 Definition of solid waste.

* * * * *

(d) * * *

(2) Secondary materials fed to a halogen acid furnace that are identified or exhibit a characteristic of a hazardous waste as defined in subparts C or D of this part.

* * * * *

PART 264—STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

III. In part 264:

1. The authority citation for part 264 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6924, and 6925.

2. It is proposed to amend § 264.342 by revising paragraphs (a) and (b)(1) to read as follows:

§ 264.342 Principal organic hazardous constituents (POHCs).

(a) All organic hazardous constituents in the waste feed must be treated to the extent required by the performance standards of § 264.343(a).

(b) (1) Principal organic hazardous constituents (POHCs) are those compounds for which compliance with paragraph (a) of this section shall be demonstrated in a trial burn. One or more POHCs shall be designated by the Administrator for each waste feed in the trial burn. POHCs shall be designated based on the degree of difficulty of incineration of the organic constituents in the waste and on their concentration or mass in the waste feed considering the results of waste analyses submitted with part B of the permit application. POHCs are most likely to be selected from among those compounds listed in part 261, Appendix VIII of this chapter that are also present in the normal waste feed. However, if the applicant demonstrates to the Regional Administrator's satisfaction that a compound not listed in Appendix VIII or not present in the normal waste feed is a suitable indicator of compliance with paragraph (a) of this section, that compound may be designated as a POHC. Such POHCs need not be toxic or organic compounds.

* * * * *

3. It is proposed to amend § 264.343 by revising paragraph (c), redesignating paragraph (d) as (g) and revising the newly redesignated paragraph (g), and adding new paragraphs (d), (e), (f), and (h) to read as follows:

§ 264.343 Performance standards.

* * * * *

(c) An incinerator burning hazardous waste must not emit particulate matter in excess of 180 milligrams per dry standard cubic meter (0.08 grains per dry standard cubic feet) when corrected for the amount of oxygen in the stack gas according to the formula:

$$P_c = P_m \times \frac{14}{E - Y}$$

Where P_c is the corrected concentration of particulate matter, P_m is the measured concentration of particulate matter, E is the percentage of oxygen contained in the air used for combustion, and Y is the measured concentration of oxygen in the stack gas, using the Orsat method for oxygen analysis of dry flue gas, presented in part 60, appendix A (Method 3), of this Chapter. This correction factor is to be used by all hazardous waste incinerators. For incinerators using ambient air for combustion, the value of E will be 21, while for incinerators using oxygen enriched air for combustion, the value of E will be greater than 21.

(d) *Carbon monoxide* (1)(i) *Tier I:* Except as provided by paragraph (d)(1)(ii) of this section, an incinerator burning hazardous waste must be operated so that carbon monoxide (CO) levels (corrected to 7% oxygen, dry basis) in the stack gas do not exceed 100 ppmv on an hourly rolling average basis.

(ii) *Tier II:* A hazardous waste incinerator may be operated at CO levels higher than those provided by paragraph (d)(1)(i) of this section provided the owner or operator demonstrates that emissions of total hydrocarbons (THC) at that higher CO level do not pose an unacceptable health risk to the maximum exposed individual. For the purpose of this demonstration, THC must be monitored continuously during the trial burn in accordance with methods specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA publication SW-846 as incorporated by reference in § 260.11. For purposes of this subpart, THC will be considered to pose acceptable health risk when:

(A) The maximum hourly average THC emissions rate during the trial burn does not exceed the THC Screening Limits identified in the "Risk Assessment Guideline for Permitting Hazardous Waste Thermal Treatment Devices" (RAG) as incorporated by reference in § 260.11; or

(B) When the owner or operator demonstrates by site-specific dispersion modeling that THC emissions will not result in an increased lifetime cancer risk to the maximum exposed individual of more than 10^{-5} using procedures prescribed in the RAG (incorporated by reference in § 260.11).

(2) CO limits will be established in the permit using one of the following formats:

(i) Hourly rolling average format, where the permitted CO level is 100 ppmv for Tier I and the average of the CO levels occurring during the trial burn for Tier II; or

(ii) Cumulative hourly time above limit format, where two CO limits will be specified—one which cannot be exceeded at any time and the other which can be exceeded only for a

specified time in any clock hour. These CO limits, and time of exceedance in any hour, shall be established to ensure that the total permitted CO emissions do not exceed those that would be allowed under the hourly rolling average format in any hour of operation.

(3) *Correction factor for oxygen.* (i) When the oxygen content in the stack gas differs from 7 percent, measured CO levels must be corrected for the actual amount of oxygen in the stack gas according to the formula:

$$CO_c = CO_m \times \frac{14}{E - Y}$$

where CO_c is the corrected concentration of CO in the stack gas, CO_m is the measured CO concentration measured in accordance with "Test Methods For Evaluating Solid Waste Physical/Chemical Methods," EPA Publication SW-846 as incorporated by reference in § 260.11, E is the percentage of oxygen contained in the air used for combustion, and Y is the measured oxygen concentration in the stack gas using the Orsat method of oxygen analysis in part 60, Appendix A (Method 3) of this Chapter if oxygen is not monitored continuously, or using the method prescribed in "Test Methods for Evaluating Solid Waste Physical/Chemical Methods," EPA Publication SW-846 is incorporated by reference in § 260.11, when oxygen is monitored continuously. This correction procedure is to be used by all hazardous waste incinerators. For incinerators using ambient air for combustion, the value for E will be 21. For incinerators using oxygen-enriched air, the value for E will be greater than 21.

(ii) For purposes of compliance with the hourly rolling average format of paragraph (d)(2)(i) of this section, the stack gas oxygen level, correction factor, and the corrected CO value shall be determined continuously. For compliance with the cumulative time above limit format of paragraph (d)(2)(ii) of this section, the appropriate stack oxygen level and the CO correction factor shall initially be determined during the trial burn (or by data in lieu of a trial burn) and, at a minimum, annually thereafter. The Regional Administrator may specify in the permit more frequent determinations if necessary to ensure that the correction factor is accurate. That correction factor shall be applied continuously to provide corrected CO values continuously.

(4) The CO limits provided by this section are based on dry stack gas. When instruments that measure CO on a wet basis are used, a correction factor shall be used to convert the measured value to a dry basis. This correction factor shall initially be determined during the trial burn and annually thereafter unless otherwise specified in the permit.

(e) *Metals.* (1) The owner and operator must comply with the metals controls provided by paragraphs (e)(2), (e)(3), or (e)(4) of this section.

(2) *Feed Rate Screening Limits.* (i) For the carcinogenic metals arsenic, cadmium, chromium, and beryllium, the sum of the ratios of the actual feed rate in lbs/hr to the Feed Rate Screening Limit for all the metals shall not exceed 1.0, as determined by the following equation:

$$\sum_{i=1}^{n} \frac{\text{Actual Feed Rate}_i}{\text{Feed Rate Screening Limit}_i} < 1.0$$

where:

n = number of carcinogenic metals

Actual Feed Rate$_i$ = the actual feed rate for metal "i", in lb/hr.

Feed Rate Screening Limit$_i$ = the limit provided in the RAG for metal "i", in lb/hr.

The Screening Limits are specified in the RAG, incorporated by reference in § 260.11, for the applicable effective stack height, terrain type and urban or rural land use classification.

(ii) For each of the noncarcinogenic metals antimony, barium, lead, mercury, silver, and thallium, the actual feed rate in lb/hr shall not exceed the Feed Rate Screening Limits specified in the RAG (incorporated by reference in § 260.11) for the applicable effective stack height, terrain type, and urban or rural land use classification.

(3) *Emissions Screening Limits.* (i) For the carcinogenic metals arsenic, cadmium, chromium, and beryllium, the sum of the ratios of the actual emission rate to the Emissions Screening Limit for all the metals shall not exceed 1.0, as determined by the following equation:

where:

n = number of carcinogens

Predicted Ambient Concentration = the maximum off-site annual average ground level concentration for metal "i", in ug/m^3, at the 10^{-5} risk level.

Total chromium emission rates measured in accordance with "Test Methods for Evaluating Solid Waste; Physical/Chemical Methods," EPA Publication SW-846, as incorporated by reference in § 260.11 are to be used for this determination, unless the applicant's sampling and analysis procedures are capable of reliably determining hexavalent chromium emission rates to the satisfaction of the Administrator.

(ii) For each of the noncarcinogenic metals, antimony, barium, lead, mercury, silver, and thallium, the predicted maximum annual average off-site ground level concentration shall not exceed the Reference Air Concentrations provided by the RAG.

(iii) Conformance with the requirements provided by this paragraph is demonstrated by stack emissions testing in accordance with the Multiple Metals Method in "Test Methods for Evaluating Solid Waste; Physical/Chemical Methods," EPA Publication SW-846, as incorporated by reference in § 260.11 and 40 CFR 60 Reference Methods 1–5, and dispersion modeling in accordance with EPA's "Guideline on Air Quality Models (Revised)" (see § 270.6).

(5) For facilities with more than one stack handling emissions from the burning of hazardous waste in an incinerator, boiler, or industrial furnace, aggregate emissions from all such stacks will be considered in demonstrating compliance with paragraph (d) of this section according to procedures prescribed in the RAG.

(f) *Hydrogen chloride.* (1) The owner and operator must comply with the total chlorine or hydrogen chloride (HCl) controls provided by paragraphs (f)(2), (f)(3), or (f)(4) of this section.

(2) *Feed Rate Screening Limits.* The actual feed rate of total chlorine in lb/hr shall not exceed the Feed Rate Screening Limits provided in the RAG (see § 260.11) for the applicable effective stack height and terrain type, as defined in the RAG.

$$\sum_{i=1}^{n} \frac{\text{Actual Feed Rate}_i}{\text{Emissions Screening Limit}_i} < 1.0$$

where:

n = number of carcinogenic metals

Actual Emission Rate$_i$ = the emission rate measured during the trail burn or provided in lieu of the trail burn for metal "i", in g/s.

Emissions Screening Limit$_i$ = the limit provided in the RAG for metal "i", in g/s.

The Screening Limits are specified in the RAG (incorporated by reference in § 260.11) for the applicable effective stack height, terain type and urban or rural land use classification. Total chromium emission rates measured in accordance with "Test Methods for Evaluating Solid Waste; Physical/Chemical Methods," EPA Publication SW-846, as incorporated by reference in

§ 260.11 are to be used for this determination unless the applicant's emissions sampling and analysis procedures are capable of reliably determining hexavalent chromium emissions rates to the satisfaction of the Administrator; and

(ii) For each of the carcinogenic metals antimony, barium, lead, mercury, silver, and thallium, the actual emission rate shall not exceed the Emissions Screening Limits provided in the RAG (incorporated by reference in § 260.11) for the applicable effective stack height, terrain type, and urban versus rural land use classification.

(iii) Metals emissions must be measured in accordance with the Multiple Metals Method in "Test Methods for Evaluating Solid Waste; Physical/Chemical Methods," EPA Publication SW-846, as incorporated by reference in §260.11 and 40 CFR 60 Reference Methods 1–5.

(4) *Site-specific risk analysis.* (i) For the carcinogenic metals arsenic, cadmium, chromium and beryllium, the sum of the ratios of the predicted maximum off-site annual average ground level concentration to the Risk-Specific Dose for all carcinogenic metals shall not exceed 1.0, as determined by the following equation.

$$\sum_{i=1}^{n} \frac{\text{Predicted Ambient Concentration}_i}{\text{Risk Specific Dose}_i} < 1.0$$

(3) *Emissions Screening Limits.* The emission rate of HCl in g/s shall not exceed the Emissions Screening Limits provided in the RAG for the applicable effective stack height and terrain type.

(4) *Site specific risk analysis.* HCl emissions shall not result in an exceedance of the 3-minute exposure Reference Air Concentration (RAC) or the annual exposure RAC provided by the RAG. Conformance with this standard shall be demonstrated as provided by paragraphs (e)(4) (iii) and (iv) of this section.

(5) For facilities with more than one stack handling emissions from the burning of hazardous waste in an incinerator, boiler, or industrial furnace, aggregate emissions from all such stacks will be considered in demonstrating compliance with paragraph (e) of this section according to procedures prescribed in the RAG.

(g) For purposes of permit enforcement, compliance with the operating requirements specified in the permit (under § 264.345) will be regarded as compliance with this section. However, evidence that compliance with those permit conditions is insufficient to ensure compliance with the performance requirements of this section may be "information" justifying modification, revocation, or reissuance of a permit under § 270.41 of this chapter.

(h) The Feed Rate and Emission Screening Limits for metals and HCl provided by paragraphs (e) and (f) of this section, and the Emission Screening Limits for THC provided by paragraph (d) of this section may not be protective in the following situations:

(1) Facility is located in a narrow valley less than 1 km wide; or

(2) Facility has a stack taller than 20m and is located such that the terrain rises to the physical stack height within 1 km of the facility; or

(3) Facility has a stack taller than 20m and is located within 5 km of the shoreline of a large body of water (such as an ocean or large lake); or

(4) The facility property line is within 200m of the stack and the physical stack height is less than 10m; or

(5) On-site receptors are of concern, and the physical stack height is less than 10m.

For these cases, and for any other reasons deemed appropriate, the Regional Administrator may, at his discretion, require the owner/operator to submit a site-specific air quality dispersion analysis consistent with "Guideline on Air Quality Models (Revised)," EPA Publication 450/2–78–027R as incorporated by reference in § 270.6 of this chapter. Where such an analysis is required, the determination of source limits shall be in accordance with the procedures employed for establishing the limits specified by this section.

4. It is proposed to amend § 264.345 by revising paragraph (a) and adding text to the end of paragraph (e) to read as follows:

§ 264.345 Operating requirements.

* * * * *

(a) An incinerator must be operated in accordance with operating requirements specified in the permit whenever there is hazardous waste in the incinerator. These will be specified on a case-by-case basis as those demonstrated (in a trial burn or in alternative data as specified in § 264.344(b) and included with part B of the facility's permit application) to be sufficient to comply with the performance standards of § 264.343.

* * * * *

(e) * * * When the hazardous waste feed is cut off, the temperature in the (secondary) combustion chamber must be maintained and emission control equipment must continue to function as specified in the permit until all residual solids exit the combustion chamber. For cases when waste feed cutoff occurred because of exceeding the CO limits, the waste feed may be resumed only after the CO levels are brought down to permitted levels.

* * * * *

5. It is proposed to revise the heading of § 264.347 and amend it by revising paragraphs (a) and (c); revising and redesignating paragraph (d) as (e); and adding new paragraph (d) to read as follows:

§ 264.347 Monitoring, inspections, and reporting requirements.

(a) The owner or operator must conduct, as a minimum, the following monitoring while incinerating hazardous waste:

(1) Combustion temperature and the indicators of combustion gas velocity, air pollution control device parameters, and other parameters as specified in the facility permit as necessary to ensure the performance standards of § 264.343 are met, must be continuously monitored by equipment that records the parameters at least every 30 seconds.

(2) CO must be monitored and recorded on a continuous basis in accordance with SW–846 (as incorporated in § 260.11) at a point in the incinerator downstream of the combustion zone and prior to release to the atmosphere.

(3) As a part of the permit renewal process or upon request by the Regional Administrator, sampling and analysis of the waste and exhaust emissions must be conducted to verify that the operating requirements established in the permit achieve the performance standards of § 264.343.

* * * * *

(c) The automatic waste cutoff system and associated alarms must be tested at least weekly to verify operability, unless the applicant demonstrates to the Regional Administrator that weekly inspections will unduly restrict or upset operations and that less frequent inspection will be adequate. At a minimum, operational testing must be conducted monthly.

(d) The continuous monitors required under § 264.347(a) must be calibrated at least weekly, unless the applicant demonstrates to the Regional Administrator that weekly calibrations will unduly restrict or upset operations and that less frequent calibration will be adequate. At a minimum, they must be calibrated monthly.

(e) The monitoring and inspection data must be recorded and the records must be placed in the operating log required by § 264.73. The operator must record in the operating log whenever the hazardous waste feed is cut off in accordance with § 264.345(e). The record must include date, time and circumstances of each cut off and the action the operator took to address the problem. Quarterly reports of automatic waste feed cutoffs, the circumstances of the cutoffs, and any noncompliance incidents must be submitted to the Administrator within 30 days of the end of the applicable reporting quarter.

PART 270—EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

IV. In part 270:

1. The authority for part 270 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912, 6924, 6925, 6927, 6939 and 6974.

2. It is proposed to amend § 270.6 (a) by adding a new reference in alphabetical order to read as follows:

§ 270.6 References.

(a) * * *

"Guideline on Air Quality Models (Revised)," EPA Publication Number 450/2–78–027R (OAQPS Guideline No. 1.2–080), available from National Technical Information Service, Springfield, Virginia, Order No. PB 86–245286.

* * * * *

3. It is proposed to amend § 270.19 by revising paragraph (a) introductory test, and paragraphs (c)(1)(iii), (c)(3), (c)(6)(ii), and (c)(7), by removing paragraph (c)(6)(vii) and redesignating paragraphs (c)(6) (viii) and (ix) as (c)(6) (vii) and (viii), respectively, and by adding paragraphs (c)(9), (e) and (f) to read as follows:

§ 270.19 Specific Part B information requirements for incinerators.

* * * * *

(a) When seeking an exemption under § 264.340 (b) or (c) of this chapter (ignitable, corrosive, or reactive wastes only), the applicant must perform and submit an analysis of representative samples of all waste streams for which the applicant is seeking an exemption, for all the part 261, appendix VIII constituents which would reasonably be expected to be in the waste. The constituents excluded from analysis must be identified, and documentation provided to support that they would not reasonably be expected to be in the waste. The applicant must also submit, as appropriate:

* * * * *

(c) * * *

(1) * * *

(iii) An identification of any hazardous metals and hazardous organic constituents, listed in part 261, appendix VIII, of this chapter, and total chlorine which are present in the waste to be burned, except that the applicant need not analyze for constituents listed in part 261, appendix VIII, of this chapter which would reasonably not be expected to be found in the waste. The constituents excluded from analysis must be identified and the basis for their exclusion stated. The waste analysis must rely on analytic techniques specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," (EPA Publication SW–846 as incorporated by reference in § 260.11 and referenced in 40 CFR part 261, appendix III), or their equivalent.

* * * * *

(3) A description and analysis of the waste to be burned shall be compared with the waste for which data from operations or trial burns are provided to support the contention that a trial burn is not needed. The data should include the items listed in paragraph (c)(1) of this section. This analysis should specify the POHCs, metals, and total chlorine which the applicant has identified in the waste for which a permit is sought, and any differences therefrom for the waste for which the trial burn data are provided.

* * * * *

(6) * * *

(ii) Total waste feed rate, individual metal feed rates (specified separately for liquid (pumpable) wastes, solid wastes, and organometals), and total chlorine feed rate.

* * * * *

(7) Such supplemental information as the Director finds necessary to achieve the purposes of this paragraph. This information includes, but is not necessarily limited to:

(i) Physical stack height.

(ii) Stack flue gas temperature.

(iii) Topographical data up to a distance of 5 km around the stack, and land use data within a 3 km radius of the stack, including maps and aerial photographs.

(iv) Stack gas flow rate.

* * * * *

(9) Information that the Director finds necessary to demonstrate compliance with the Feed Rate Screening Limits, Emissions Screening Limits, or Site-Specific Risk Analysis standards for metals and HCl at levels which do not pose an unacceptable risk to human health and the environment and which may include the following data:

(i) For Emissions Screening Limits and Site-Specific Risk Analysis, metals and HCl emission rates from the stack for the facility whose data is proposed to be used in lieu of the trial burn.

(ii) For Site-Specific Risk Analysis, predictions of maximum annual average off-site ground level concentrations (on-site concentrations must be considered if individuals reside on site) for metals and HCl for the facility seeking the permit, as well as:

(A) Meteorological data;

(B) Rationale for air dispersion model selection;

(C) Topographic considerations.

(iii) A comparison of the actual emission rates from the facility whose data is being proposed to the expected emission rates of the facility seeking the permit.

* * * * *

(e) Applicants seeking to be permitted for burning of wastes containing metals or chlorine must submit information or documentation needed for the Director to determine whether the incinerator is situated in complex or noncomplex terrain, whether the incinerator is located in an urban or rural land use area as defined in the RAG, and any other information necessary to set the appropriate metals at HCl permit conditions. The applicant must set forth the methodology and all information used for the determination.

(f) Applicants seeking to be permitted under the Site-Specific Risk Analysis provisions of § 264.343 for THC, metals and total chlorine must submit a dispersion modeling plan with part B of the permit application. The Director will review the plan for conformance with the "Guideline on Air Quality Models (Revised)" (incorporated by reference, see § 270.6). The Director will either approve the modeling plan or determine that an alternate or supplementary plan is appropriate. After completion of the trial burn to measure metals, THC and HCl emission rates, the owner or operator must conduct dispersion modeling according to the approved plan and submit the results to the Director in the trial burn report. The Director will determine whether the results are in conformance with the requirements of § 264.343 (d), (e), and (f) of this chapter and will establish appropriate operating requirements as required by § 264.345 of this chapter.

* * * * *

5. It is proposed to amend § 270.62 by revising paragraphs (b)(2)(i)(C),

(b)(2)(i)(D), (b)(2)(ii)(F), (b)(2)(ii)(G), (b)(2)(vii), (b)(4), (b)(6)(i), (b)(6)(ii), (b)(6)(iii), (b)(6)(v), (b)(6)(viii), (b)(6)(ix), (b)(8), (c) introductory text, and (c)(1); by adding new paragraphs (b)(2)(i)(E), and (b)(2)(ii)(K), and redesignating paragraph (b)(10) as (b)(11) and revising it and adding a new paragraph (b)(10) to read as follows:

§ 270.62 Hazardous waste incinerator permits.

* * * * *

(b) * * *

(2) * * *

(i) * * *

(C) An identification of any hazardous metals, hazardous organic constituents listed in part 261, appendix VIII of this chapter, and total chlorine, which are present in the waste to be burned, except that the applicant need not analyze for constituents listed in part 261, appendix VIII, of this chapter which would not reasonably be expected to be found in the waste or are easier to destroy than the most difficult POHC to be tested in the trial burn. The constituents excluded from analysis must be identified, and the basis for the exclusion stated. The waste analysis must rely on analytical techniques specified in "Test Methods for Evaluating of Solid Waste, Physical/Chemical Methods," EPA Publication SW–846 as incorporated by reference, in § 260.11 or their equivalent.

(D) An approximate quantification of the hazardous constituents including metals and total chlorine identified in the waste, within the precision produced by the analytical methods specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW–846 as incorporated by reference, in § 260.11, or their equivalent.

(E) Total chlorine concentration of the waste in the form and composition in which it will be burned.

(ii) * * *

(F) Description of automatic waste feed cut-off system(s), and how they are connected to any thermal relief valve or bypass system.

(G) Stack gas monitoring, pollution control equipment, and heights of all stacks or combustion gas discharge vents, measured from ground level.

* * * * *

(K) Location and description of any bypass systems, and any backup or redundant equipment to limit the number of bypass events.

* * * * *

(vii) Procedures for rapidly stopping waste feed, shutting down the incinerator, maintaining temperature in the combustion chamber until all waste exit the incinerator, and controlling emissions in the event of an equipment malfunction or activation of any thermal relief valve or other bypass system including calculations demonstrating that emissions will be controlled during such an event (sufficient oxygen for combustion and maintaining negative pressure), and the procedures for executing the "contingency plan" whenever a relief valve is used, thus causing an emergency release of emissions.

* * * * *

(4) Based on the waste analysis data in the trial burn plan, the Director will specify as trial Principal Organic Hazardous Constituents (POHCs), those constituents for which destruction and removal efficiencies must be calculated during the trial burn.

(i) These trial POHCs will be specified by the Director based on his estimate of the difficulty of incineration of the constituents identified in the waste analysis, their concentration or mass in the waste feed, and, for wastes listed in part 261, subpart D, of this chapter, the hazardous waste organic constituent or constituents identified in appendix VII of that part as the basis for listing.

(ii) The use of a POHC surrogate as proved by § 264.342(b)(1) of this chapter may be appropriate in certain circumstances based on the Director's estimate of the difficulty of chemical analysis of the waste, the low concentrations of POHCs in the waste, the low stability of waste POHCs in the waste, or other appropriate factors. Such surrogates need not be organic, toxic or present in the waste. The Director may approve the use of a POHC surrogate provided it is suitable based on the performance standard of § 264.343(a), the composition of the wastes to be incinerated, and the sampling and analysis requirements.

* * * * *

(6) * * *

(i) A quantitative analysis of the trial POHCs, total chlorine, and metals in the waste feed to the incinerator.

(ii) A quantitative analysis of the exhaust gas for the concentration and mass emissions of the trial POHCs (POHC surrogates), oxygen (O_2), and, as appropriate, metals and hydrogen chloride.

(iii) A quantitative analysis of the scrubber water (if any), ash residues, and other residues, for the purpose of estimating the fate of the trial POHCs, HCl, and metals, as appropriate.

* * * * *

(v) A computation of the total chlorine feed rate and, if applicable, the HCl emission rate, in accordance with § 264.343(f) of this chapter.

* * * * *

(viii) A continous measurement of temperature, combustion gas velocity, and all waste feed rates.

(ix) A continuous measurement in the exhaust gas of carbon monoxide (CO) and oxygen (O_2) (as required), and THC emissions if complying with 40 CFR 264.343(d)(1)(ii) in lieu of 40 CFR 264.343(d)(1)(i).

* * * * *

(8) All data collected during any trial burn, and subsequent analyses of all trial burn samples including assurance and control (QA/QC) data must be submitted to the Director within 90 days of completion of the trial burn.

* * * * *

(10) All trial burn runs for which permit conditions will be established must be passed (i.e., conformance must be demonstrated for all performance standards provided by § 246.343 of this chapter for all runs). A minimum of three runs must be passed for each set of permit conditions. One of the three runs may be disregarded if the Director believes there is sufficient reason.

(11) Based on the results of the trial burns, the Director shall set the operating requirements in the final permit according to § 264.345 of this chapter. The permit modification shall proceed as a minor modification according to § 270.42.

(c) For the purposes of allowing operation of a new hazadous waste incinerator following completion of the trial burn and prior to final modification of the permit conditions to reflect the trial burn results, the Director may establish permit conditions, including but not limited to allowable waste feeds, emission rates, and operating conditions sufficient to meet the requirements of § 264.345 of this chapter, in the permit to a new hazardous waste incinerator. These permit conditions will be effective for the minimum time required to complete sample analysis, data computation, and submission of the trial burn results by the applicant, and modification of the facility permit by the Director.

(1) Applicants must submit a statement with the permit application, which identifies the conditions necessary to operate in compliance with the performance standards of § 264.343 of this chapter, during this period. This statement should include, at a minimum, restrictions on waste constituents, waste feed rates, emission rates, and operating parameters in § 264.345 of this chapter.

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